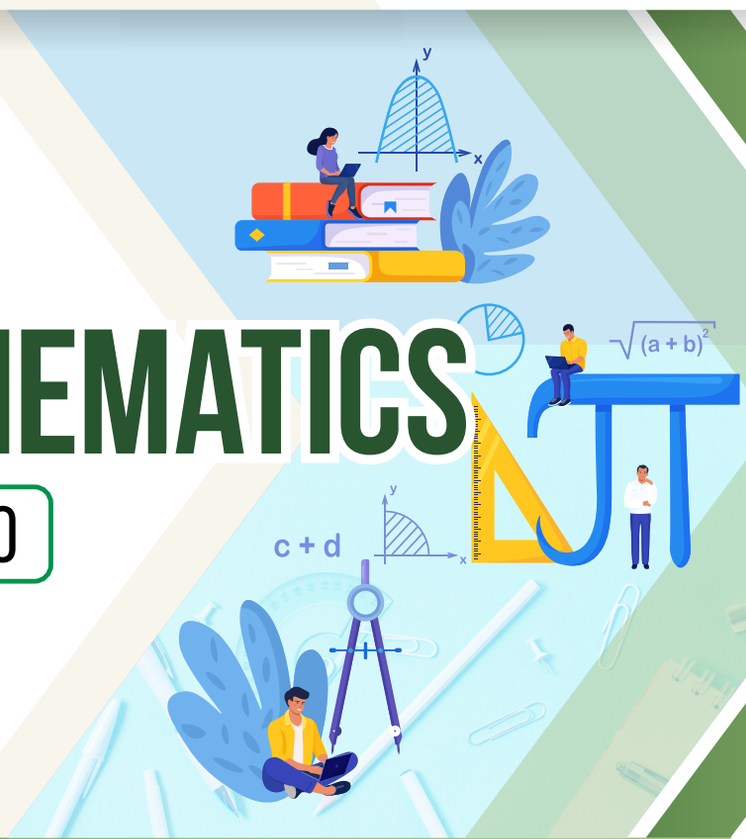
DEPARTMENT OF SCHOOL EDUCATION

RIGHT TO EDUCATION
SAMAGRA SHIKSHA - A.P.
EDUCATION FOR ALL

STRUCTURED LESSON PLANS FOR CBSE-AFFILIATED SCHOOLS



MATHEMATICS

GRADE-10

A Teacher Resource Book for
Competency Based Teaching-Learning

STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING (SCERT)

Committee for Development of Structured Lesson Plans

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MESSAGE BY PRINCIPAL SECRETARY

It brings me a great joy to invite all the teachers of CBSE-affiliated government schools to this valuable resource book of structured lesson plans. Inspired by the vision of our honorable Chief Minister, we are committed to supporting the teachers in shaping a bright future for all the children in Andhra Pradesh. We envision our children transforming into global citizens, excelling in academics and being ready for the world of work. In order to aid the teachers in this pivotal task of preparing the students to emerge as global citizens, the School Education Department is committed to making available the best resources and training. This lesson plans resource book is a transformational step in that direction. Utilized appropriately, this resource books will transform the teaching-learning process and experience in the classroom and lead to deeply engaging the students.

I hope you make the best use of this resource, which has been put together by our own teachers trained by experts from Azim Premji University and facilitated by the Center for Research in Schemes and Policies (CRISP). They have taken into consideration the teaching-learning needs of all types of learners and created lesson plans that are rich in activities, examples, and assessments. They have followed the CBSE Learning Framework and NCERT Learning Outcomes for Secondary Stage, along with principles from the National Curriculum Framework: School Education 2023.

At the crucial juncture of secondary school, our children need spirited teachers like you to prepare them for the changing and dynamic world. You bear the power and responsibility to shape their minds and hearts and guide them to step out into the world and contribute to our state's growth and country's economy.

Your dedication and efforts in implementing these structured pedagogical approaches will not only enhance the learning experience of our students but also equip them with the necessary skills and knowledge to thrive in an ever-evolving global landscape. Together, let us embark on this journey of educational excellence and empower our students to become the leaders of tomorrow.

With great hope and appreciation,

Shri Praveen Prakash, IAS
Principal Secretary, Department of School Education
Government of Andhra Pradesh

MESSAGE BY COMMISSIONER

The United Nations Sustainable Development Goal 4 (SDG 4) underscores the pivotal role of education in unleashing human potential and fostering self-respect. As the Commissioner of School Education, I am privileged to champion a vision that empowers the children of Andhra Pradesh with boundless possibilities and opportunities. Through pioneering reforms in education, encompassing cutting-edge infrastructure, ongoing professional development for educators and administrators, innovative digital initiatives, and an unwavering commitment to providing top-tier educational resources, our state stands as a beacon of educational transformation.

Government of Andhra Pradesh is committed to implement best initiatives to enhance rthe quality of education in the State. Obtaining CBSE affiliation to 1000 schools is one of such key initiatives. This lesson plan resource book developed for the use of teachers working in CBSE schools represents yet another milestone in our journey. Recognizing teachers as the cornerstone of our education system, we have entrusted them to craft these lesson plans for your benefit. After undergoing rigorous training in pedagogy, subject matter, learning outcomes and competencies, our educators have infused these lesson plans with their profound knowledge of the subject, and understanding of our students and their diverse contexts. It is a labor of love and thought, an amalgamation of explorations and experiments, presented for you to embrace and utilize effectively.

These lesson plans are created with the aim of providing a rich repository of ideas to enhance classroom engagement and productivity, and provide yet another innovative resource that teachers can employ. Feel free to adapt and supplement these plans as you see fit. The teacher reflections section serves as a tool for self-assessment and improvement, allowing you to augment your lessons and address any gaps you may identify.

I am optimistic about our state's trajectory towards competency-based teaching, with a focus on measurable learning outcomes that can be continually evaluated and enhanced. The decision to affiliate 1000 schools with CBSE and implement a curriculum aligned with national standards is indeed a significant stride in the right direction. Together, let us embrace this transformative journey towards educational excellence and empower our students to thrive in an ever-evolving world.

I congratulate everyone who worked towards bringing this excellent resource book for the teachers. I thank Center for Research in Schemes and Policies (CRISP) for the innovative ideas they presented to the Government, including development of structured lesson plans. The support of SPD Samagra Shiksha, continuous facilitation by CRISP, expert technical advice of Azim Premji University faculty, hard work of our teachers, CBSE team in Commissionerate office and SCERT made it possible to bring out this resource book in time for the 2024-25 academic year.

With sincere optimism and appreciation,
Shri S Suresh Kumar, IAS
Commissioner,
Department of School Education,
Government of Andhra Pradesh

MESSAGE BY THE STATE PROJECT DIRECTOR

The National Education Policy 2020 highlights that the purpose of education is to develop good human beings capable of rational thought and action, possessing compassion and empathy, courage and resilience, scientific temper and creative imagination, with sound ethical moorings and values. It aims at producing engaged, productive, and contributing citizens for building an equitable, inclusive, and plural society as envisaged by our Constitution. To realize the NEP's vision, it is essential for educators to align with this goal and transition from curriculum-centric to competency-driven teaching methods.

The State's commitment to this shared vision is visible in the Strengthening Andhra's Learning Transformation (SALT) Project, where one of the pivotal focus areas is the professional development of teachers. This entails utilizing insights from self-assessments, academic performance data from school-based evaluations, and classroom observations to enhance pedagogical skills. With continuous support from the education department, teachers will refine their pedagogical approaches, ensuring effective delivery of lessons.

In the same vein, I am delighted to introduce this Lesson Plan resource book for our CBSE-affiliated schools, crafted by experts from both within our state and across the nation. These lesson plans signify a shift away from rote memorization and content accumulation towards a structured approach aimed at fostering values, dispositions, and competencies in students. Rooted in the vision of the NEP and operationalized by the National Curriculum Framework: School Education 2023, each plan corresponds to a 40-minute class targeting specific learning outcomes from NCERT's Secondary Stage. These outcomes collectively contribute to observable learning achievements and the development of competencies over time. Moreover, this resource book empowers teachers to tailor their content and assessments dynamically by monitoring and addressing students' learning needs continuously.

I hope the teachers will find these resources valuable and helpful in transforming classroom transactions. Together I hope we will reshape the educational landscape of Andhra Pradesh in the years ahead. Best wishes for your endeavors!

Shri B Srinivasa Rao, IAS
State Project Director, Samagra Shiksha
Government of Andhra Pradesh

MESSAGE BY JOINT DIRECTOR, CBSE

In a landmark decision, the Government of Andhra Pradesh affiliated 1000 Government schools with the Central Board of Secondary Education (CBSE). This transition marks a significant milestone in our efforts to provide standardized and high-quality education to our students. The CBSE curriculum is widely recognized for its comprehensive and contemporary approach to learning, offering students a competitive edge on a national scale. The Board emphasizes holistic development of learners by providing a stress-free learning environment that will develop competent, confident and enterprising citizens who will promote harmony and peace. It is committed to providing quality education to promote intellectual, social and cultural vivacity among its learners.

By aligning our schools with CBSE, we aim to ensure our students are well-prepared to compete on a national level and excel in today's dynamic world. In order to achieve this, our utmost efforts have gone into developing these structured lesson plans incorporating NCERT's Secondary Stage Learning Outcomes, the National Curricular Framework: School Education 2023, and CBSE Learning Framework document developed by Azim Premji University. 'Structured Pedagogy' is a scientific, evidence-based, learner-centric approach for teaching that equips every teacher with clearly defined objectives, proven methods, well-structured tools, and practical training. After many rounds of rigorous training, expert teachers from our CBSE schools integrated the conceptual and practical aspects of their subjects and condensed them into these easy-to-use lesson plans.

We thank the Center for Research in Schemes and Policies (CRISP) and Azim Premji University for their innovative ideas and tireless support.

I encourage each of you to fully utilize these plans and personalize them to fit your teaching style. May this invaluable resource serve as a valuable tool as you guide Grade 10 students through this critical stage of their education. Your dedication as teachers brings us immense joy and pride, as we entrust the future of our state's children to your capable hands. Wishing you all the best!

Mr Krishna Reddy
Joint Director, CBSE
Department of School Education
Government of Andhra Pradesh

MESSAGE BY CENTRE FOR RESEARCH IN SCHEMES AND POLICIES (CRISP)

Shri. **R. Subrahmanyam**
I.A.S.(Retd), Secratary of CRISP

Ms. K. Sandhya Rani
IPoS.(Retd), Founding member of CRISP

Mrs. P. Usha Kumari
I.A.S.(Retd), State Lead of AP Team CRISP

In October 2023, the Centre for Research in Schemes and Policies (CRISP) forged a significant partnership with the Government of Andhra Pradesh, to help bring about a transformation for the state's School Education system. Our inaugural initiative was designed to cultivate excellence within the 1000 CBSE-affiliated schools. CRISP's primary focus was to support both teachers and students during the transition from the State Board to the CBSE Board.

Research reveals that an average teacher grapples with approximately 1,500 decisions daily. While it may be impractical to intervene in every decision-making process, our aim was to alleviate the cognitive load associated with tasks such as lesson planning, question formulation, activity design, and assessment creation. Recognizing the novelty of transitioning from the State Syllabus to CBSE, our initiative encompassed the provision of essential resources alongside comprehensive training for all educators involved.

To enhance our efforts, we collaborated with Central Square Foundation, a renowned organization in the field of Education, to train our teachers in their Structured Pedagogy approach. This evidence-based, learner-centric methodology equips educators with clearly defined objectives, proven methods, well-structured tools, and practical training.

We are thankful to professors from Azim Premji University who provided invaluable support by mentoring the core group of teachers over a six-month period, guiding them through NCERT's Learning Outcomes for the Secondary Stage and the National Curriculum Framework: School Education 2023. The culmination of these efforts is the creation of this resource book, comprising structured lesson plans for the benefit of teachers, and vetted meticulously by the SCERT. We hope that the tremendous effort of our teachers serves as an inspiration to continue shaping the minds of our youth.

We extend our sincere gratitude to Dr. Emmanuel Joseph, Joint Commissioner (Academics) at CBSE, New Delhi, professors from Azim Premji University, experts from Central Square Foundation, the State CBSE team, SCERT, and the entire Department of School Education for their invaluable guidance and support throughout this endeavor. Their deep commitment to enhance the quality of education and to transform the teaching-learning process in the classrooms made it possible to bring this initiative to life within a remarkably short span of time.

We thank the Government of Andhra Pradesh for giving us this opportunity, for the trust they reposed in accepting the innovative idea and facilitating it to germinate and fructify.

Centre for Research in Schemes and Policies
February, 2024

FOREWORD BY DIRECTOR, SCERT

At the heart of quality education lie two indispensable pillars: the teacher and the student. While textbooks, digital resources, infrastructure, and curriculum play crucial roles in the educational landscape, it is the teacher who bears the primary responsibility of delivering lessons, facilitating comprehension of complex concepts, nurturing independent thinking, and molding individuals into responsible members of society. The Department of School Education, Government of Andhra Pradesh aspires to create citizens equipped with the skills and competencies to succeed and solve problems at a global scale, while remaining locally rooted and aware.

To achieve this goal, we have developed a comprehensive resource book to support teachers across the state, enhancing their planning and teaching processes with ease and creativity.

These meticulously crafted lesson plans have been curated by trained educators and thoroughly reviewed by SCERT experts. Each lesson plan is structured into distinct period plans, addressing specific topics within the lesson. Clear learning outcomes are outlined at the beginning of each lesson and progressively addressed throughout the class session. Furthermore, each period plan is divided into sections including Learning Outcomes, Teaching-Learning Process, Pointers for Assessment, and Material Required, offering teachers a flexible framework to tailor to their preferences. The provided questions to assess prior knowledge, suggested activities, and prompts for understanding checks serve as guides, encouraging teachers to adapt the plans to suit the unique needs of their classroom and students.

The SCERT extends its sincere appreciation to the dedicated members of its textbook committee, source material reviewers, lesson plan creators, and technical partners for their invaluable contributions in realizing this vision. We also express our gratitude to the Principal Secretary and Commissioner, Department of School Education, and State Project Director, Samagra Siksha, Department of School Education for their steadfast commitment to promoting quality education, consistently driving us toward excellence in all facets. We appreciate the steadfast support of Center for Research in Schemes and Policies (CRISP) and professors from Azim Premji University in developing the lesson plans.

Dr B Pratap Reddy
Director,
State Council of Educational, Research, and
Training Government of Andhra Pradesh

INTRODUCTION AND BACKGROUND TO THE STRUCTURED LESSON PLANS RESOURCE BOOK

The National Education Policy, 2020 (NEP) focuses strongly on a need for a well-defined Curriculum and a Structured Pedagogy in schools, to ensure holistic, integrated, enjoyable and engaging learning of the students.[1] In pursuance of the Memorandum of Understanding (MoU) signed between Government of Andhra Pradesh (GoAP) and Centre for Research in Schemes and Policies (CRISP), and the recommendation made by CRISP in the Action Plan for CBSE, GoAP agreed that *"Structured pedagogy should be adopted for Classes 8 and above in the newly converted CBSE schools. For this purpose, while using material already available, standard lesson plans should be prepared."* In furtherance of adapting structured pedagogy approach in Government CBSE Schools to improve the quality of teaching-learning, the GoAP organized the following:

1. Organised a Structured Pedagogy workshop was organized in collaboration with CRISP in Vijayawada from 11th to 13th July 2023. Experts from Central Square Foundation and Azim Premji University (APU) anchored the workshop, with additional sessions by Room to Read, Leadership for Equity, Ambitus World School, and SCERT Telangana. Sessions focused on the need for a structured way of teaching and learning, shifting from rote method to competency based curriculum, and delved into the NCERT Learning Outcome Framework for the Secondary Stage. A total of 60 subject teachers along with A.P SCERT subject experts participated in the workshop representing English, Mathematics, Social Science, Biology, Chemistry, and Physics. Each subject group consisted of 10 teachers, 1 SCERT expert, and 1 CBSE School Principal acting as a Coordinator. With guidance from CSF and APU, the subject groups prepared one sample lesson plan per subject by the end of the 3-day workshop.
2. Post the workshop, facilitated the expert subject teachers to work on lesson plan development, with virtual support from APU faculty virtually.
3. Organised a Capacity Building workshop from 11th to 14th October 2023 in Vijayawada with expert support of experts from APU. Sessions were held on mapping content to specific learning competencies, designing and using creative Teaching-Learning Materials, adding Check for Understanding questions, using interdisciplinary approach in the lessons, addressing student misconceptions, and creating a diverse range of assessments. The workshop enhanced the ability of the teachers to

[1]Chapter 4 & 5, National Education Policy, 2020 (NEP, 2020)

a. understand the principles and practices underpinning competency-based curriculum as outlined in NEP 2020 and NCF-SE 2023;

b. equip the teachers to analyse the need to effectively align curriculum content, competencies, pedagogical practices, and assessment methods in the classroom;

c. helped them to learn to develop competency-based lesson plans that integrate NCF-SE 2023 guidelines, ensuring that learning outcomes are aligned to the desired competencies with the help of model lesson plans

d. trained them to gain practical insights into designing and implementing both formative and summative assessments that accurately measure students' progress toward achieving the competencies set forth in NCF-SE 2023

4. Held a physical camp for the core team of teachers to develop and quality check the lesson plans for all the subjects in Vijayawada for 12-days, from 20th November to 1st December 2023. APU teachers and Leadership for Equity team provided technical support.

5. In early February 2024 the lesson plans developed for Grade 9 and 10 were vetted and finalised by AP SCERT and sent to the Textbook Press for printing and distribution.

ELEMENTS OF THE STRUCTURED LESSON PLANS

All lesson plans are meticulously organized into detailed period plans, each focusing on a specific topic and its corresponding Learning Outcomes. These period plans are then subdivided into four essential sections:

1. Topic and Learning Outcomes, along with associated Indicators
2. Teaching-Learning Process, highlighting Pedagogical Strategies
3. Assessment Strategies to gauge student understanding and progress
4. Materials required, ensuring all necessary resources are readily available for effective instruction.

Within these sections, the following elements have been covered:

- **Higher order thinking questions** have been added to encourage critical thinking, problem-solving, creativity, and analysis. These questions usually move beyond ‘What’, and ‘When’, and focus on ‘Why’, or ‘How’. Some examples of these are:
  “Explain the twinkling of stars.” [Physics]
  “How does trade help connect the countries in the world?” [History]

"Why can amphibians and reptiles tolerate mixing of blood to some extent?" [Biology]
"Do you think it was right for the farmer to be angry with the postmaster? Why or why not? [English]
"What should India do or achieve to become a developed country?" [Economics]
"Why does a snail change its sex?" [Biology]
"How did Gendhadhur, a backward village in Mysore, Karnataka, become rich in rain water?" [Geography]
"Why can't astronauts see the rainbow from the surface of the moon?" [Physics]

- **Keywords and key concepts** are stated in the beginning of every chapter so that the teacher can be sure to cover them during the course of the lesson
- **Prior knowledge and skills are tested** at the beginning of every period to assess whether students have retained concepts covered in previous lessons, and to gauge the overall level of knowledge on the topic to be covered
- **Prompts and questions to address common misconceptions** about the topic have been given in the plans to clarify any incorrect ideas students may have. For example: "A woman in your neighborhood is blamed for giving birth to a baby girl. Is the sex of the baby determined by her? Remove the misconception through your argument." [Biology]
- **Discussion prompts** for class or group discussions have been given, especially for the humanities subjects. For example:
  "Why do you think men receive higher wages than women for the same job? Discuss." [Economics]
  "Human societies have steadily become more interlinked. Comment." [History]
  "Discuss the benefits and drawbacks of using chemical fertilizers." [Geography]
- **Assessment and remedial periods** have been allocated after every lesson plan to gauge student learning, and revise concepts that students need more clarity or practice in, before moving to the next lesson
- **Inter-disciplinary nature of subjects and topics** has been encouraged in the plans so that students recognize the value of all subjects equally. It also promotes a holistic understanding of the topic and opens them up to thinking about an issue from various lenses
- **Formative and summative assessments, check for understanding questions, and worksheets** are given for every lesson to assess student learning at every stage of the lesson
- **Space for teachers to reflect on every period** has been provided at the end of the plan. The prompts are designed to assist teachers in assessing the alignment of their plan with overarching curricular goals and competencies, evaluating student engagement levels, ensuring effectiveness of assessment strategies in measuring student understanding, and gauging the efficacy of teaching materials, activities, and case studies utilized

HOW TO USE THESE LESSON PLANS

Teachers should have a comprehensive understanding of the curricular goals, competencies, and the nature of the subject they teach. It is essential to thoroughly review the section on "Pedagogical Practices" to gain deeper insight into teaching methodologies. With this groundwork, teachers can then delve into the lesson plans for their subject. It is highly recommended to study the entire lesson plan before initiating the lesson in class. Throughout the lesson, teachers can refer to each period plan and manage class time effectively to cover the elements outlined in the plan. Additionally, teachers are encouraged to modify the plan as needed, incorporating or removing content, questions, or activities to address the specific needs of their students and contextual requirements.

PEDAGOGICAL PRACTICES

Broad Aims of School Education

The Learning Standards are guided by certain widely agreed upon broad Aims of School Education that are articulated in this NCF. These aims have been arrived at from the vision and purpose of education as envisaged by NEP 2020:

1. **Rational Thought and Autonomy:** An individual should have the capacity of rational reasoning and sufficient knowledge to understand the world around them. An individual should be able to make an informed decision. This fundamentally requires knowledge in breadth and depth.
2. **Health and wellbeing**: School education should be a wholesome experience for students. Students should acquire Knowledge, Capacities, and Dispositions that promote mind-body wellness.
3. **Democratic participation:** This requires appropriate knowledge capacities, values, and dispositions so that an individual may be oriented towards sustaining and improving the democratic functions of Indian society.
4. **Economic participation:** Education should work as an enabler for a healthy democracy as well as a healthy economy.
5. **Cultural and social participation:** Along with democracy and economy, society, and culture also play an important role in the mode of associated living. An individual should acquire capacities and a disposition to contribute meaningfully to culture.

For a more detailed explanation, please refer to the National Curriculum Framework: School Education 2023 (p.45-51, p.88-92, p.101-102, p.116-121)

NATURE OF THE SUBJECT: MATHEMATICS

(Adapted from the CBSE Learning Standards document. Please refer to it here: https://cbseacademic.nic.in/cbe/documents/Learning_Standards_Maths.pdf)

“Mathematics, as an expression of the human mind, reflects the active will, the contemplative reason, and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality”- Courant and Robbins

Mathematics has been a part of everyone’s life, be it estimates we make in our routine activities or precise calculations for various transactions and fairness in sharing or in describing objects around us. The relevance of mathematics is more than its utilitarian value. It helps us to think and reason about the world around us and take informed decisions, be it at the individual level to cope with life in various spheres of activity or at the societal level to contribute to technological and socio-economic development.

Given these reasons, it is not surprising that mathematics education has been made compulsory at the school level and is one of the first subjects encountered by the learner entering formal schooling. The focus of school mathematics is developing the problem solving and reasoning skills needed to have an organised and progressing society. This includes reflecting on and studying problems and topics which may be perceived as more of an intellectual exercise and not immediately useful at this stage. However, these have unforeseen far-reaching benefits. It must be emphasized that the selection of such study material must be made in a manner such that mathematics will not be a burden to the learner but an engaging and joyful activity.

Mathematical objects and ideas are abstract – created by humans from the needs of science, economics, statistics and any kind of quantitative analysis needed in daily life. That is, they have no physical properties such as size, colour, smell, taste, texture, sound and so on. Mathematical ideas are formed by classifying similarly related and commonly noticed properties. This leads to the pedagogical challenge of making these ideas experiential. For example, Number, which is a root concept is derived by providing experiences of collections of the same number of objects. The concept of addition is built on the concept of number, and it then becomes the pre-requisite concept for viewing multiplication as repeated addition. This in turn builds on to the understanding of higher concepts. Thus, mathematics builds up from the bottom i.e., from axioms and definitions in a structured and hierarchical way as a vast network of interlinked concepts.

It is well recognized how rigid mathematics is, i.e., $2 + 2 = 4$ and not 5 or 22. However, new mathematics can and has been discovered based on $2 + 2 = 22$ i.e., based on how the rules are modified. At the same time, this ‘rigid’ structure is free from perspectives and subjectivity. Mathematical truth, once established and consistent with existing results, lasts forever.

Therefore, after the meaning of various mathematical objects and ideas are understood, one can engage with these, and discover their properties. Thus, with proper facilitation, a learner can be mostly self-dependent in learning mathematics and can even be given a glimpse of how math progresses or branches off if rules are changed.

To communicate mathematical ideas, mathematicians have, over the years, developed the language of mathematics which has vocabulary, symbols, and sentence structure and is characterised by both precision and concision. Mathematical language supports in communicating mathematical ideas or concepts during discussions in the classroom and leads to representing ideas, observing and generalizing patterns, communicating thought processes and justifying their discoveries and learning. However, it does bring its own pedagogical challenges when learners are not conversant in this language or when the language used is not age appropriate.

Assessment in mathematics has to encompass both the nature of mathematics and the difficulties which the learner faces because of it. When assessment is cognizant of the limitations of the learner and the constraints and affordances of the nature of the subject, it enables the learner to harness the power of mathematics and the teacher to enable the learner to do this.

The structured lesson plans in this book are rooted in the vision of the National Education Policy 2020, operationalized by the National Curriculum Framework: School Education 2023, and based on the Learning Outcomes from NCERT's Learning Outcomes at the Secondary Stage. The following content has been adapted from the original documents to provide context and explanation for the pedagogical practice behind the development of these lesson plans.

NCERT Curricular Expectations for the Secondary Stage:

For detailed Learning Outcomes and suggested Pedagogical Processes, please refer to the **NCERT Learning Outcomes at Secondary Stage**

MATHEMATICS Curricular Expectations

At this stage learners are expected to develop ability and attitude for—

- mathematisation (ability to think logically, formulate and handle abstractions) rather than knowledge of procedures (formal and mechanical).
- mathematical vocabulary.
- consolidation and generalisation of the concepts learnt so far.
- understanding and proving mathematical statements.

- addressing problems that come from other domains such as science and social sciences.
- integration of concepts and skills that the children have learnt into a problem solving ability.
- analysing and constructing the processes involved in mathematical reasoning.
- establishing linkages between mathematics and daily life experiences and across the curriculum.

Aims of Mathematics

Mathematics helps students develop not only basic arithmetic skills, but also the crucial capacities of logical reasoning, creative problem solving, and clear and precise communication (both oral and written). Mathematical knowledge also plays a crucial role in understanding concepts in other school subjects, such as Science and Social Science, and even Art, Physical Education, and Vocational Education. Learning Mathematics can also contribute to the development of capacities for making informed choices and decisions. Understanding numbers and quantitative arguments is necessary for effective and meaningful democratic and economic participation.
Mathematics thus has an important role to play in achieving the overall Aims of School Education. The specific aims of Mathematics Education in this NCF are as follows:

a. Basic Numeracy. Numbers and quantities along with words (language) are the two ways in which human beings understand and interpret the world. Numbers and quantities also play a very important role in day-to-day interactions within a complex society. Fluency in quantifying and performing calculating is essential for basic daily interactions, such as shopping and banking. Mathematics Education in schools should ensure that all students are fluent in basic numeracy. This would include not just fluency in numbers and number operations using Indian numerals, but also the capacities to handle situations that involve space and measurement.
b. Mathematical Thinking. Mathematical thinking involves systematic and logical ways to think about and interpret the world. The capacities for identifying patterns, explaining patterns, quantifying and measuring, using deductive reasoning, working with abstractions, and communicating clearly and precisely are some illustrations of mathematical thinking. Mathematics Education in schools should aim for developing such mathematical thinking in all students.
c. Problem Solving. The capacity to formulate well-defined problems that can be solved through mathematical thinking is an important aspect of learning Mathematics. Clear and precise formulation of problems and puzzles, knowing the appropriate mathematical concepts and techniques that can model the problems, and possessing the techniques and the creativity to solve the problems are core aspects of problem solving. Mathematics Education in schools should aim for developing such problem-solving capacities in all students. Problem solving also develops the capacities of perseverance, curiosity, confidence, and rigour.

d. Mathematical Intuition. Developing an intuition for what should or should not be true in Mathematics is often just as important as the more formal 'paper - pencil' doing of Mathematics. Focusing on the common themes and patterns of reasoning across mathematical areas, guessing correct answers (in terms of, e.g., 'order of magnitude') before working out precise answers, and engaging in informal argumentation before carrying out rigorous proofs are all effective ways of developing such mathematical intuition in students. Developing such mathematical intuition in all students should be one of the aims of Mathematics Education in schools. 270 Part C National Curriculum Framework for School Education

e. Joy, curiosity, and wonder. Discovering, understanding, and appreciating patterns and other mathematical concepts, ideas, and models can require great creativity and often generates great wonder and joy. To see Mathematics as merely calculations and mechanical procedures is very limiting. Mathematics Education in schools should nurture this sense of joy, curiosity, aesthetics, creativity, and wonder in all students.

For more details on the Aims of specific subjects please refer to the NCFSE following pages: English: p234-267; Mathematics: p268-293; Science: p294-319; Social Science: p320-352.

CHAPTER:1

REAL NUMBERS

10

CLASS

1062CH01

http://epathshala.nic.in/QR/?id=1062CH01

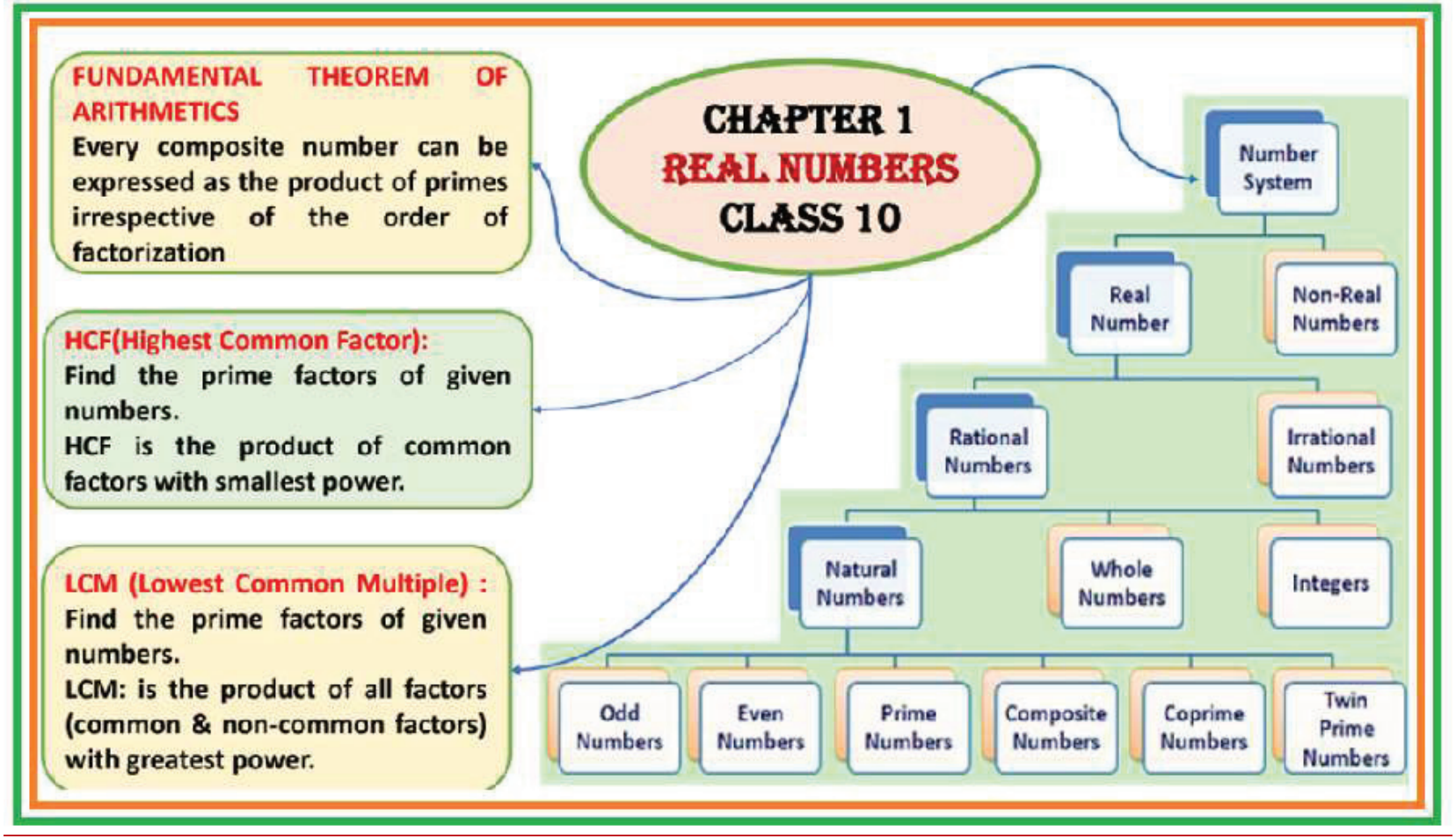
https://epathshala.nic.in

https://epathshala.nic.in/topics.php?ln=en

THE FOLLOWING CURRICULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPTER

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-1: Understanding numbers (natural, whole, integer, rational, irrational and real), ways of representing numbers, relationships amongst numbers, and number sets.	**C-1.1**: Develops understanding of numbers, including the set of real numbers and its properties.
CG-2: Builds deductive and inductive logic to prove theorems related to numbers and their relationships (such as $\sqrt{2}$ is an irrational number, recursion relation for Virahanka numbers, formula for the sum of the first n square numbers)	**C-2.1**: Extends the understanding of powers (radical powers) and exponents.

MIND MAP



PERIOD WISE PLAN

PERIOD NO.	TEACHING TOPIC	LEARNING OUTCOMES/Objectives
1	**Introduction to Real Numbers**	- Uses the fundamental theorem of arithmetic to check the digit in the place of unit in the power of a number. - Justifies the classification of rational numbers into terminating and non-terminating (recurring) decimals by prime factorization of the denominator of its simplest form. - Solves HCF and/or LCM problems based on real life contexts. - Students recall rational numbers, irrational numbers. - Understanding real Numbers - Able to Understanding Rational, Irrational, Real Numbers
2	**Prime factorization and factor tree**	- Observes that any two integers a and b (a > b) can be expressed as a = b × quotient + remainder. - Recalls that the fundamental theorem of arithmetic is used to find HCF/LCM for any two positive integers. - Uses the fundamental theorem of arithmetic to find either one of LCM/HCF of two positive integers given the other. - Applies the identity that HCF (a, b) × LCM (a, b) = a × b to find the LCM of any two positive integers a and b. - Expresses the prime factorization of a number in exponential form.
3	**Application of Fundamental Theorem of Arithmetic**	- Observes that any two integers a and b (a > b) can be expressed as a = b × quotient + remainder. - Recalls that the fundamental theorem of arithmetic is used to find HCF/LCM for any two positive integers. - Uses the fundamental theorem of arithmetic to find either one of LCM/HCF of two positive integers given the other. - Applies the identity that HCF (a, b) × LCM (a, b) = a × b to find the LCM of any two positive integers a and b. - Expresses the prime factorization of a number in exponential form.
4	**LCM and HCF**	- Observes that any two integers a and b (a > b) can be expressed as a = b × quotient + remainder. - Recalls that the fundamental theorem of arithmetic is used to find HCF/LCM for any two positive integers. - Uses the fundamental theorem of arithmetic to find either one of LCM/HCF of two positive integers given the other.

		- Applies the identity that HCF (a, b) × LCM (a, b) = a × b to find the LCM of any two positive integers a and b. Expresses the prime factorization of a number in exponential form.
5	**Revisiting Irrational Numbers (P.T. $\sqrt{2}$ is an irrational number)**	- Justifies the irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ and other surds such as $m + p\sqrt{n}$ using the fundamental theorem of arithmetic.
6	**Revisiting Irrational Numbers (P.T. $\sqrt{3}$ is an irrational number)**	- Justifies the irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ and other surds such as $m + p\sqrt{n}$ using the fundamental theorem of arithmetic.
7	**Revisiting Irrational Numbers (P.T. $5-\sqrt{3}$, $3\sqrt{2}$ is irrational)**	- Justifies the irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ and other surds such as $m + p\sqrt{n}$ using the fundamental theorem of arithmetic.
8	**Revisiting Irrational Numbers (P.T. $\sqrt{5}-\sqrt{3}$ is irrational)**	- Justifies the irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ and other surds such as $m + p\sqrt{n}$ using the fundamental theorem of arithmetic.
9	**Practice Period on Exemplary**	- Justifies the irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ and other surds such as $m + p\sqrt{n}$ using the fundamental theorem of arithmetic. - Expresses the prime factorization of a number in exponential form. - Uses the fundamental theorem of arithmetic to check the digit in the place of unit in the power of a number.
10	**Practice session**	- Generalizes properties of numbers and relations among them studied earlier to evolve results – such as, Euclid's division algorithm, Fundamental Theorem of Arithmetic – and applies them to solve problems related to real life contexts. - Generalizes properties of numbers and relations among them to evolve results – such as, Euclid's division algorithm, Fundamental Theorem of Arithmetic. - Applies properties of numbers and results (as stated above) to solve problems related to real life contexts.

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th

Chapter: Real Numbers

Total no. of periods for this chapter:10

Period no :1/10

Sub Topic: Introduction to Real Numbers

Learning Outcomes & Indicators/micro-competencies.	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.	Material required
C-1.1: Develops understanding of numbers, including the set of real numbers and its properties. **C-2.1**: Extends the understanding of powers (radical powers) and exponents	**Introduction: (10 minutes)** **Teacher ask the students to recall the previous knowledge of number system by asking questions:** 1. What are the counting numbers where we Use in our daily life? 2. Identify the difference between Natural and whole numbers? 3. If we denote the height of a place above sea level by a positive integer and depth below the sea level by a negative integer, write the following using integers with the appropriate signs:	What type of number is $\frac{7}{9}$.	 https://youtu.be/IueVrMlmQ2I **Introduction of Real numbers**

Learning outcome:

- Uses the fundamental theorem of arithmetic to check the digit in the place of unit in the power of a number.
- Justifies the classification of rational numbers into terminating and non-terminating (recurring) decimals by prime factorization of the denominator of its simplest form.
- Solves HCF and/or LCM problems based on real life contexts.

- Students recall rational numbers, irrational numbers.

- Understanding real Numbers

- Able to Understanding Rational, Irrationl, Real Numbers

(a) 200 m above sea level

(b) 100 m below sea level

(c) 10 m above sea level

(d) 0 m Sea level.

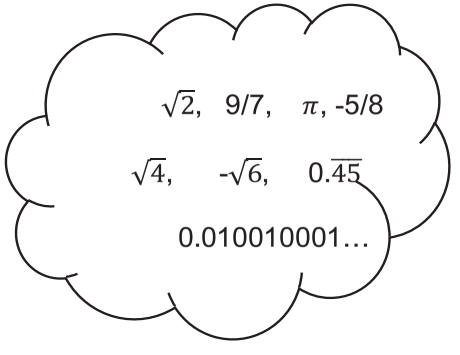
4. If you add two positive integers, what sign will the answer have?
5. If you add two negative integers, what sign will the answer have?
6. What must you do if you are adding integers with different signs?
7. Which sign do you keep when adding integers with different signs?

Demonstration: (25 minutes)

For introduction of real numbers Teacher shows diksha e content video. After completion of video teacher encourages the students present the content which they learnt.
And also, teacher asks the following questions.

1.Give examples of some rational numbers?

2. Identify the irrational numbers in the following.



Which of the following is not an irrational number

(a) $5-\sqrt{3}$ (b) $\sqrt{5}+\sqrt{3}$ (c) $4-\sqrt{2}$ (d) $5+\sqrt{9}$

3. Give some examples of irrational numbers?

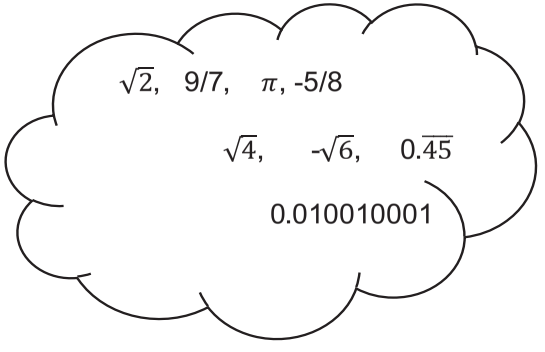
4. Ramu argued $\frac{\sqrt{7}}{1}$ is rational number. do you agree with him? Give reasons?

5. Prepare a diagrammatic representation of different kinds of number sets. (Real Numbers)

Describe Real Numbers on your own words?

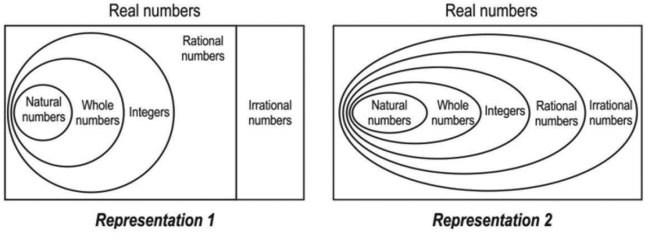
Prepare some questions of your own using the above figure?

6.



Collect Real number from the above figure.

7.Which of the following Representation is correct?



Describe the difference between rational numbers and irrational Numbers.

7. Identify the terminating decimals in the following rational numbers?

$\frac{7}{8}, \frac{9}{225}, -\frac{11}{80}, \frac{7}{15}, \frac{3}{32}, \frac{12}{35}, \frac{33}{55}, \frac{7}{140}$

8. Which of the following is equivalent to a decimal that Terminates.

$a)\ \frac{1}{5^2 2^2}$ b) $\frac{1}{2^2 \times 3}$ c) $\frac{1}{5^2 \times 7}$ d) $\frac{1}{5^2 11^2}$

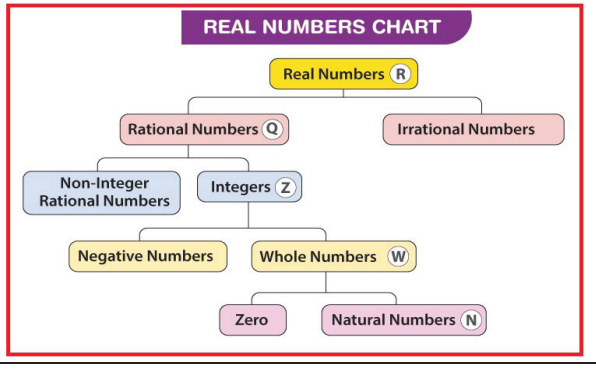
9. The decimal expansion of $\frac{141}{120}$ will terminate after how many places of decimals?

10.A rational number can be expressed as a terminating decimal if the denominator has factors

(a) 2, 3 or 5 (b) 2 or 3 (c) 3 or 5 (d) 2 or 5

Activity: (5 minutes)

Teacher asks to give examples of each type of number system.



Describe Terminating and non -terminating decimals in your own words?

What is the nature of the denominator when a rational number is terminated?

Summative assessment plan- only where relevant

1. Classify the numbers in Rational Numbers.
2. Write some real life situations which leads Rational and irrational numbers?

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

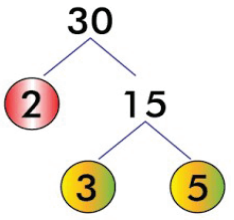
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

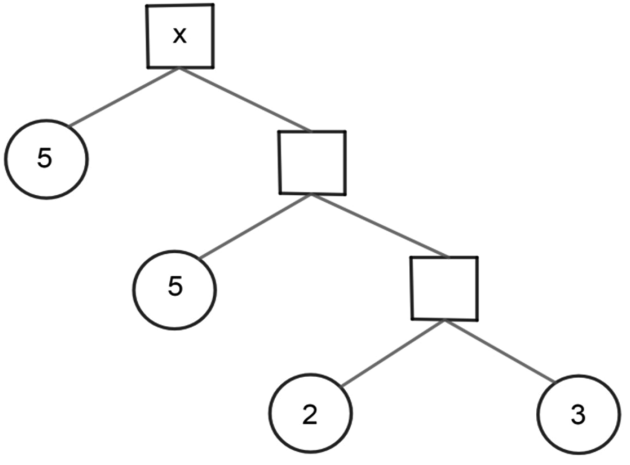
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Real Numbers
Total no. of periods for this chapter:10
Period no :2/10
Sub Topic: Prime factorization and factor tree

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.	Material required
Learning outcome: C-1.1: Develops understanding of numbers, including the set of real numbers and its properties C-2.1: Extends the understanding of powers (radical powers) and exponents. 1. Observes that any two integers a and b (a > b) can be expressed as a = b × quotient + remainder. 2. Expresses the prime factorization of a number in exponential form.	**Introduction: (10 minutes)** **Teacher asks the students to recall the previous knowledge of number system by asking questions:** 1. Discriminate between Prime and composite numbers? 2. Is 1 prime or composite? 3. How many factors for 20? 4. How many factors for 19? 5. When do you we call a number is Prime? **Demonstration:** (25 minutes) Teacher obtains the concept by asking questions: 1. Express 30 as product of primes.		

	 2. Collect the primes in prime factorization of 30. Using product of those primes prepare some numbers of your own. 3. Take any collection of prime numbers say 2,3,5,7,11,13. Find large collection of positive integers using those primes by multiplication. 4. Let us suppose your collection of primes includes all the possible primes. What is your guess about the size of this collection? 5. How many such collection of numbers can be framed? 6. How do we call such resulting numbers? 7. Can we produce all composite numbers in this way? 8. Identify a composite number which cannot be expressed as product of primes. **Introduction of 'Fundamental Theorem of Arithmetic'** **[Teacher Note: play the video to introduce 'Fundamental Theorem of Arithmetic']** **25 min** Teacher makes students into groups and ask them to prime factorize 1260 and ask them to write their result on the board and discuss the uniqueness among prime factorization. Ask the students to try it out for several other natural numbers. Is these leads a conjecture. Teacher should introduce 'Fundamental Theorem of Arithmetic' Teacher should explain the contribution of Euclid and Gauss.	Factorize the following numbers through factor tree. (1) 468 (ii) 420 (iii) 9072 Give some examples of composite numbers? **State 'Fundamental Theorem of Arithmetic' with your own words',**	https://youtu.be/FcueHThVTvw?si=BLmZIcXPGssRE9Gj **Video relating Fundamental Theorem of Arithmetic**

	Activity: (5 Minutes) **Fill up the Blanks in the factor tree:** **Teacher guides the students while completing the factor tree**  •	Explain whether the following numbers prime or composite? Give Reasons. (i)$7 \times 11 \times 26 + 13$ (ii) (3x5x13x46) +23 (iii) 2x3x3x5+5 (iv) 6x5x4x3x2x1+10 (v) 7x11x13+5	

Summative assessment plan- only where relevant

Answer the following:

1. Find the Prime Factor of 544 using the factorial tree method.
2. Find the prime factors of the following numbers.
   1000,45,88,50

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Real Numbers
Total no. of periods for this chapter:10
Period no :3/10
Sub Topic: Application of Fundamental Theorem of Arithmetic

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.	Material required
C-1.1: Develops understanding of numbers, including the set of real numbers and its properties. **C-2.1**: Extends the understanding of powers (radical powers) and exponents **Learning outcome:** 1. Observes that any two integers a and b (a > b) can be expressed as a = b × quotient + remainder.	**Introduction: (10 minutes)** **Teacher asks the students to recall the previous knowledge of number system.** 1) In how many ways 72 can be written as product of primes? 2) State Fundamental Theorem of Arithmetic. 3) 10=2x5 30=2x3x5 100=2x2x5x5 By observing the above product, tell us that which prime numbers should be there in a composite number ending with 0? **Demonstration: (25 minutes)** Teacher obtains the concept by asking questions:		https://youtu.be/k2E73iY7SMc?si=3RPdX3GudpN_6P7_ **Application of Fundamental theorem Arithmetic Finding LCM and HCF**

2. Recalls that the fundamental theorem of arithmetic is used to find HCF/LCM for any two positive integers. 3. Uses the fundamental theorem of arithmetic to find either one of LCM/HCF of two positive integers given the other. 4. Applies the identity that HCF (a, b) × LCM (a, b) = a × b to find the LCM of any two positive integers a and b. 5. Expresses the prime factorization of a number in exponential form.	Teacher explains some applications of Fundamental theorem of Arithmetic. 1) Consider the numbers 4^n, where n is a natural number. Check whether there is any value of n for which 4^n ends with the digit zero. What are the prime numbers present in the prime factorization of 4? Is 5 presents in the prime factorization? is any natural number n for which 4^n ends with the digit zero? **Techer explains for finding LCM and HCF using Prime factorization method** **[Teachers Note: HCF (x, y) = Product of the smallest power of each common prime factor in the numbers.** **LCM (x, y) = Product of the greatest power of each prime factor, involved in the numbers, where x and y are positive integers]** Find the LCM and HCF of 6 and 20 by the prime factorization method. Teacher asks learners to prime factorize the given numbers 6 and 20. Identify common prime factor involved in it? Use the above rule find HCF. Using the above rule find LCM. In the above question find the product of given numbers? And also find the product of LCM and HCF? What is observation? Is there any relationship between LCM and HCF and to the product of given numbers?	If any number ends with zero what are the prime numbers should present in its prime factorization? 1. Can the number 12^n, n being a natural number end with the 0 or 5? Give reason. 2. Show that 9^n can't end with 2 for any integer n Write LCM and HCF of 6 and 20. Find HCF and LCM of 24 and 36 using prime factorization method? If and b are two natural numbers and L and G are their LCM and HCF write the relation between a, b L and G.	https://youtu.be/P-bZqjeeySM?si=5OI3ii6rgE7Whkz5 **More application of Fundamental theorem of Arithmetic**

	1.Find the HCF of 96 and 404 by the prime factorization method. Hence, find their LCM. **Activity: (5 minutes)** Teacher makes students in pairs and instructed to find prime factorization of 96 and 404. And ask them to find HCF. [Using **Product of the smallest power of each common prime factor in the numbers]** **Now asks the students to find LCM Using the relationship between LCM, HCF, Product of numbers.**	a=36,b=72,LCM(36,72)=72 find HCF(36,72).	

Summative assessment plan- only where relevant

1. Can the number $16^{n,}$ n being a natural number end with the zero? Give reason.
2. Find the LCM & HCF of 26 and 91 by the prime factorization method.
3. Given that HCF (253, 440) = 11 and LCM (253, 440) = 253 × R. Find the value of R

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Real Numbers
Total no. of periods for this chapter:10
Period no :4/10
Sub Topic: Application problems of LCM and HCF

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.	Material required
C-1.1: Develops understanding of numbers, including the set of real numbers and its properties. **C-2.1**: Extends the understanding of powers (radical powers) and exponents **Learning outcome:** 1. Observes that any two integers a and b (a > b) can be expressed as a = b × quotient + remainder. 2. Recalls that the fundamental theorem of arithmetic is used to find	**Introduction: (10 minutes)** **Teacher asks the students to recall the previous knowledge of number system by asking questions:** 1. Find the HCF of 24 and 36. ... 2. Determine the GCF of 18 and 48. ... 3. Find the HCF of 135 and 225 using the prime factorisation method. ... 4. What is the HCF of 408 and 1032? ... 5. Find the LCM of 3 and 4. ... 6. What is the LCM of 6 and 8? ... 7. Determine the LCM of 4 and 12 using the prime factorization method. **Demonstration: (10minutes)** Teacher obtains the concept by asking questions: Find LCM and HCF of 12,15 and 21.	Write the relation between given numbers a and b and HCF & LCM Verify by taking for any three positive integers a, b and c Is HCF (a, b, c) × LCM (a, b, c) = a × b× c	https://youtu.be/lPrJK-DRZBo?si=w-wZ0RuNKXf072aT **Misconceptions in LCM and HCF**

HCF/LCM for any two positive integers. 3. Uses the fundamental theorem of arithmetic to find either one of LCM/HCF of two positive integers given the other. 4. Applies the identity that HCF (a, b) × LCM (a, b) = a × b to find the LCM of any two positive integers a and b. 5. Expresses the prime factorization of a number in exponential form.	Teacher asks the students to prime factorize the given numbers and apply the rule to find LCM and HCF which is discussed in the previous class. Verify the relationship between LCM and HCF, product of numbers? **Teacher discusses the following applicative problems in groups 15 min.** ➢ If two positive integers a and b are written as $a = x^3 y^2$ and $b = xy^3$; x, y are prime numbers, then Find HCF (a, b). ➢ If two positive integers p and q can be expressed as $p = ab^2$ and $q = a^3 b$; a, b being prime numbers, Find LCM of (p, q). ➢ On a morning walk, three persons step off together and their steps measure 40 cm, 42 cm and 45 cm, respectively. What is the minimum distance each should walk so that each can cover the same distance in complete steps **Activity: (5 Minutes)** A dining hall has a length of 8.25 m, breadth of 6.75 m, and height of 4.50 m. What is the length of the longest unmarked ruler that can exactly measure the three dimensions of the hall? Show your steps and give valid reasons.		

Summative assessment plan- only where relevant

1. There is a circular path around a sports field. Sonia takes 18 minutes to drive one round of the field, while Ravi takes 12 minutes for the same. Suppose they both start at the same point and at the same time, and go in the same direction. After how many minutes will they meet again at the starting point

2. A circular field has a circumference of 360 km. Three cyclists start together and can cycle 48, 60 and 72 km a day round the field. When will they meet again?

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: 1. Real Numbers
Total no. of periods for this chapter: 10
Period no :5/10
Subtopic: Revisiting Irrational Numbers (P.T. $\sqrt{2}$ is an irrational number)

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.	Material required
C-1.1: Develops understanding of numbers, including the set of real numbers and its properties.	**Activity: (10 minutes)** p=2 and for a^2=1,4,9,25,36,49,64 and 81. Identify the numbers (a^2) which are divisible by 2. Check whether p (=2) divides a.		

C-2.1: Extends the understanding of powers (radical powers) and exponents

Learning outcome:

1. Justifies the irrationality of √2, √3, √5 and other surds such as m + p√n using the fundamental theorem of arithmetic.

Think of a prime number(p).

Think of a perfect square which is divisible by the prime number (a^2)

Check if the prime number also divides the number (a)

Whole Class Activity: (15 minutes)

Teacher explains the proof of the following theorem

Theorem: Let p be a prime number. If p divides a^2, then p divides a, where a is a positive integer.

Consider the prime factorization of a is as follows:

a = $p_1 p_2 p_3 \dots \dots p_n$, where $p_1, p_2, p_3, \dots \dots p_n$ are primes, not necessarily distinct.

Find a^2.

Now, we are given that p divides a^2.

Which implies p divides a.

[Teacher note: Therefore, from the Fundamental Theorem of Arithmetic, it follows that p is one of the prime factors of a^2.

How ever using the uniqueness part of the Fundamental Theorem of Arithmetic, we realise that the only prime factors of a^2 are $p_1 p_2 p_3 \dots \dots p_n$. So, p is one of $p_1, p_2, p_3, \dots \dots p_n$. Now, since a = $p_1 p_2 p_3 \dots \dots p_n$, p divides a]

<u>Teacher explains contradiction method of proof with an example.</u>

Whole Class Activity: (15 minutes)

Theorem: √2 is irrational.

a^2	p	p/a^2	p/a	Yes/no
64	2			
121	11			
196	7			
324	3			

https://youtu.be/mX91_3GQqLY?si=cGK5zhktE_P_Wwnx

Proving √2 is irrational

	Teacher explains the theorem √2 is irrational by giving step by step instructions. Step1: What if √2 is not irrational? Step2: How can we represent a rational number? Step3: Simplify besides squaring both sides Step4: Apply previous theorem and simplify further (Teacher note: deduct 2 is common factor for both numerator and denominator) Step5: Obtain the contradiction and conclude.	Describe a rational number in your own words? Give examples of co-prime numbers? Why $\sqrt{4}, \sqrt{16}, \sqrt{25}$ are not irrational numbers?	

Summative assessment plan- only where relevant

1. Prove that √5 is irrational.
2. Show that $\log_{10} 2$ is an irrational. (Hint: assume $\log_{10} 2 = \frac{p}{q} \Rightarrow 10^{\frac{p}{q}} = 2 \; then \; proceed$)

Teachers' reflections and experiences:

1. Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2. How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3. How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4. How effective were the Materials and resources used in the lesson?
5. Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Real Numbers
Total no. of periods for this chapter: 10
Period no :6/10
Subtopic: Revisiting Irrational Numbers (P.T. 5-$\sqrt{3}$, $3\sqrt{2}$ is irrational)

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.	Material required
C-1.1: Develops understanding of numbers, including the set of real numbers and its properties. **C-2.1**: Extends the understanding of powers (radical powers) and exponents **Learning outcome:** **1.** Justifies the irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ and other surds such as $m + p\sqrt{n}$ using the fundamental theorem of arithmetic.	**Introduction: (10 Minutes)** Teacher asks the following questions to recap the previous concepts which help to prove some more given numbers as irrational. 1) Distinguish rational numbers and irrational numbers. 2) Can a rational number can be equal to irrational number? 3) Can we represent the irrational on number line. 4) $\sqrt{19}$ is rational or not? 5) What do you say about difference of a rational number and an irrational number?		

2. Expresses the prime factorization of a number in exponential form. **3.** Uses the fundamental theorem of arithmetic to check the digit in the place of unit in the power of a number.	**Demonstration: (20 minutes)** **Whole Class Activity:** 1. Show that $5-\sqrt{3}$ is irrational. Teacher explains the process of proving irrational numbers when difference of a rational and irrational numbers is given (while using contra positive method). **Teacher Note**: Method of proving irrationality of numbers should be incorporated among students in a logical way. 1) Assume the given number is not irrational (i.e., rational) E.g. R=a/b where a and b are coprime. Teacher gives step by step instructions for proving above $5-\sqrt{3}$ is irrational. Assume that $5-\sqrt{3}\ rational.$ Transpose 5 to R.H.S. Multiply with (-1) on both sides. Now LHS $\sqrt{3}$ what kind of number? R.H.S $5-\frac{a}{b}$ what kind number? Can you arrive a contradiction/ Why do you get this contradiction? Explain? Write your con conclusion? **Classroom assignment** **10 min** **The following questions are discuss in groups and present Infront of the class** Q) Show that $3\sqrt{2}$ is an irrational number.	Is $\sqrt{3}$=3? If a is a non-perfect square number, p and q are integers.$\sqrt{a}=p+q$ jutify? Show that 3-$\sqrt{5}$ is an irrational?	https://youtu.be/SNW2r1Yjrkk https://youtu.be/LmPYj3eKm18?si=bE5kBbCbEMP4FMJH

	Q) Show that $5-\sqrt{3}$ is irrational		

Summative assessment plan- only where relevant

1. Prove that $\frac{2+\sqrt{3}}{5}$ is an irrational number.
2. Prove that $\frac{1}{2+\sqrt{3}}$ is an irrational number.
3. Prove that $\frac{2\sqrt{3}}{5}$ is an irrational number.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Real Numbers
Total no. of periods for this chapter:1. Real Numbers
Period no :7/10
Key concepts: 1) Intro of Number System 2) The Fundamental Theorem of Arithmetic 3) Revisiting Irrational Numbers
Subtopic: Revisiting Irrational Numbers (P.T. $\sqrt{5}-\sqrt{3}$, is irrational)

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C-1.1: Develops understanding of numbers, including the set of real numbers and its properties. **C-2.1**: Extends the understanding of powers (radical powers) and exponents **Learning outcome:** **1.** Justifies the irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ and other surds such as $m + p\sqrt{n}$ using the fundamental theorem of arithmetic.	**Introduction : (5 MINUTES)** Teacher asks the following questions to recap the previous concepts which help to prove some more given numbers as irrational. 1. Distinguish rational numbers and irrational numbers. 2. Can a rational number can be equal to irrational number? 3. What is the resulting number of sum/subtraction/product/divisions of two rational numbers? **DEMONSTRATION: (10 min)** **Whole Class Activity:** Q) Show that $\sqrt{5}-\sqrt{3}$ is irrational.	Complete the table number | Rational /irrational $3\sqrt{2}$ | $3+\sqrt{2}$ | $3-\sqrt{2}$ | $\frac{3}{\sqrt{2}}$ |	**GeoGebra Graph**

	Teacher explains the solution with the help of following questions (while using contra positive method). 1) If the given number is not rational, what it would be? 2) Instruct the students to think √5-√3 as the assumed rational number as $\frac{a}{b}$ 3) Square both sides. 4) Keep irrational number on LHS and rational number in RHS. 5) Can you arrive Contradiction? Give reasons. 6) Write your conclusion. Q) Show that √5+ √3 (10 min) Teacher explains the solution with the help of following questions (while using contra positive method). 7) If the given number is not rational, what it would be? 8) Instruct the students to think √5-+$\sqrt{3}$ as the assumed rational number as $\frac{a}{b}$ 9) Square both sides. 10) Keep irrational number on LHS and rational number in RHS. 11) Can you arrive Contradiction? Give reasons. 12) Write your conclusion.	Prove that √3-√5 is irrational Prove that √2-+$\sqrt{3}$ is an irrational?	 https://www.youtube.com/watch?v=crYBX3duaK0 **Proving Irrational number**

	Activity : (5 minutes) Teacher makes students into groups and ask them to solve the following questions and present their solutions in front of the class P.T. √3-√7, P.T. √3+√13 etc., is irrational number.		

Summative assessment plan- only where relevant

1) P.T. √7-√11 is irrational number
2) Show that the diagonal of a square is always an irrational if the length of side is a positive integer?
3) Prove that √p-+$\sqrt{q}$ is an irrational?

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Real Numbers
Total no. of periods for this chapter:1. Real Numbers
Period no :8/10
Subtopic: Case Based questions

	Teaching-Learning Process **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
	Techer provide some case-based questions from cbse academic and discuss with the students in pairs. To enhance the reading skills of grade X students, the school nominates you and two of your friends to set up a class library. There are two sections- section A and section B of grade X. There are 32 students in section A and 36 students in section B. 		

1. What is the minimum number of books you will acquire for the class library, so that they can be distributed equally among students of Section A or Section B?

a) 144 b) 128 c) 288 d) 272

2. If the product of two positive integers is equal to the product of their HCF and LCM is true then, the HCF (32, 36) is

a) 2 b) 4 c) 6 d) 8

3. 36 can be expressed as a product of its primes as

a) 2^2X3^2 b) 2^2X3 c) $2X3^2$ d) 2^0X3^0

4. 7 is a

a) Prime number b) Composite number

c) Neither prime nor composite d) None of the above

5. If p and q are positive integers such that p = a and q= b, where a , b are prime numbers, then the LCM (p, q) is

a) ab b) a^2b^2 c) a^3b d) a^0b^0

2. A seminar is being conducted by an Educational Organization, where the participants will be educators of different subjects. The number of participants in Hindi, English and Mathematics are 60, 84 and 108 respectively.

1. In each room the same number of participants are to be seated and all of them being in the same subject, hence maximum number participants that can accommodated in each room are

a) 14 b) 12 c) 16 d) 18

2. What is the minimum number of rooms required during the event?

a) 11 b) 31 c) 41 d) 21

3. The LCM of 60, 84 and 108 is

a) 3780 b) 3680 c) 4780 d) 4680

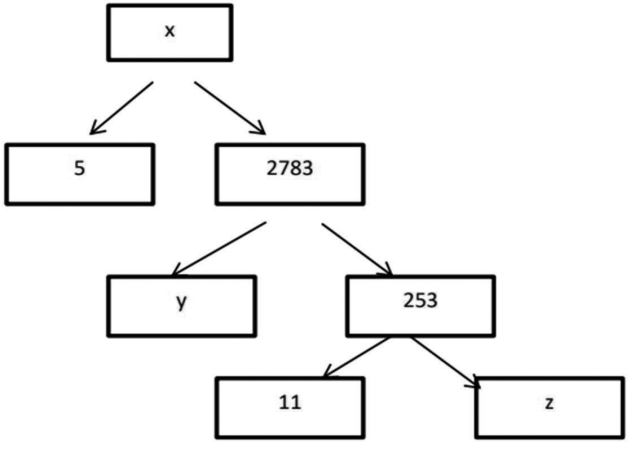
4. The product of HCF and LCM of 60,84 and 108 is

a) 55360 b) 35360 c) 45500 d) 45360

5. 108 can be expressed as a product of its primes as

a) 2^2X3^2 b) 2^2X3^3 c) $2X3^2$ d) 2^0X3^0

A Mathematics Exhibition is being conducted in your School and one of your friends is making a model of a factor tree. He has some difficulty and asks for your help in completing a quiz for the audience.
Observe the following factor tree and answer the following:



1. What will be the value of x?

a) 15005 b) 13915 c) 56920 d) 17429

2. What will be the value of y?

a) 23 b) 22 c) 11 d) 19

2. What will be the value of z?

a) 22 b) 23 c) 17 d) 19

	4. According to Fundamental Theorem of Arithmetic 13915 is a a) Composite number b) Prime number c) Neither prime nor composite d) Even number **3.** prime factorization of 13915 is a) $5 \times 11^2 \times 23$ b) $5 \times 11^3 \times 13^2$ c) $5 \times 11^3 \times 23^2$ d) $5 \times 11^2 \times 13^2$		

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

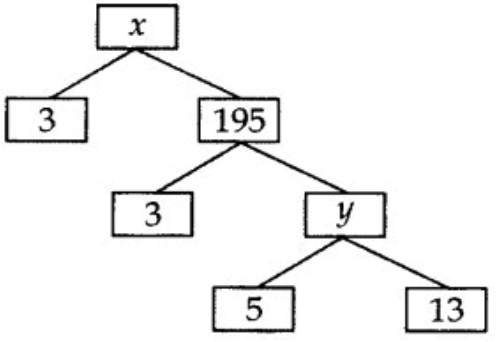
Period plan (40 mins class)

Class: 10th
Chapter: Real Numbers
Total no. of periods for this chapter:1. Real Numbers
Period no :9/10
Subtopic: Practice Period on Exemplary

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.	Material required
C-1.1: Develops understanding of numbers, including the set of real numbers and its properties. **C-2.1**: Extends the understanding of powers (radical powers) and exponents **Learning outcome:** 1. Justifies the irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$ and other surds such as $m + p\sqrt{n}$ using the fundamental theorem of arithmetic. 2. Expresses the prime factorization of a number in exponential form.	**Introduction:** (5 Minutes) **Q: 1** **Let p be a prime number and k be a positive integer.** **If p divides k^2, then which of these is DEFINITELY divisible by p ?** $\frac{k}{2}$ | k | $7k$ | k^3 1 only k 2 only k and $7k$ 3 only k, $7k$ and k^3 4 all - $\frac{k}{2}$, k, $7k$ and k^3		

3. Uses the fundamental theorem of arithmetic to check the digit in the place of unit in the power of a number.	**Q: 2** **$\sqrt{n}$ is a natural number such that n > 1.** **Which of these can DEFINITELY be expressed as a product of primes?** **i) $\sqrt{n}$** **ii) n** **iii) $\frac{\sqrt{n}}{2}$** **1** only ii) **2** only i) and ii) **3** all - i), ii) and iii) **4** (cannot be determined without knowing *n*) 3.A rational number in its decimal expansion is 327.7081. What can you say about the prime factors of q, when this number is expressed in the form p/q? Give reasons. 4.Show that the square of an odd positive integer is of the form 8m + 1, for some whole numbers. **Demonstration: (25 Minutes)** Diwali is the biggest festival in India. People give gifts to their loved ones and wish them "Happy Diwali". People give different types of gifts to their loved ones but most of them prefer to give sweets in gifts. Therefore, all sweet shops remain very busy on the Diwali festival in India. One shopkeeper A prepares 396 Gulab Jamuns and 342 Ras-Gullas. He packs them in combination. Each container consists of either Gulab Jamuns or Ras-Gullas but has an equal number of pieces. (a) Find the number of pieces, Shopkeeper A should put in each box so that number of boxes is the least. (i) 12 (ii) 18 (iii) 20 (iv) 25		

	(b) There is another sweets shopkeeper B beside shopkeeper A. Shopkeeper B prepares 350 Gulab Jamuns and 400 Ras-Gullas. His packing follows the same rules as of shopkeeper A. Find the number of pieces shopkeeper B should put in each box so that number of boxes is the least. (i) 20 (ii) 18 (iii) 50 (iv) 5 (c) The ratio of the number of boxes required by shopkeeper A to shopkeeper B, is: (i) 9:25 (ii) 3:5 (iii) 1:1 (iv) 5:1 (d) If there is another shopkeeper C who makes 500 Gulab Jamuns and 400 Ras-Gullas, then the ratio of Number of boxes required by Shop keep A, B, and C is : (i.e. A: B: C) : (i) 3:5:10 (ii) 3:4:5 (iii) 9:25:50 (iv) 1:3:50 (e) The ratio of the Number of boxes required by Shopkeeper A and C is (i.e., A: C): (i) 3:25 (ii) 1:2 (iii) 9:50 (iv) 2:25 **Activity:** (5 minutes)		

	Complete the following factor tree and find the composite number x.  		

Summative assessment plan- only where relevant

1. **Express each number as a product of its prime factors:**

   (i) 140
   (ii) 156
   (iii) 3825
   (iv) 5005
   (v) 7429

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Real Numbers
Total no. of periods for this chapter:10
Period no: 10/10
Sub Topic: Practice session

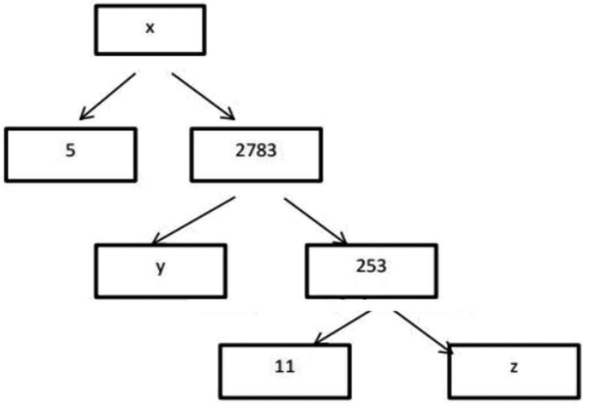
Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.	Material required
	Practice session: (40 minutes) To enhance the reading skills of grade X students, the school nominates you and two of your friends to set up a class library. There are two sections- section A and section B of grade X. There are 32 students in section A and 36 students in section B. Q1) What is the minimum number of books you will acquire for the class library. So that they can be distributed equally among students of section A and section B. A) 144 B) 128 C) 288 D) 272 Q2) If the product of two positive integers equal to the product of their HCF and LCM. Is true, then the HCF (32,36) is	1. Express 144 as a product of primes? 2. Prove that $3 + \sqrt{5}$ is irrational. 3. Whether the sum of rational and irrational is rational or irrational?	SCAN ME **Important NCERT Exemplar Questions REAL NUMBERS** https://www.youtube.com/live/MCBFgAqibX0?si=Eyc0wY3xzYN2cicq

	A) 2 B) 4 C) 6 D) 8 Q3) 36 can be expressed as product its primes as A) 2^2X3^2 B) $2x3^3$ C) 3^3x3 D) 2^0x3^0 2. A seminar is being conducted by an Educational Organisation, where the participants will be educators of different subjects. The number of participants in Hindi, English and Mathematics are 60, 84 and 108 respectively. **1. In each room the same number of participants are to be seated and all of them being in the same subject, hence maximum number participants that can accommodated in each room are** a) 14 b) 12 c) 16 d) 18 **2. What is the minimum number of rooms required during the event?** a) 11 b) 31 c) 41 d) 21 **3. The LCM of 60, 84 and 108 is** a) 3780 b) 3680 c) 4780 d) 4680 **4. The product of HCF and LCM of 60,84 and 108 is** a) 55360 b) 35360 c) 45500		

	d) 45360 **5. 108 can be expressed as a product of its primes as** a) $2^3 \times 3^2$ b) $2^3 \times 3^3$ c) $2^2 \times 3^2$ d) $2^2 \times 3^3$		

Summative assessment plan- only where relevant

A Mathematics Exhibition is being conducted in your School and one of your friends is making a model of a factor tree. He has some difficulty and asks for your help in completing a quiz for the audience.



Observe the following factor tree and answer the following:

1. What will be the value of x?

a) 15005 b) 13915 c) 56920 d) 17429

2. What will be the value of y?

a) 23 b) 22 c) 11 d) 19

3. What will be the value of z?

a) 22 b) 23 c) 17 d) 19

4. According to Fundamental Theorem of Arithmetic 13915 is a

a) Composite number b) Prime number c) Neither prime nor composite d) Even number

5. The prime factorization of 13915 is

a) $5 \times 11^3 \times 13^2$ b) $5 \times 11^3 \times 23^2$ c) $5 \times 11^2 \times 23$ d) $5 \times 11^2 \times 13^2$

Teachers' reflections and experiences:

1. Did I clearly communicate the lesson objectives to the students?
2. Did I use effective instructional strategies to engage students in the lesson?
3. How can I improve the variety and effectiveness of my teaching methods to cater to
4. different learning styles and needs?
5. How well did I manage the classroom during the lesson?

CHAPTER-1(REAL NUMBERS)
WORKSHEET (BASICS)

Choose the correct option: (2×1=2)

1. For some integer q. every odd integer is of the form

a. q b. q+1 c. 2q d. 2q+1

2. The product of a non-zero rational and an irrational number is

a. always irrational c. always rational

b. rational or irrational d. one

Fill in the blanks: (2×1=2)

3. $\sqrt{2},\sqrt{3},\sqrt{7}$, etc. are _____ numbers.

4. A rational number can be expressed as terminating decimal when the factors of the denominator are _____.

Work Sheet:2 on Real Numbers for Class:10

Multiple Choice Questions (MCQs)

1. Which of the following is an irrational number?
   - (A) 0.25
   - (B) 0.333…
   - (C) √2
   - (D) 1.414
2. Which of the following is equivalent to 3/5?
   - (A) 0.6
   - (B) 0.66…
   - (C) 0.5
   - (D) 0.3
3. Which of the following is a property of real numbers?
   - (A) Commutativity
   - (B) Associativity
   - (C) Distributivity
   - (D) All of the above
4. Which of the following is not a real number?
   - (A) π
   - (B) e
   - (C) i
   - (D) φ
5. Which of the following is the correct way to write 0.0000345 in scientific notation?
   - (A) 3.45 × 10^-5
   - (B) 34.5 × 10^-6
   - (C) 345 × 10^-7
   - (D) All of the above
6. Which of the following is a rational number?
   - (A) √3
   - (B) √4
   - (C) √5
   - (D) √6

7. Which of the following is the correct way to write 5.67 × 10^9 in standard form?

- (A) 5670000000
- (B) 5670000
- (C) 567000
- (D) 56700

8. Which of the following is the correct way to compare two real numbers using a number line?
   - (A) The number closer to the origin is smaller
   - (B) The number farther from the origin is smaller
   - (C) The number on the right is larger
   - (D) The number on the left is larger
9. Which of the following is the correct way to add two real numbers?
   - (A) Align the decimal points and add the digits
   - (B) Align the decimal points and subtract the digits
   - (C) Ignore the decimal points and add the digits
   - (D) Ignore the decimal points and subtract the digits
10. Which of the following is the correct way to multiply two real numbers?
    - (A) Multiply the digits and add the exponents
    - (B) Multiply the digits and subtract the exponents
    - (C) Multiply the digits and the exponents
    - (D) Divide the digits and add the exponents.

Work Sheet:3 on Real Numbers for Class:10

1. What is the difference between a rational and an irrational number? Give an example of each.
2. What is the difference between a terminating and a non-terminating decimal? Give an example of each.
3. What is the difference between a repeating and a non-repeating decimal? Give an example of each.
4. What is the difference between scientific notation and standard form? Give an example of each.
5. What is the difference between a natural number and a whole number? Give an example of each.
6. Prove that $\sqrt{5}$ is irrational
7. P.T. $\frac{1}{\sqrt{2}}$ is irrational
8. P.T. $6-5\sqrt{3}$ is irrational
9. P.T. $\sqrt{5}+\sqrt{2}$ is irrational
10. P.T. $\sqrt{19}-\sqrt{11}$ is irrational

LESSON PLAN / PERIOD PLAN

Class : 10

Subject : Mathematics

Chapter No. : 2

Chapter Name : POLYNOMIALS

1062CH02

https://epathshala.nic.in/topic-d.php?id=1062CH02

CURRICULAR GOALS & COMPETENCIES

The following curricular goals and competencies are relevant to the chapter:

Curricular Goals	Competencies
CG-3: Discovers and proves algebraic identities and the models real - life situations in the form of equations to solve them.	**C-3.2:** Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled
CG-8: Builds skills such as visualization, optimization, representation, and mathematical modelling along with their application in daily life.	**C-8.1:** Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions.

MIND MAP

CHAPTER-2
POLYNOMIAL
CLASS-10

Polynomial:- An algebraic expression in which the exponent of the variable is a whole number is called a polynomial.
Example : $4x^4 - 3x^3 + 4x^2 - 5x + 2$

Zeroes of a polynomial

Solutions of a polynomial are called its zeroes.

Values of x for which the given polynomial become equal to zero are called the zeroes of a polynomial.

Types of polynomial On the basis of terms terms

Monomial:
Polynomial having one term. Eg. $4x^2$

Binomial:
Polynomial having two terms. Eg. $4x^2 + 6x$

Trinomial:
Polynomial having three terms. Eg. $4x^2 + 6x + 5$

Quadrinomial:
Polynomial having four terms. Eg. $4x^3 + 5x + 2 + y$

Types of polynomial On the basis of degree

Constant Polynomial: A polynomial of degree zero

Linear Polynomial: Polynomial of degree one

Quadratic Polynomial: Polynomial of degree two

Cubic Polynomial: Polynomial of degree three

Bi-Quadratic Polynomial: Polynomial of degree four

Relationship between zeroes and coefficients of a quadratic polynomial:-

Quadratic polynomial is given by $P(x) = ax^2 + bx + c$

If α and β are the zeroes of quadratic polynomial then

$$Sum\ of\ zeroes\ (\alpha+\beta) = \frac{-(coefficient\ of\ x)}{coefficient\ of\ x^2} = \frac{-b}{a}$$

$$Product\ of\ zeroes\ (\alpha\beta) = \frac{constant\ term}{coefficient\ of\ x^2} = \frac{c}{a}$$

Graphical Meaning of linear, Quadratic and Cubic Polynomial

PERIOD WISE PLAN

PERIOD NO.	TEACHING TOPIC	LEARNING OUTCOMES
1	Recall of previous knowledge – Definition of polynomials in one variable, degree, classification and zero of polynomial	Students are able to recall the previous knowledge.
2	Geometric meaning of zero of linear and quadratic polynomials	Students are able to represent in graphical form.
3	Shapes of graphs (parabolas) of quadratic polynomials in different cases	Students are able to relate graphs of quadratic polynomials with its coefficients.
4	Geometric meaning of zero of cubic polynomials	Students are able to represent in graphical form.
5	Relationship between Zeroes and Coefficients of Linear and Quadratic Polynomials	Students are able to verify and utilize the relationships between zeroes and coefficients of Linear and Quadratic Polynomials.
6	Relationship between Zeroes and Coefficients of Cubic Polynomials	Students are able to verify and utilize the relationships between zeroes and coefficients of Linear and Quadratic Polynomials.
7	Case Based Questions	Students are able to apply concept of polynomials different situations

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Polynomials
Total no. of periods for this chapter:7
Period no :1
Sub Topic: Polynomials in One Variable
Degree of Polynomial
Linear Polynomial, Quadratic Polynomial, Cubic Polynomial
Value of Polynomial
Zero of Polynomial
Zero of Linear Polynomial

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled	**Teacher makes the students recall the concept of Polynomial in one variable through the following activity. 10min** **ACTIVITY 1 (Pair work)** Students identify polynomial from the given list. x+5, 3x-1, $4x^2 + 3x - 2$, $-5x^2 - 6x$, $x^2 + \frac{5}{x} - 4$, $8x^3 - x^2 - \sqrt{x} + 1$, $x^3 - 4x^2 + 3x - 5$, $x^4 - \frac{5}{3}x^2 - 9x + 1$ [Teacher note: Teacher to go to each pair and ask students to give reason for their identification.]	If it is a polynomial give reasons in support of your answer.	**Paper and pen and doing the computational tasks**

	Teacher reiterates that a polynomial in one variable is an algebraic expression in one variable with exponents of variables as whole numbers. **<u>Teacher makes the students into groups recall the concept of degree of Polynomial in one variable and its classification based on degree through the following activity.</u>** **<u>ACTIVITY 2</u>** **(15min)** Teacher puts students in pair to play this. The student A says a digit from 0 to 3 randomly and student B is invited to say a polynomial in one variable with the degree same as the digit spoken by A and say whether it is a constant/ linear/ quadratic/ cubic, and vice versa. The process may be continued for 3 to 4 cycles. Teacher observes the activity and explains that the degree is the highest exponent among the exponents of variable in the polynomial and the polynomial is non-zero constant / linear / quadratic / cubic when the degree is 0 / 1 / 2 / 3 respectively. (Teacher Note: Teacher should ensure that student recall that the degree of non-zero constant polynomials is zero and degree of zero polynomial is not defined.) Teacher emphasizes that the general forms of linear, quadratic and cubic polynomials are $ax + b$, $ax^2 + bx + c$ and $ax^3 + bx^2 + cx + d$ respectively where $a \neq 0$ and are represented by p(x), q(x) etc.	Give an example of a constant polynomial? Give an example of a zero polynomial? Assignment: 1. List four examples of polynomials in one variable. 2. List four examples of algebraic expressions which are not polynomials. 3. Find whether $\sqrt{4}x^4 + \sqrt{3}x^3 - \sqrt{2}x^2 + \sqrt{1}x^1 - \sqrt{0}x^0$ is a polynomial. Give reason in support of your answer. 4. The degree of $4x^2 + 3x - 2$ is _____. 5. Give an example of a polynomial whose degree is zero?	

Teacher makes the students recall the concept of Value of a Polynomial in one variable through computational activity and recalls the concept of zero of polynomial and algebraic solution to linear polynomial.

ACTIVITY 3 **(15min)**

Teacher gives the following table that contains variable values and the values of polynomials for the variable values in jumbled manner. Children are asked to match the two columns suitably using computations.

Match the following

$p(x) = 2x - 4$

x	$p(x)$
-3	-6
-2	-2
-1	-10
0	-4
1	-8
2	2
3	0

Teacher emphasizes that the value of polynomial is the value of the polynomial for a given variable value. And, zero of polynomial is the value of variable that gives the polynomial value 0. In the activity discussed, the zero of the polynomial is 2.

[Teacher generalizes the idea of zero of polynomial and gives its definition. If p(x) is a polynomial and p(a)=0 then x=a is the zero of polynomial.]

Complete the table

t	$P(t)=t^2-1$	value
1		
-1		
0		
2		

Identify the zeroes of p(t).

Describe zero of a polynomial in your own words?

https://youtu.be/5GyfX8cWjdg?si=nJEFn1Rvrh7hMEVT

Degree of polynomials

https://www.youtube.com/watch?v=xkzlAfLKyss&t=143s

	Further, teacher generalizes the idea and explains that, if $p(x) = ax + b,\ a \neq 0$ is the given linear equation then its solution may be obtained algebraically as $p(x) = 0$ $\Rightarrow ax + b = 0$ $\Rightarrow ax = -b$ $\Rightarrow x = \frac{-b}{a} = \frac{-constan\ \ term}{coefficient\ of\ x}$ (Teacher Note: Teacher should ensure that the students understand the meaning of the term coefficient. Necessary recap of the term may be given if needed.) (Teacher Note: Teacher should ensure that the students understands that every real number is the zero of a zero polynomial.)		Zeroes of a polynomial

Summative assessment plan- only where relevant

1. What is the degree of a zero polynomial?
2. If $p(x) = x^3 + x^2 + x + 1$ then find the values of p(1), p(2) and p(-3).

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

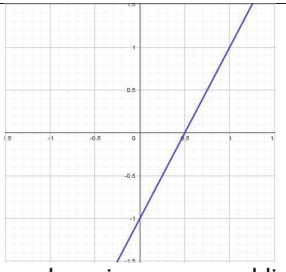
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

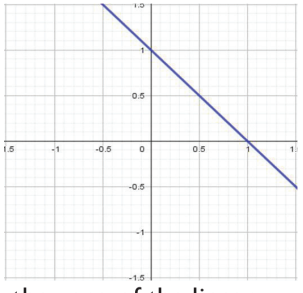
Period plan (40 mins class)

Class: 10th
Chapter: Polynomials
Total no. of periods for this chapter:7
Period no :2
Sub Topic: Geometric meaning of Zero of Linear Polynomial
Geometric meaning of Zeroes of Quadratic Polynomial

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled **C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions**	**<u>Teacher makes the students understand that the zero of a linear polynomial is the x-coordinate of point of intersection of its graph with x-axis.</u>** **<u>ACTIVITY 1 (Pair Work)</u>** **(10min)** Teacher groups the students in pairs. Teacher gives two tasks to each group of two students ("A" and "B"). In the first task, teacher gives a linear polynomial $p(x) = 2x - 1$, "A" solves it algebraically and "B" tabulates it and graphs it to find the point of intersection with the x-axis. Teacher asks to compare their results for some relationship and make a note.	Assignment: Solve the equation $x - 4 = 0$ algebraically. Check your result by sketching the graph of $p(x) = x - 4$.	**Graph Paper and Stationery** **GeoGebra** **Geometrical Meaning of Zeroes of Polynomial** **1.**



In the second task, teacher gives a second linear polynomial $q(x) = -x + 1$, "A" tabulates it and graphs it to find the point of intersection with the x-axis and "B" solves it algebraically. Teacher asks to compare their results for some relationship and make a note.



Teacher ensures that the zero of the linear polynomial obtained algebraically is same as x-coordinate of the point where its graph intersects x-axis.

Teacher concludes that the zero of a linear polynomial is precisely the x-coordinate of the point of intersection of its graph with x-axis.

https://www.youtube.com/watch?v=Jy-A-6jpZho

2.

https://www.youtube.com/watch?v=LsNMjsFlPdQ

Teacher makes the students understand that the zeroes of a quadratic polynomial are the x-coordinates of points of intersection of its graph with x-axis. 30min

ACTIVITY 2

Teacher engages the students in computation activity by giving a quadratic polynomial, say $p(x) = x^2 - 2x - 3$, and ask to find the values of the polynomial for different values of variable and table it in the following way:

x	$y=p(x) = x^2 - 2x - 3$	(x, y)
-2		
-1		
0		
1		
2		
3		
4		

Teacher asks the students to take a graph paper and choose a pair of coordinate axes and name them as X-axis and Y-axis accordingly.

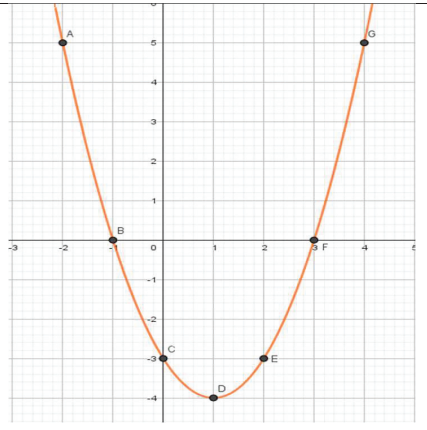
Teacher asks the students to mark points corresponding to the ordered pairs (x, y) from the table and asks whether they lie on a straight line.

(Teacher Note: Teacher should ensure that the students says no and the points lie on a curve). Teacher asks the students to join the points obtained by a smooth curve and says that such a curve is the graph of the quadratic polynomial and it is called a parabola.

Assignment:

Solve the equation $-x^2 + x + 12 = 0$ algebraically. Check your result by sketching the graph of $p(x) = -x^2 + x + 12$.

What is the shape of graph of a quadratic Polynomial?

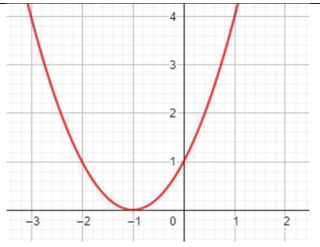
	Teacher asks the students to find the zeroes of the quadratic polynomial $p(x) = x^2 - 2x - 3$ algebraically.  (Teacher Note: Teacher should ensure that students recap the middle term factorization method learnt in previous class, utilizes it). Teacher asks to compare the zeroes with x-coordinates of the intersecting point of the graph with the x-axis.) (Teacher Note: Teacher should ensure that children get the two are the same) Teacher concludes that the zeroes of a quadratic polynomial are precisely the x-coordinates of the points of intersection of its graph with x-axis.	1.Verify the zeroes by splitting the middle term method? 2.Write the interaction points of the curve and X-axis. 3.Suppose the values of x-coordinates say α, β find p (α) and $p(\beta)$? 4.write your conclusion?	

Summative assessment plan- only where relevant

1.Solve the equation $2x + 3 = 0$ algebraically. Check your result by sketching the graph of $p(x) = 2x + 3$.

2.Solve the equation $x^2 - 3x + 2 = 0$ algebraically. Check your result by sketching the graph of $p(x) = x^2 - 3x + 2$.

3.Find the number of zeroes the polynomial p(x) has given its graph as follows:



Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

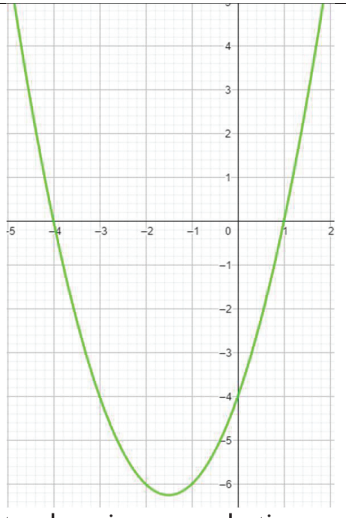
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

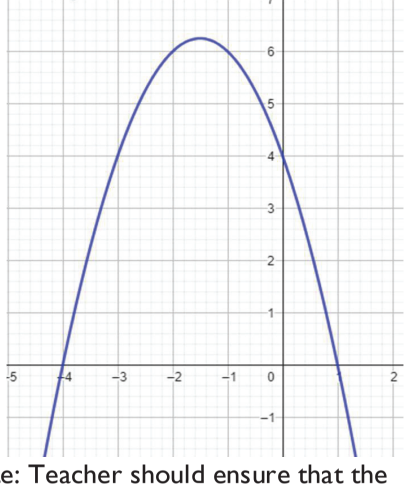
Class: 10th
Chapter: Polynomials
Total no. of periods for this chapter:7
Period no :3

Sub Topic: Shapes of the graph of Quadratic Polynomial $y = ax^2 + bx + c$ in different cases

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled **C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions**	**Teacher makes the students understand the shapes of graph (parabola) of quadratic polynomial with two zeroes (distinct)** **ACTIVITY 1 (Pair Work) (10min)** Teacher groups the students in pairs. Teacher gives two tasks to each group of two students. In the first task, teacher gives a quadratic polynomial with positive leading coefficient (a>0), say, $p(x) = x^2 + 3x - 4$, and asks one of them to find its zeroes algebraically and the other to solve it graphically.	Assignment: Sketch the graphs of the polynomials $p(x) = x^2 - 9$ and $q(x) = -x^2 + 9$ and discuss the shapes of their graphs.	**Graph Paper and Stationery** https://youtu.be/mBF7Gd7eiNo?si=WpbBqr--aWulms9d **Geogebra For showing intractive graphs**



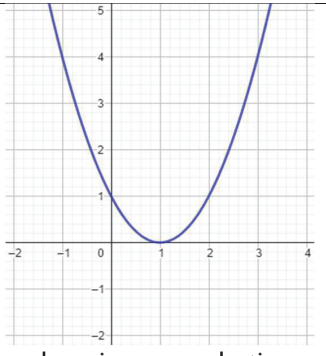
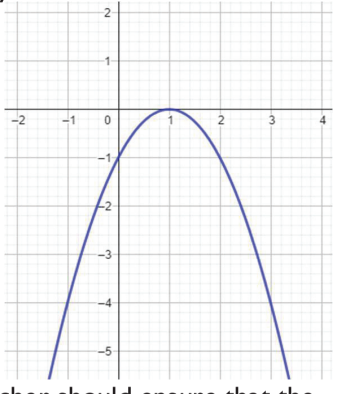
In the second task, teacher gives a quadratic polynomial with negative leading coefficient (a<0), say, $q(x) = -x^2 - 3x + 4$, and asks one of them to find its zeroes algebraically and the other to solve it graphically.

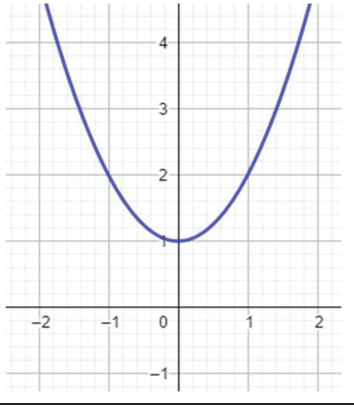


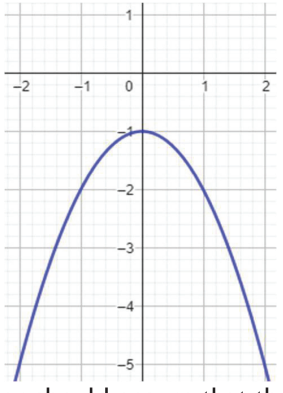
(Teacher Note: Teacher should ensure that the students gain the skill of tabling and graphing parabolas comfortably)

What is the nature of coefficient of x^2 on the basis shape of parabola?

	Teacher asks the students to compare the shapes of graphs obtained in the two tasks. (Teacher Note: Teacher should ensure that students correlate the number of zeroes obtained with the number of intersections of graph with x-axis, and identify upward opening parabola in case of a>0 and downward opening parabola in case of a<0). Teacher concludes that If a quadratic polynomial has two zeroes then its graph intersects x-axis at two points and it opens upwards when a>0 and opens downwards when a<0 . (Teacher Note : Teacher is advised to use GEOGEBRA CAS graphing tool to demonstrate the cases) **<u>Teacher makes the students understand the shapes of graph (parabola) of quadratic polynomial with one zero (two equal zeroes)</u>** **ACTIVITY 2 (Pair Work) (15 min)** Teacher groups the students in pairs. Teacher gives two tasks to each group of two students. In the first task, teacher gives a quadratic polynomial with positive leading coefficient (a>0), say, $p(x) = x^2 - 2x + 1$, and asks one of them to find its zeroes algebraically and the other to solve it graphically.	Assignment: 6. Sketch the graphs of the polynomials $p(x) = x^2$ and $q(x) = -x^2$ and discuss the shapes of their graphs. Write the zeroes of the polynomial? Justify your answer?	**Shapes of parabolas in different cases** **https://www.youtube.com/watch?v=Jy-A-6jpZho** Geometrical meaning of Zeroes of Polynomials

	 In the second task, teacher gives a quadratic polynomial with negative leading coefficient (a<0), say, $q(x) = -x^2 + 2x - 1$, and asks one of them to find its zeroes algebraically and the other to solve it graphically.  (Teacher Note: Teacher should ensure that the students get the graph like a parabola touching the x-axis at one point in each task.) Teacher asks the students to compare the shapes of graphs obtained in the two tasks. (Teacher Note: Teacher should ensure that students correlate the number of zeroes obtained with the number of intersections of graph with x-axis, and identify upward opening	Write the zeroes of the polynomial? Justify your answer?	**Graph Charts related to graphs**

	parabola in case of a>0 and downward opening parabola in case of a<0). Teacher concludes that If a quadratic polynomial has one zeroes (two equal zeroes) then its graph intersects x-axis at one point (two coincident points) and it opens upwards when a>0 and opens downwards when a<0 . (Teacher Note: Teacher is advised to use GEOGEBRA CAS graphing tool to demonstrate the cases) **Teacher makes the students understand the shapes of graph (parabola) of quadratic polynomial with no zero 15 min** **ACTIVITY 3 (Pair Work)** Teacher groups the students in pairs. Teacher gives two tasks to each group of two students. In the first task, teacher gives a quadratic polynomial with positive leading coefficient (a>0), say, $p(x) = x^2 + 1$, and asks one of them to find its zeroes algebraically and the other to solve it graphically.  	Assignment: Sketch the graphs of the polynomials $p(x) = x^2$ and $q(x) = -x^2$ and discuss the shapes of their graphs.	

	In the second task, teacher gives a quadratic polynomial with negative leading coefficient (a<0), say, $q(x) = -x^2 - 1$, and asks one of them to find its zeroes algebraically and the other to solve it graphically.  (Teacher Note: Teacher should ensure that the students arrive at no solution algebraically noticing that $x^2 = -1$ has no solution, and get the graph not intersecting the x-axis at any point.) Teacher asks the students to compare the shapes of graphs obtained in the two tasks. (Teacher Note: Teacher should ensure that students correlate the number of zeroes obtained with the number of intersections of graph with x-axis, and identify upward opening parabola in case of a>0 and downward opening parabola in case of a<0). Teacher concludes that If a quadratic polynomial has no zero then its graph does not intersects x-axis and it opens upwards when a>0 and opens downwards when a<0 . (Teacher Note : Teacher is advised to use GEOGEBRA CAS graphing tool to demonstrate the cases)	**TRY THIS**: 1. Write three polynomials that have 2 zeros each. 2. Write one polynomial that has one zero. 3. How will you verify if it has only one zero. 4. Write three polynomials that have no zeroes for x that are real numbers.	

Summative assessment plan- only where relevant

3. Draw the graph of $p(x) = -2x^2 + 5x + 3$ and discuss the shape of the graph.

Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

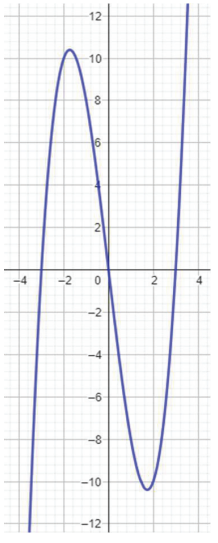
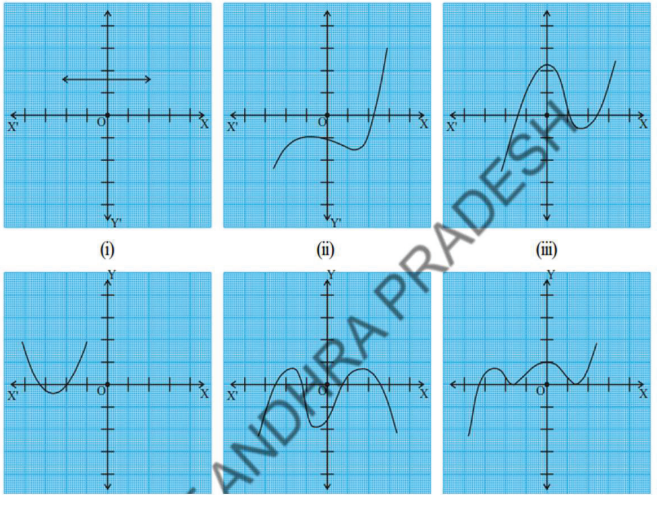
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Polynomials
Total no. of periods for this chapter:7
Period no :4
Sub Topic: Geometric meaning of Zero of Cubic Polynomial

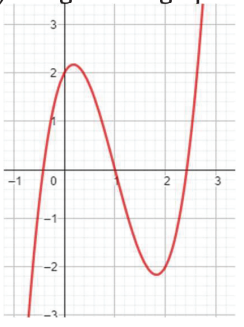
Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled **C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions**	**Teacher makes the students understand that the zeroes of a cubic polynomial are the x-coordinates of its graph with x-axis.** **ACTIVITY 1 (Pair Work): 40 min** Teacher groups the students in pairs. Teacher gives a task to each group. Teacher gives a cubic polynomial, say, $p(x) = x^3 - 9x$ to the group and asks one of them to find its zeroes algebraically and the other to table the values of the polynomial and graph it. x | y=$p(x) = x^3 - 9x$ | (x, y) -3 | | -2 | | -1 | | 0 | | 1 | | 2 | | 3 | |	If $P(t)=t^3-1$ then find the values of p(1),P(0),p(-1),p(2),p(-2) Assignment: 1. Solve the equation $x^3 - 2x = 0$ algebraically. Check your result by sketching the graph of $p(x) = x^3 - 2x$. 2. Solve the equation $x^3 = 0$ algebraically. Check your result by sketching the graph of $p(x) = x^3$.	**Graph Paper and Stationery** **GeoGebra Using for showing interactive graphs** **Summary of geometric**

	 (Teacher Note: Teacher should ensure that the student uses the factoring technique properly for the cubic polynomial with previous knowledge, and the gets graph of cubic polynomial properly.) Now, Teacher asks the two students of each group to compare and observe their results and comment. (Teacher Note: Teacher should ensure that the students of each group get three zeroes of polynomial same as the x-coordinates of the three intersecting points of the graph with the x-axis.) Teacher concludes that the zeroes of a cubic polynomial are precisely the x-coordinates of the points of intersection of its graph with x-axis.	3.Identify the zeroes from graph? 2.The graphs of y = p(x) are given in the figure below, for some polynomials p(x). In each case, find the number of zeroes of p(x).  	**al meaning of zeroes of polynomi als**

	(Teacher Note: Teacher is advised to use GEOGEBRA CAS graphing tool to demonstrate the cases)		

Summative assessment plan- only where relevant

4. Solve the equation $2x^3 - 8x = 0$ algebraically. Check your result by sketching the graph of $p(x) = 2x^3 - 8x$.
5. Find the number of zeroes the polynomial p(x) has given its graph as follows :



Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

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Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Polynomials
Total no. of periods for this chapter:7
Period no :5
Sub Topic: Relationship between Zero and Coefficients of a Linear Polynomial
Relationship between Zeroes and Coefficients of a Quadratic Polynomial

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualised problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled	**Teacher makes the students recall the concept of zero of linear polynomial ad relates it with the coefficients of the linear polynomial** **ACTIVITY (Computational) 10min** Teacher gives a matching table where students compute to find the zeroes of different linear polynomials and match the two columns.		**Paper and Pen**

Match the following :

Column – A (Linear Polynomial)	Column – B (Zero)
2x+3	$\frac{-5}{4}$
4x+5	$\frac{-1}{3}$
3x+1	$\frac{-5}{6}$
6x+5	$\frac{-3}{2}$

(Teacher Note: Teacher should ensure that students recall the method of solving simple equations and their solvation to find zeroes.)
Teacher makes the students recall the formula that the zero of a linear polynomial of the form $p(x) = ax + b$ is $x = \frac{-b}{a}$.
Teacher gives another table with the same linear polynomials to fill and draw conclusions.

Linear Polynomial	Zero	Coefficient of x	Constant Term	$\frac{-(constant\ term)}{coefficient}$
2x+3				
4x+5				
3x+1				
6x+5				

Teacher concludes the relationship as :
If α is the zero of a linear polynomial $ax + b$ then $\alpha = \frac{-b}{a} = \frac{-(constant\ term)}{coefficient\ of\ x}$.

Teacher makes the students understand the relationships between the zeroes and coefficients of a quadratic polynomial

15 min

I. Teacher deduces the relationship in the following way:

1. Teacher asks the students to consider a quadratic polynomial $p(x) = ax^2 + bx + c$, $(a \neq 0)$, whose zeroes are $\alpha\ and\ \beta$.
2. Now, teacher asks the students to find the zeroes of a quadratic polynomial, say, $q(x) = 3x^2 + 9x + 6$ using factoring.
   [Teacher Note: Teacher should ensure that students recall and produce the steps:

$$3x^2 - 9x + 6 = 0$$
$$\Rightarrow 3(x^2 - 3x + 2) = 0$$
$$\Rightarrow 3(x - 1)(x - 2) = 0$$

Assignment:
1. Find the zero of polynomial $p(x) = 6x + 3$ using formula. And verify the relationship between the zero and the coefficients of the polynomial.
2. Find the zero of polynomial $p(x) = 4x$ using formula. And verify the relationship between the zero and the coefficients of the polynomial.

Relationships between zeroes and coefficient of polynomials

1. https://www.youtube.com/watch?v=qEZ0tj8XYSI

https://www.youtube.com/watch?v=hjPuKZLFCV4

https://www.youtube.com/watch?v=fl7wGov66t8

$\Rightarrow x = 1, x = 2$

3. Now, teacher asks to observe that 1 and 2 are the zeroes of polynomial $q(x) = 3x^2 + 9x + 6$ and hence $3x^2 + 9x + 6$ can be expressed as $3(x-1)(x-2)$
   And, teacher correlates and says that, here, $\alpha \; and \; \beta$ are the zeroes of $p(x) = ax^2 + bx + c$, hence
   $ax^2 + bx + c = a(x-\alpha)(x-\beta)$.
4. Teacher asks students, can it help in getting the relations between zeroes and coefficients?
   [Teacher Note: Teacher should ensure that the student expands the right-hand side of the equation above and compares with left hand side and gets the relations]
5. Teacher concludes that,
   If $\alpha \; and \; \beta$ are the zeroes of $p(x) = ax^2 + bx + c$ where $(a \neq 0)$, then

$$Sum\ of\ zeroes = \alpha + \beta = \frac{-b}{a} = \frac{-(coefficient\ of\ x)}{coefficient\ of\ x^2}$$

and

$$Product\ of\ zeroes = \alpha\beta = \frac{c}{a} = \frac{constant\ term}{coefficient\ of\ x^2}.$$

II. ACTIVITY (Pair Work) 15 min

Teacher pairs the students and assigns the verification of relations through computations and observations via following table :

Quadratic	Zeroes $\alpha = ?$ $\beta = ?$	$a = ?$ $b = ?$ $c = ?$	$\alpha + \beta = ?$	$\frac{-b}{a} = ?$	$\alpha + \beta = ?$	$\frac{-b}{a} = ?$
$2x^2 + 5x$						

If Type equation here.

Assignment:

3. Form the quadratic polynomial whose zeroes are -2 and 5.

$x^2 + 2x - 3$						
$x^2 - 4$						
$x^2 + 4x+3$						

Teacher asks the students to observe and verify the relationships.
(Teacher Note: Teacher should ensure that the students do the computations correctly and draws the correct conclusions)
Teacher concludes that,

If α *and* β are the zeroes of $p(x) = ax^2 + bx + c$ where $(a \neq 0)$, then

$$Sum\ of\ zeroes = \alpha + \beta = \frac{-b}{a} = \frac{-(coefficient\ of\ x)}{coefficient\ of\ x^2}$$

and

$$Product\ of\ zeroes = \alpha\beta = \frac{c}{a} = \frac{constant\ term}{coefficient\ of\ x^2}$$

.

Assignment:

4. Find the zeroes of polynomial $p(x) = 2x^2 + 3x - 2$ using formula. And check the relationship between the zero and the coefficients of the polynomial.

Summative assessment plan- only where relevant

6. Form the quadratic polynomial with sum of zeroes as 5 and product of zeroes as -6.
7. Find the zeroes of polynomial $p(x) = x^2 + x - 6$ using formula. And check the relationship between the zero and the coefficients of the polynomial.

Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

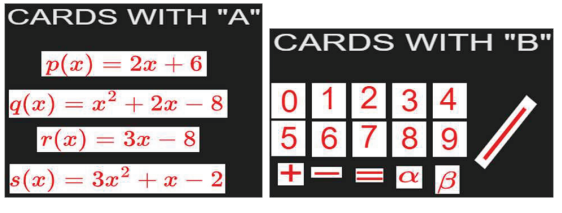
4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Polynomials
Total no. of periods for this chapter:7
Period no :6
Sub Topic: Relationship between Zero and Coefficients of a Cubic Polynomial

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled	**Teacher makes the students recall the relationships between the zeroes and coefficients of Linear and Quadratic polynomials 10min** **ACTIVITY (Play involving 3 students) 10min** Teacher groups students with each group comprising of three students named as "A", "B" and "C". "A" is asked to prepare four cards, and a linear or a quadratic polynomial is written on each card, with coefficients as digits from 0 to 9 only. "B" is asked to prepare small cards, and a digit or "+" or "-" or "=" or "/" or "α" or "β" is written on each card. 		**Paper/ card board, scissor, gum and colour pens**

During the play, "A" is asked to pick one card and show it to "B", in response "B" has to use the cards available to display the relations between the zeroes and coefficients. "C" observes the activity.
(Teacher Note: Teacher is advised to ask the students to prepare the cards at home to save time.)

Teacher reiterates the relationships between the zeroes and coefficients of linear and quadratic polynomials as follows:

Teacher makes the students understand the relationships between the zeroes and coefficients of a cubic polynomial 30 min

III. Teacher deduces the relationship in the following way:

5. Teacher asks the students to consider a cubic polynomial $p(x) = ax^3 + bx^2 + cx + d$, $(a \neq 0)$, whose zeroes are $\alpha , \beta \text{ and } \gamma$.
6. Now, teacher asks the students to find the zeroes of a cubic polynomial, say, $q(x) = 4x^3 - 12x^2 + 8x$ using factoring. [Teacher Note: Teacher should ensure that students recall and produce the steps

$$4x^3 - 12x^2 + 8x = 0$$
$$\Rightarrow 4x(x^2 - 3x + 2) = 0$$
$$\Rightarrow 4x(x-1)(x-2) = 0$$
$$\Rightarrow 4(x-0)(x-1)(x-2) = 0$$
$$\Rightarrow x = 0, x = 1 , x = 2$$

]
7. Now, teacher asks students to observe that 0, 1 and 2 are the zeroes of polynomial $q(x) = 4x^3 - 12x^2 + 8x$ and hence $4x^3 - 12x^2 + 8x$ can be expressed as $4(x-0)(x-1)(x-2)$

Write the relationships between the zeroes and coefficients of linear and quadratic polynomial.

Complete the table:

DO THIS:

If α, β, γ are the zeroes of the given cubic polynomials, find the values as given in the table

S. No	Cubic Polynomial	$\alpha + \beta + \gamma$	$\alpha\beta + \beta\alpha + \gamma\alpha$	$\alpha\beta\gamma$
1	$x^3 + 3x^2 - x - 2$			
2	$4x^3 + 8x^2 - 6x - 2$			
3	$3x^3 + 4x^2 - 5x - 2$			
4	$x^3 + 5x^2 + 4$			

	And, teacher correlates and says that, here, α , β and γ are the zeroes of $p(x) = ax^3 + bx^2 + cx + d$, hence $ax^3 + bx^2 + cx + d = a(x - \alpha)(x - \beta)(x - \gamma)$. 8. Teacher asks students, Can it help in getting the relations between zeroes and coefficients? [Teacher Note: Teacher should ensure that the student expands the right-hand side of the equation above and compares with left hand side and gets the relations] Write relationship between zeroes and coefficients of a cubic polynomial.	Assignment: 1.Verify that $\frac{-1}{2}, -1$ and 2 are the zeroes of the cubic polynomial $p(x) = 2x^3 - x^2 - 5x - 2$, and then verify the relationships between the zeroes and the coefficients.	

Summative assessment plan- only where relevant

8. Verify that $\frac{-1}{3}, -1$ and 3 are the zeroes of the cubic polynomial $p(x) = 3x^3 - 5x^2 - 11x - 3$, and then verify the relationships between the zeroes and the coefficients.

Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Polynomials
Total no. of periods for this chapter:7
Period no :7
Sub Topic: Relationship between Zero and Coefficients of a Cubic Polynomial

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
	CASE STUDY 1: The below picture are few natural examples of parabolic shape which is represented by a quadratic polynomial. A parabolic arch is an arch in the shape of a parabola. In structures, their curve represents an efficient method of load, and so can be found in bridges and in architecture in a variety of forms.    		

1. In the standard form of quadratic polynomial, $ax^2 + bx + c$, a, b and c are

a) All are real numbers.

b) All are rational numbers.

c) 'a' is a non zero real number and b and c are any real numbers.

d) All are integers.

2. If the roots of the quadratic polynomial are equal, where the discriminant D = b^2 – 4ac, then

a) D > 0

b) D < 0

c) D ≥ 0

d) D = 0

3. If $\alpha \; and \; \frac{1}{\alpha}$ are the zeroes of the qudratic polynomial $2x^2 - x + 8k$, then k is

a) 4

b) $\frac{1}{4}$

c) $\frac{-1}{4}$

d) 2

4. The graph of $x^2+1=0$

a) Intersects x-axis at two distinct points.

b) Touches x-axis at a point.

c) Neither touches nor intersects x-axis.

d) Either touches or intersects x- axis.

5. If the sum of the roots is –p and product of the roots is $-\frac{1}{p}$, then the quadratic polynomial is

a) k $(-px^2 + \frac{x}{p} + 1)$

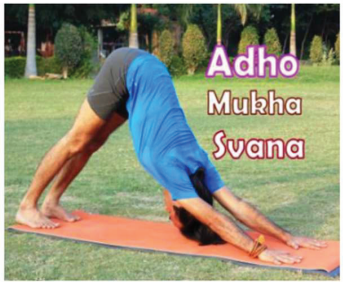
b) k $(px^2 - \frac{x}{p} - 1)$

c) k $(x^2 + px - \frac{1}{p})$

d) k $(x^2 - px + \frac{1}{p})$

CASE STUDY 2:

An asana is a body posture, originally and still a general term for a sitting meditation pose, and later extended in hatha yoga and modern yoga as exercise, to any type of pose or position, adding reclining, standing, inverted, twisting, and balancing poses. In the figure, one can observe that poses can be related to representation of quadratic polynomial



1. The shape of the poses shown is
   a) Spiral
   b) Ellipse
   c) Linear
   d) Parabola

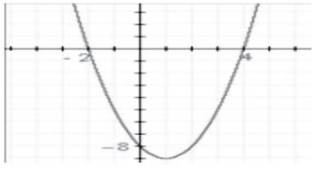
2.The graph of parabola open downwards, if_____

   a) $a \geq 0$
   b) $a = 0$
   c) $a < 0$
   d) $a > 0$

3. The two zeroes in the above shown graph are
   a) 2, 4
   b) -2, 4
   c) -8, 4
   d) 2,-8

4.

In the graph, how many zeroes are there for the polynomial?



a) 0
b) 1
c) 2
d) 3

5. The zeroes of the quadratic polynomial $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ are

a) $\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$
b) $-\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$
c) $\frac{2}{\sqrt{3}}, -\frac{\sqrt{3}}{4}$
d) $-\frac{2}{\sqrt{3}}, -\frac{\sqrt{3}}{4}$

Summative assessment plan- only where relevant.

Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

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5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

WORKSHEET – I

I. MULTIPLE CHOICE QUESTIONS:

1. The zeroes of x^2-2x-8 are:

(a) (2,-4)

(b) (4,-2)

(c) (-2,-2)

(d) (-4,-4)

2. What is the quadratic polynomial whose sum and the product of zeroes is $\sqrt{2}$, $\frac{1}{3}$ respectively?

(a) $3x^2-3\sqrt{2}x+1$

(b) $3x^2+3\sqrt{2}x+1$

(c) $3x^2+3\sqrt{2}x-1$

(d) None of the above

3. If the zeroes of the quadratic polynomial ax^2+bx+c, $c\neq 0$ are equal, then

(a) c and b have opposite signs

(b) c and a have opposite signs

(c) c and b have same signs

(d) c and a have same signs

4. The degree of the polynomial, $x^4 - x^2 + 2$ is

(a) 2 (c) 1

(c) 0 (d) 4

5. If one of the zeroes of cubic polynomial is x^3+ax^2+bx+c is -1, then product of other two zeroes is:

(a) b-a-1

(b) b-a+1

(c) a-b+1

(d) a-b-1

II. OBJECTIVE TYPE QUESTIONS:

1. Write the zeros of the polynomial $x^2 - x - 6$.

2. Write a polynomial whose zeros are $(2+\sqrt{3})$ and $(2 - \sqrt{3})$.

3. If α, β are the zeros of the polynomial, such that $\alpha+\beta=6$ and $\alpha\ \beta=4$, then write the polynomial.

4. If α and $1/\alpha$ are the zeros of the polynomial $4x^2 - 2x + (k - 4)$, find the value of k .

5. Check whether -2 is a zero of the polynomial $9x^3 - 18x^2 - x - 2$.

III. SHORT ANSWER TYPE QUESTIONS:

1. Find the zeroes of the polynomial $2x^2 - 9$ and verify the relationship between zeros and coefficients.

2. Find a quadratic polynomial the sum and product of whose zeros are 3 and -2/5 respectively.

3. If α and β are zeros of $3x^2 + 5x + 13$, then find the value of $1/\alpha + 1/\beta$

4. Check whether x = −3 is a zero of $x^3 + 11x^2 + 23x - 35$.

5. Find p and q if p and q are the zeros of the quadratic polynomial $x^2 + px + q$.

WORKSHEET – II

I. SHORT ANSWER TYPE QUESTIONS :

Q1. Find the zeroes of the following polynomial by factorisation method and verify the relations between the zeroes and their coefficients

i) $7y^2 - \frac{11}{3}y - \frac{2}{3}$

ii) $\sqrt{3}x^2 + 10x + 7\sqrt{3}$

iii) $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$

Q2. If the sum of the zeroes of the polynomial $p(x) = (a + 1)x^2 + (2a + 3)x + (3a + 4)$ is -1, then find the product of the zeroes.

Q3. If (x + a) is a factor of two polynomials $x^2 + px + q$ and $x^2 + mx + n$, then prove that $a = \frac{n-p}{m-p}$

Q4. Can the quadratic polynomial $x^2 + kx + k$ have equal zeroes for some odd integer k > 1?

Q5. If one zero of a polynomial $3x^2 - 8x + 2k + 1$ is seven times the other, find the value of k.

WORKSHEET.III

VERY SHORT ANSWER TYPE QUESTIONS

Q1. If one zero of the quadratic polynomial x^2-5x-6 is 6, then find the other zero.

Q2. If both the zeroes of the quadratic polynomial ax2 + bx + c are equal and opposite in sign, then find the value of 'b'?

Q3. Can x2 – 1 be the quotient on division of x6 + 2x3 + x – 1 by a polynomial in x of degree 5?

Q4. If 1 is a zero of the polynomial p(x) = ax2 - 3(a-1)x - 1, then find the value of 'a' ?

Q5. If on division of a polynomial p(x) by a polynomial g(x) the quotient is zero, what is the relation between degree of p(x) and g(x)?

Q6. If one root of the polynomial p(y) = 5y2 +13y + m is reciprocal of other, then find the value of 'm'?

Q7. If the graph of a polynomial intersects the x – axis at only one point, can it be a quadratic polynomial?

SHORT ANSWER TYPE QUESTIONS

Q8. What number should be added to the polynomial x^2 -5x+4, so that 3 is the zero of the polynomials?

Q9. If α and β are zeros of p(x) = x2 +x-1, then find 1/α+ 1/β?

Q10. If α and β are the zeros of the quadratic polynomial $f(x) = 2x^2 -5x + 7$, find a polynomial whose zeros are 2α+ 3β and 3α+ 2β?

Q11. If one of the zeros of the cubic polynomial x3 + ax2 + bx + c is -1, then what will be the product of the other two zeros?

Q12. If α, β, γ be zeros of the polynomial $6x^3 + 3x^2 -5x+1$, then find the value of α-1 + β -1 + γ -1?

Q136. If α, β are the two zeros of the polynomial f(y) = y2 - 8y +a and $\alpha^2 + \beta^2 = 40$, find the value of 'a'?

3 PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

[Goto https://epathshala.nic.in]

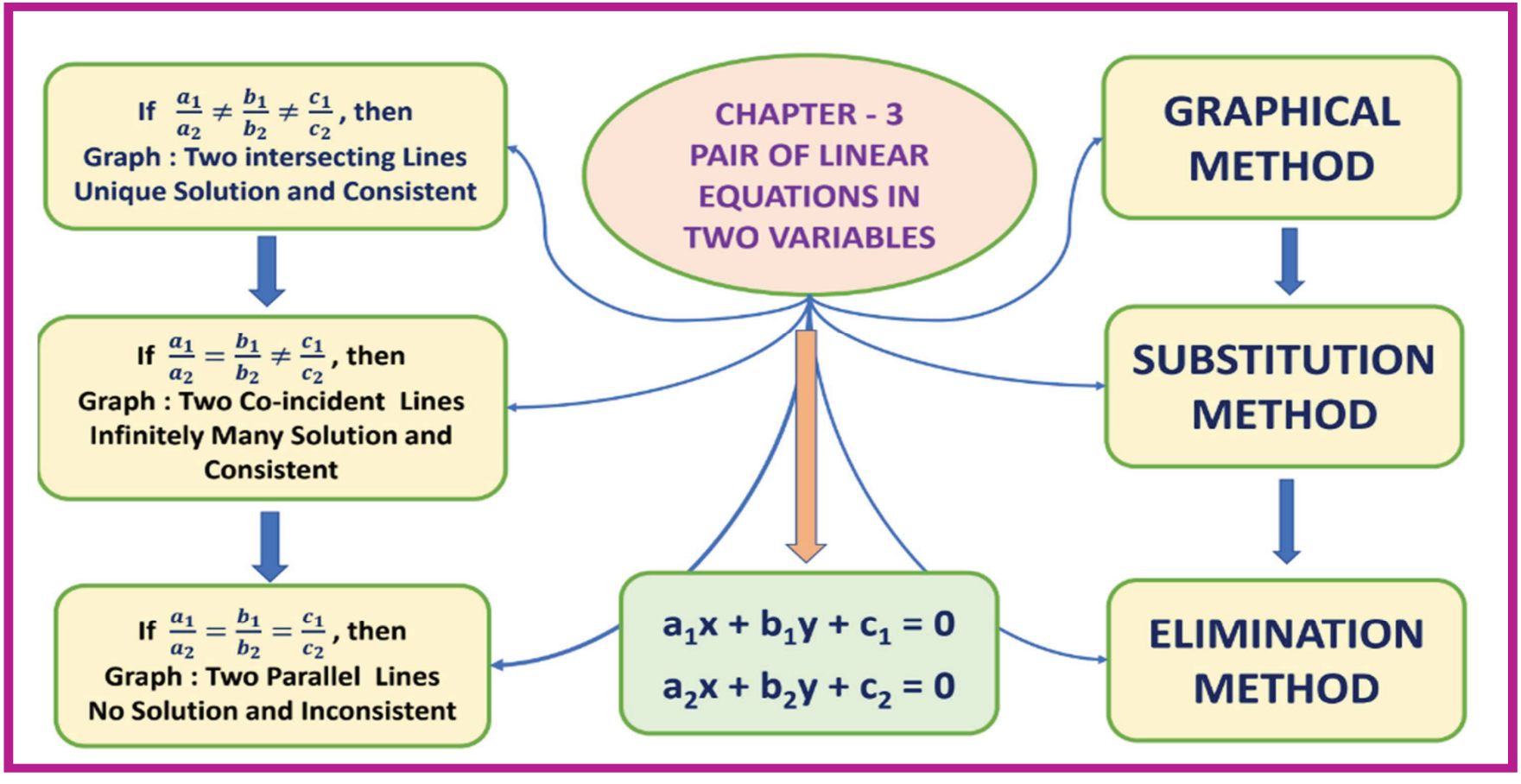
https://epathshala.nic.in/topics.php?ln=en

1062CH03

THE FOLLOWING CURRICULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPTER

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-3: Discovers and proves algebraic identities and the models real- life situations in the form of equations to solve them	C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled
CG-4: Analysis characteristics and properties of two-dimensional geometric shapes and develops mathematical arguments to explain geometric relationships.	C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices
CG-8: Builds skills such as visualization, optimization, representation, and mathematical modelling along with their application in daily Life.	C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions

MIND MAP


If $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, then
Graph : Two intersecting Lines
Unique Solution and Consistent
If $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$, then
Graph : Two Co-incident Lines
Infinitely Many Solution and Consistent
If $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, then
Graph : Two Parallel Lines
No Solution and Inconsistent
CHAPTER - 3
PAIR OF LINEAR EQUATIONS IN TWO VARIABLES
$a_1x + b_1y + c_1 = 0$
$a_2x + b_2y + c_2 = 0$
GRAPHICAL METHOD
SUBSTITUTION METHOD
ELIMINATION METHOD

PERIOD WISE PLAN

Learning outcome: Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods.

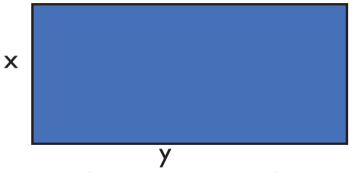
PERIOD NO.	TEACHING TOPIC	LEARNING OUTCOMES/objectives
1	Representation of given situation into pair of Linear equations in 2 variables	Represent given situation into pair of linear equation in 2 variables
2	Graphical Method of Solution of a Pair of Linear Equations	Interpret the concepts of linear equations in order to represent any given situation algebraically and graphically
3	Graphical Method of Solution of a Pair of Linear Equations - continued	Interpret the concepts of linear equations in order to represent any given situation algebraically and graphically
4	Consistent and inconsistent pair of equations	Demonstrate given two linear equations in order to comment on the nature/behaviour of the lines representing the linear equations
5	Graphical Method of Solution of a Pair of Linear Equations (Consistency and inconsistency)	Check the given pair of linear equation are constitent or consistent and find solution (if consistent)
6	Graphical Method of Solution of a Pair of Linear Equations (Real life Problems)	Use the concepts of pair of linear equations in two variables in order to represent any given situation algebraically and find its solution
7	Solving pair of linear equations in two variables by using Substitution method	Find solutions using substitution method
8	Solving pair of linear equations in two variables by using Elimination method	Find solutions using elimination method method
9	Real life and connection type problems	Choose appropriate method and find solutions
10	Case study questions	Understand the given comprehension to find solutions

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no: 01/10
Subtopic: 1. Representation of given situation into pair of Linear equations in 2 variables

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
Competencies: C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing (10min)** 1. Identify linear equation one variable in the following? a) $x^2 + 1 = 0$ $b)$ $\frac{1}{x^2} - 5 = 0$ $c)$ $x + 5 = 0$ 2. Identify a linear equation in two variables in the following $a) x^2 + y + 1 = 0$ $b)$ $x + y + 6 = 0$ $c)$ $x + 5 = 0$	How do you find the value of length and breadth?	GeoGebra graph Graph maker

with given coordinates as vertices C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions **Learning outcome:** Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods Represent given situation into pair of linear equation in 2 variables.	 perimeter of the rectangle 60 units. Express the given situation into linear equation in two variables. 3. Identify the unknowns in each situation. (i) The cost of 1kg potatoes and 2kg tomatoes was ₹30 on a certain day. After two days, the cost of 2kg potatoes and 4kg tomatoes was found to be ₹66. (ii) The coach of a cricket team of M.K.Nagar High School buys 3 bats and 6 balls for ₹1300. Later he buys one more bat and 2 balls for ₹3900. Express the above situation into pair linear equation in 2 variables? **Teacher introduces pair of equations in 2 variables through an activity. 15min** **Activity:** Laxmi bought some types of notebooks and pens. She paid ₹110 for 4 notebooks and 3 pens. She paid ₹80 for 3 notebooks and 2pens. Express the given situation into pair of linear equations in 2 variables. (i) Cost of 4 notebooks + 3 pens = ₹110. (ii) Cost of 3 notebooks + 2 pens = ₹80.	How many equations are formed? Name the type of the equations. (i) Can you guess the values of a notebook and a pen using the equation Cost of 4 notebooks + 3 pens = ₹110. Assignment: Represent the following situation into pair of linear equations in two variables 1.10 students of Class-X took part in a mathematics quiz. If the number of girls is 4 more than the number of boys then, find the number of boys and the number of girls who took part in the quiz.	https://diksha.gov.in/dial/2CXXU3 Introduction

	Step-1 : Represent notebooks by [ ] and pens by [ ]. Siri bought 3 books and 2 pens for ₹80.  Laxmi bought 4 books and 3 pens for ₹110.  Represent above equations in the variables x and y. **[Teacher plays the video and ask the students to observe how a given situation converted into pair of linear equations in two variables] (15 min)** **Activity 2:** 2. Akhila went to a fair in her village. She wanted to enjoy rides on the Giant Wheel and play Hoopla (a game in which you throw a ring on the items kept in a stall, and if the ring covers any object completely, you get it). The number of times she played Hoopla is half the number of rides she had on the Giant Wheel. If each ride costs ₹3, and a game of Hoopla costs ₹4, how would you find out the number of rides she had and how many times she played Hoopla, provided she spent ₹20. Teacher makes the learners into groups and ask them to study the situation and represent pair of equations in 2 variables. Teacher gives some suggestions. If she has one ride, is it possible? Is it possible to have two rides? Continue this process and prepare pair of equations? Teacher makes the learners into pairs ask them to guess the values of the number of rides that Akhila had (x) and the number of times she played Hoopla (y) by using trial and error method.	2. 5 pencils and 7 pens together cost ₹50 whereas 7 pencils and 5 pens together cost ₹46. Find the cost of one pencil and that of one pen. 3. Half the perimeter of a rectangular garden, whose length is 4m more than its width, is 36m. Find the dimensions of the garden.	https://www.youtube.com/watch?v=9QiqHnNIBP8&t=74s Introduction

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

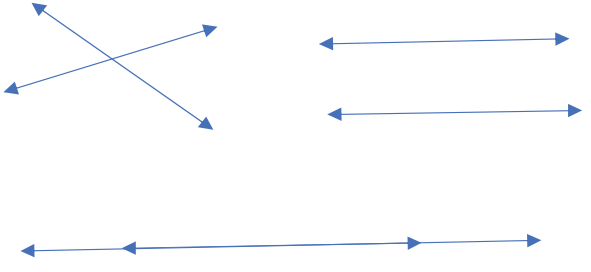
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no: 02/10
Subtopic: 2. Graphical Method of Solution of a Pair of Linear Equation.

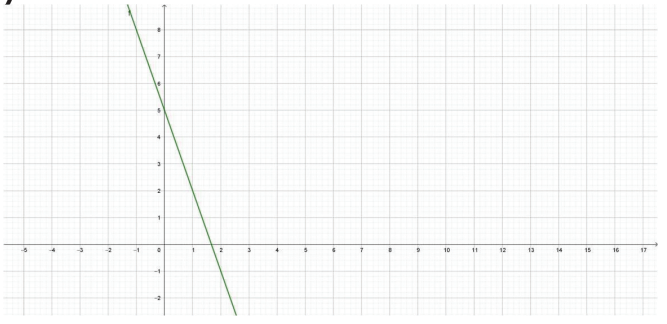
Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing. 15 min** 1. Identify which of the following is a solution of linear equation in one variable 3x+7=13 a) 3 b) 2 c) 4 d) 5 2. How many solutions can we find for a linear equation in one variable? 3. Identify the general form of a linear equation in two variables $a)\ ax+b=0, a\neq 0$ $b)\ ax+by+c=0, a\neq 0$ $c)\ ay+b=0, a\neq 0$ $d)\ ax+by+c=0, a\neq 0, b\neq 0$ 4. Verify x=2 and y=-2 are a solution of the linear equation in 2 variables 5x+3y=4	1.Describe solution of a linear equation in your own words? 2. Find the value of k so that the point (2, k) lies on the line represented by 2x-3y=10	**GeoGebra graph**

C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions **Learning outcome: Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods.** **Objective:** **Interpret the concepts of linear equations in order to represent any given situation algebraically and graphically**	5. Can you find any other solution for the above equation? 6. How many solutions can we find for a linear equation in 2 variables? 7. Draw the graph of the equation y-x=2. Teacher makes the students into groups ask them to find at least 3 solutions. And instructed the students plot the points on suitable graph sheet and join them and present Infront of the class. [Draw the coordinate axes XOX^{l} and YOY^{l}, and plot the points on graph] What is the shape of a graph of every linear equation in two variables? Pick some points on the line and verify whether they are solution to the give linear equation. **Techer introduces Solution of Pair of linear equation in two variables in various methods.** **Graphical Method of Solution of a Pair of Linear Equation 10min** **[Teacher should focus on representations of pair of linear equations in two variables and its constraints]** **Teachers asks the students to draw two lines on a paper in different possible ways and submitted to the teacher.** 	Write general form of pair of linear equations in two variables? Are the lines intersecting to each other at a point?	https://www.youtube.com/watch?v=D5HLkCdpuvI&t=124s **Graphical method of solution of a pair of linear equations in two variables|**

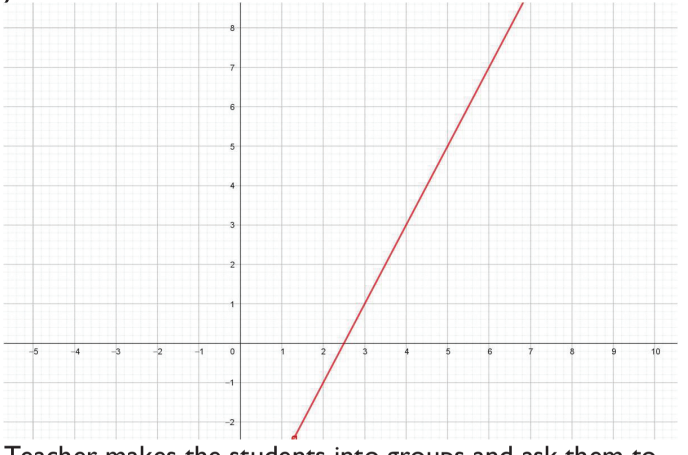
Represent The following pair of linear equations graphically. Find the points where the lines intersect Y-axis.

$3x + y - 5 = 0;\ 2x - y - 5 = 0$ **15min**

y=-3x+5



y= 2x-5

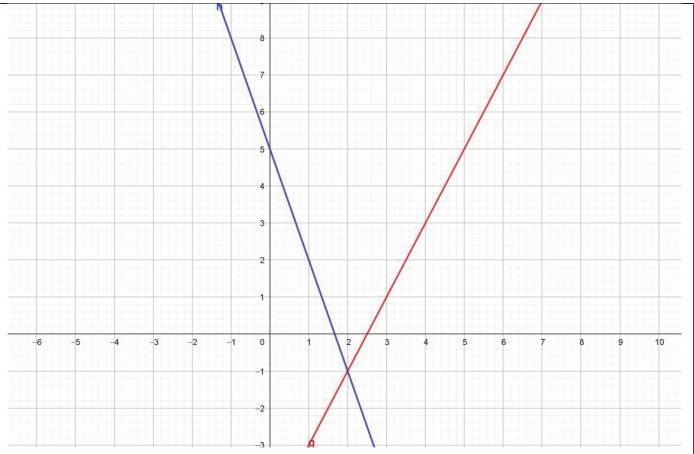


Teacher makes the students into groups and ask them to prepare table for solution of each equation. (at least two solutions)

Now ask the students to plot the points on a graph paper and join them to get a straight line for 1st equation. And ask them same thing to do for 2nd equation on same graph paper.

Observe the graph of line $3x + y - 5 = 0$ and check whether it intersects Y-axis?

Observe the graph of line $2x - y - 5 = 0$ and check whether it intersects Y-axis?

	 What is the intersecting point of these lines? Substituting the coordinates of the point in both the equations write your observation?	Verify (2,-1) are the solution or not the given system of equations?	https://youtu.be/NPzlCNDEJqA How find solution of pair of linear equations in 2 variables?

Summative assessment plan- only where relevant

1. Solve the system of equations x+3y=6 and 2x-3y=12 graphically.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

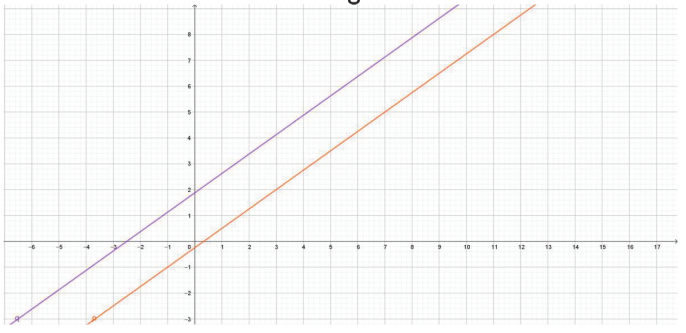
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no: 03/10
Subtopic: 2. Graphical Method of Solution of a Pair of Linear Equations in 2 variables

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
Competencies: C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle	**Teacher makes the students into groups and ask the students to find table for solutions of each linear equation in two variables and draw the graph.** I. $3x - 4y = 1\ and\ 6x - 8y = -15$ **20 min** Step I: Find table for solutions of $y = \frac{3x-1}{4}$ Step II. Find table for solutions of $y = \frac{6x+15}{8}$	Write your observations? Can you find any solution?	**GeoGebra** **Graph maker** **For drawing graphs**

with given coordinates as vertices C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions **Learning Outcome:** Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods. **Objective:** Interpret the concepts of linear equations in order to represent any given situation algebraically and graphically	Now ask the students to plot the points on a graph paper and join them to get a straight line for 1st equation. And ask them same thing to do for 2nd equation on same graph paper. Are these lines are intersecting?  If so, write the solution? 2. Show graphically that system of equations 2x+3y=5 and 6x+9y=15 and write your observations. **20 min** Teacher makes the students into pairs and ask them to find at least two solutions for each equation and instructed draw the graph. How many solutions identify? What type of lines are these? Are the lines being coincident?	What kind of lines are these? Are the number of solutions of these equations' finite?	https://www.youtube.com/watch?v=5kEb6fZnvbk&t=1s&pp=ygU4Z3JhcGhpY2FsIG1ldGhvZCBwYWlyIG9mIGVxdWF0aW9ucyB0aWMgdGFjIGxlYXJuIGVuZ2xpc2g= Graphical method

Summative assessment plan- only where relevant

1.Draw the graphs and verify they are intersecting/parallel/coincident

1. 3x+4y=7; 5x-3y=2
2. x+2y=5; 2x+4y=10
3. x-y=8; 3x-3y=24

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

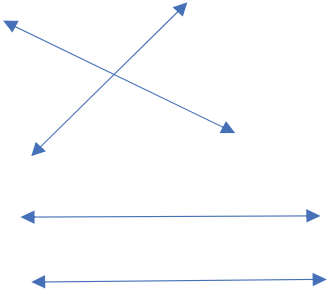
4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no :04/10
Subtopic: 2. Consistent and inconsistent pair of equations in 2 variables

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices C-8.1: Models daily-life phenomena and uses representations such as	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing. 10min** Match the following **Lines** **Relation**  coincident intersecting		**GeoGebra** **Graph maker** **For drawing graphs**

graphs, tables and equations to draw conclusions **Learning Outcome:** Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods **Objective:** **Demonstrate given two linear equations in order to comment on the nature/behaviour of the lines representing the linear equations**	 Parallel **Activity:** **Teacher divided the whole class into three groups and ask them to represent following pair of equations in two variables, present behavior of lines Infront of the class. 15 min** Consider the following three pairs of equations. (i) $x - 2y = 0$ and $3x + 4y - 20 = 0$ (GI) ii) $2x + 3y - 9 = 0$ and $4x + 6y - 18 = 0$ (GII) (ii) $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$ (GIII) Can you express behavior of lines representing a pair of linear equations without representing in graph of pair of linear equation in two variables. Is there any relation between coefficients of both the equations? [Techer Note: Teacher should focus on behavior of lines Condition for consistency.] What do you call a pair of linear equations with no solution? What do you call a pair of linear equations with infinitely many solutions? What do you call a pair of linear equations with unique solution?	What do you notice. I. Which pair of equations represent intersecting lines? II. Which pair of equations represent coincident lines? III. Which pair of equations represent Parallel lines? What does it mean of consistency. Match the following No. of solutions Intersecting lines infinite Parallel lines 1 Coincident lines 0	**Graph sheet board For drawing graphs** https://www.youtube.com/watch?v=BHb-Vs_SANo Biju's video consistent and inconsistent equations

[In pairs discuss about the table and complete it]
15 min

Complete the table

Sl No.	Pair of lines	$\frac{a_1}{a_2}$	$\frac{b_1}{b_2}$	$\frac{c_1}{c_2}$	Compare the ratios	Graphical representation	Algebraic interpretation
1.	$x-2y=0$ $3x+4y-20=0$						
2.	$2x+3y-9=0$ $4x+6y-18=0$						
3.	$x+2y-4=0$ $2x+4y-12=0$						

1. Do the equations 4x + 3y – 1 = 5 and 12x + 9y = 15 represent a pair of coincident lines? Justify your answer.

Teacher makes the students into groups and ask them to compare, write behavior of the lines and present Infront of the class.

https://www.youtube.com/watch?v=fPE6n25_SXw

Summative assessment plan- only where relevant

1. For what value of 'p' the following pair of equations has a unique solution. 2x + py = - 5 and 3x + 3y = - 6 ?

2. Find the value of 'k' for which the pair of equations 2x - ky + 3 = 0, 4x + 6y - 5 =0 represent parallel lines.

3. For what value of 'k', the pair of equation 3x + 4y + 2 = 0 and 9x + 12y + k = 0 represent coincident lines ?

4. For what positive values of 'p' the following pair of liner equations have infinitely many solutions ?

$px + 3y - (p - 3) = 0$ and $?12x + py - p = 0$

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no: 05/10
Subtopic: 2. Graphical Method of Solution of a Pair of Linear Equations (Consistency and inconsistency)

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing) 5min** 1.Which of the following pair of equations have no solution a) 2x+3y=4,3x+2y=8 b) x+2y=4,2x+4y=8 c) 2x+4y=5,6x+12y=15 d) None 2. Write pair of linear equations in 2 variables which represent coincident lines. 3.Describe constituency of pair of equations in your own words.		GEOGEBRA For drawing graphs

with given coordinates as vertices C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions **Learning outcome: Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods.** **Objective:** **Check the given pair of equation are constitent or consistent .and find solution (if consistent)**	**Teacher explains how to verify the graphical representation and algebraic interpretation of pair of linear equations in 2 variables 20min** Check whether the given pair of equations represent intersecting, parallel or coincident lines. Find the solution if the equations are consistent. 2x + y - 5 = 0 3x - 2y - 4 =0 Teacher makes the students in pairs ask them to verify consistency of the given pair of equations. And also ask to the students prepare table for solutions and draw the graph. Identify the intersecting point and verify the answer by verifying whether it satisfies by substituting the values in both equations. 2. Check whether the following pair of equations is consistent. 3x + 4y = 2 and 6x + 8y = 4. Verify by a graphical representation. **15 min** Teacher makes the students in pairs ask them to verify consistency of the given pair of equations. And also ask to the students prepare table for solutions and draw the graph. What do you notice by relation between graphical representation and algebraical interpretation.	What kind of pair of equations are given? Write the solution of the given pair of equations? Write your observations? Check whether the equations 2x-3y = 5 and 4x-6y = 15 are consistent. Also verify by graphical representation	

Summative assessment plan- only where relevant

Check whether the following equations are consistent or inconsistent. Solve them graphically
a) 3x+2y = 8, 2x-3y=1
b) 2x - 3y = 8, 4x-6y=9

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no: 06/10
Subtopic: 2. Graphical Method of Solution of a Pair of Linear Equations (Real life Problems)

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required

C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions **Learning outcome: Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods**. **Objective:** **Use the concepts of pair of linear equations in two variables in order to represent any given**	**Teacher discussed with the students' problems about real life situations. 10 min** 1. In a garden there are some bees and flowers. If one bee sits on each flower then one bee will be left. If two bees sit on each flower, one flower will be left. Find the number of bees and number of flowers. Teacher makes the learners into groups and instructed to Read the given question carefully. And also asked them to prepare pair of linear equations in 2 variables using given data. Ask them to represent given information in graph and solve it graphically. Verify the answer by checking whether it satisfies the conditions of the given problem **By following the same scaffolding solve the following word problems related to real life situations 30 min** 2. A lending library has a fixed charge for first three days and an additional charge for each day thereafter. Bhavya paid Rs. 27 for a book kept for seven days, while Vrinda paid Rs. 21 for a book kept for five days. Find the fixed charge and the charge for each extra day. 3. Father's age is 3 times the sum of ages of his two children. After 5 years his age will be twice the sum of ages of the two children. Find the age of father. 4. From a pair of linear equations in two variables using the following information and solve it graphically. Five years ago, Sagar was twice as old	**1.** From a pair of linear equations in two variables using the following information and solve it graphically. 5 pencils and 7 pens together cost Rs.50 whereas 7 pencils and 5 pens together cost Rs.46. Find the cost of one pencil and that of one pen.	https://www.youtube.com/watch?v=0nmXKJHCoYc SOURCE:: https://www.youtube.com/@KnowledgePlatformPK

situation algebraically and find its solution	as Ramu. Ten years later, Sagar's age will be ten years more than Ramu age. Find their present ages?		

Summative assessment plan- only where relevant

1. From a pair of linear equations in two variables using the following information and solve it graphically.
8 men and 12 boys can finish a piece of work in 10 days while 6 men and 8 boys can finish it in 14 days. Find the time taken by one man alone and that by one boy alone to finish the work.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no:07/10
Subtopic: 3. Solving pair of linear equations in two variables by using Substitution method

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualised problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices C-8.1: Models daily-life phenomena and uses representations such as	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing 10min** 1.Is the graphical method is suitable for non-integer solutions. 2.if y=x+5 express the following equation in terms of x 3. consider the pair of linear equations x + y=5, x-y=5 can you find the values of x and y without using graphs? 4. if x + y=5 express y in terms of x. replace y in x-y=5. Now what do you notice? 5. can you find the value without guessing? [Teacher note: The graphical method is not convenient in all cases where the point representing the solution has no integral co-ordinates. For example, when the solution is of the form ($\sqrt{3}$, 2) , (- 1.75, 3.3), ($\frac{4}{13}, \frac{1}{19}$) etc. There is		https://www.youtube.com/watch?v=MPeKHzJRCmY

graphs, tables and equations to draw conclusions **Learning outcome: Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods** **Objective: Find solutions using substitution method**	every possibility of making mistakes while reading such co-ordinates.] Is there any alternative method of finding the solution? **Teacher introduces the substitution method. Ask the students to read the following rules and ask them to discuss in their groups. 15min** **[Teacher should focus on step-by-step procedure for solving pai of equations in two variables by using substitution method]** 1.Solve the following pair of equations by substitution method: $7x - 15y = 2$ …… (1) $x + 2y = 3$…….. .(2) pick either of the equations and write one variable in terms of the other. Substitute this value in y in the equation (ii) and reduce it into an equation in one variable, i.e., in terms of x, which can be solved. Substitute the value step III in the equation used in Step II to obtain the value of the other variable, i.e., y. Verification: Substituting x = $\frac{49}{29}$,and y =$\frac{19}{29}$, you can verify that both the Equations (1) and (2) are satisfied. **Teacher explains how to solve real life problems by using substitution method. 15min** 1.The age of a father is equal to sum of the ages of his 6 children. After 15 years, twice the age of the father will be the sum of ages of his children. Find the age of the father.	1.Solve $2x + 3y = 11$ and $2x - 4y = -24$ and hence find the value of 'm' for which $y = mx + 3$.	substitution method https://www.youtube.com/watch?v=2abBcEyBYGU substitution method https://www.youtube.com/watch?v=Wf3UCg9Eh8M substitution method

	Teacher makes the students into groups and ask them to read question carefully and also ask them to prepare pair of linear equation in two variables for given information. Follow the above procedure and find the age of father. Verify this answer by checking if it satisfies the conditions of the given problems 2.A person travels 600 km partly by train and partly by car. If he covers 400 km by train and the rest by car, it takes 6 hours 30 minutes. But if he travels 200 km by train and the rest by car, he takes half an hour longer. Find the speed of the car and that of the train. Teacher makes the students into pairs and ask them to read question carefully and also ask them to prepare pair of linear equation in two variables for given information Follow the above procedure and find the age of father.	Write the pair of equations for the given data? What is the age of father? Write the speed of car and speed of train? Verify this answer by checking if it satisfies the conditions of the given problems	

Summative assessment plan- only where relevant

1. A fraction becomes $\frac{4}{5}$ if 1 is added to both numerator and denominator. If, however, 5 is subtracted from both numerator and denominator, the fraction becomes $\frac{1}{2}$. What is the fraction?

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no: 08/10
Subtopic: 4. Solving pair of linear equations in two variables by using Elimination method.

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualised problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing 10min** 1.Consider the equations x + y=5, x-y=5 Find the value of x and y. 2.add both the equations. 3.Write resulting equation? 4.what is the value of x? 5.substitute x=5 in x + y=5 what is the value of y? which procedure did we follow? 6. Now consider the equations 2x+3y=9……..(1) 3x+4y=5……..(2) add the above 2 equations. Using resulting equation do you find any one of the values x or y?	Is this method substitution/graphical method?	https://www.youtube.com/

C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions Learning outcome: Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods Objective: **Find solutions using elimination method method**	subtract the above equations. Using resulting equation do you find any one of the values x or y The method used in solving the example above is called the elimination method, because we eliminate one variable first, to get a linear equation in one variable **Teacher introduces the Elimination method. Ask the students to read the following rules and ask them to discuss in their groups. 15min** 1. Solve the 2x+3y=9……..(1) 3x+4y=5……..(2) Using elimination method. Teacher makes the students into pairs and ask them to multiply both the equations by some suitable non-zero constants to makes the coefficient of the variable to be numerically equal. Multiply Equation (1) by 3 and Equation (2) by 2 to make the coefficients of x equal. Then we get the equations as (3) and (4) [add or subtract the one equation from the other, so that one variable gets eliminated] Subtracting Equation (4) from Equation (3) Find the value of y. Substituting the value of y in (1) and find the value of x? **Teacher explains elimination method by taking different model problems. 15 min** Solve: 148x + 231y= 527……(1) 231x+ 148y= 610 …… (2)	Is Haresh correctly solved a pair of linear equations in two variables and found their only point of intersection as (3, -2). One of the lines was x-y=5.Which of the following could have been the other line? i) 3x-3y=15 ii) 2x-3y=12 iii) 2x-3y=14 1. only I 2. only II 2. only I and III 4. only II and III Write the solution. Verify the both equations by substituting the values of x and y. By which non zero constant by multiplying both the equations to make the coefficients of y equal Solve 3x + 2y = 11 …….. (1) 2x + 3y = 4…… (2) Using elimination method.	watch?v=96Q_WgEi3E0 elimination method https://www.youtube.com/watch?v=2MKf9lqnSdA&t=5s elimination method

	Using elimination method. **[Note: Here the coefficients of x and y in both equations are reasonably large. So first we simplify the equations 1. addition 2. subtraction.]** **Teacher makes the students into pairs and ask the students to observe the given equations.** **And ask them to add and simplify get equation 3.** **And also ask the students to subtract the given equations to get equation 4.** Now follow the previous question instructions and find the value of x and y? Verify the both equations by substituting the values of x and y.	Write the resulting equation after simplifying (1) +(2). Write the resulting equation after simplifying (1)-(2). Solve: 47x + 31y = 63, 31x + 47y = 15. Using appropriate method	

Summative assessment plan- only where relevant

Solve the given pair of linear equations:

$(a - b)x + (a + b)y = a^2 - 2ab - b^2$

$(a + b)(x + y) = a^2 + b^2$

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

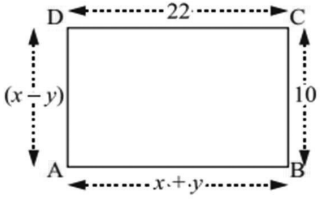
4.How effective were the Materials and resources used in the lesson?

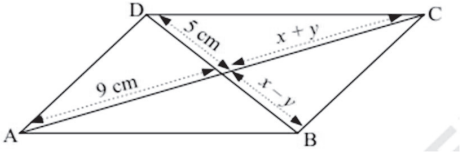
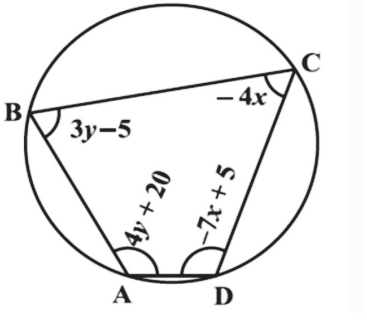
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no: 09/10
Subtopic: Real life and connection type problems

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices	**Teacher takes different type of geometrical figures and real-life situation problems and ask the student to solve. 5x8min = 40min** Under guidance of teacher students are to solve and present in front of the class. Teacher should help the students wherever necessary. 1. In the figure, ABCD is a rectangle. Find the values of x and y.  Using properties of rectangle prepare pair of equations in two variables.	What is the perimeter of the rectangle?	

C-8.1: Models daily-life phenomena and uses representations such as graphs, tables and equations to draw conclusions **Learning outcome:** Finds solutions of pairs of linear equations in two variables using graphical and different algebraic methods. **Objective:** **Choose apprpriate method and find solutions**	Use appropriate method and find the values of x and y. 2. In the figure, ABCD is a parallelogram. Find the values of x and y.  Using properties of parallelogram prepare pair of equations in two variables. Use appropriate method and find the values of x and y. 3. ABCD is a cyclic quadrilateral find the angles of the cyclic quadrilateral  Teacher makes the learners into groups and ask them to explain properties of cyclic quadrilaterals and makes the given situation into pair of equations Real life problems: 4. In a competitive exam, 3 marks are to be awarded for every correct answer and for every wrong answer, 1 mark will be deducted.	In the parallelogram what is the relationship between diagonals? Write the properties of cyclic quadrilateral?	https://www.youtube.com/watch?v=GDEWkML-mdY SOURCE:: https://www.yout

	Madhu scored 40 marks in this exam. Had 4 marks been awarded for each correct answer and 2 marks deducted for each incorrect answer, Madhu would have scored 50 marks. How many questions were there in the test? (Madhu attempted all the questions) Assume that the number of correct answers be x; and the number of wrong answers be y. Teacher asks the students to prepare pair of linear equation in 2 variables using the above given conditions. Instructed the students to choose appropriate method and find the value of x and y. Verify the answer by checking whether it satisfies the conditions of the given problem 5. The auto fare for the first kilometer is fixed and is different from the rate per km for the remaining distance. A man pays Rs. 57 for the distance of 16 km and Rs. 92 for a distance of 26 km. Find the auto fare for the first kilometer and for each successive kilometer. Teacher asks the students choose appropriate method and find the auto fare for the first kilometer and for each successive kilometer. Verify the answer by checking whether it satisfies the conditions of the given problem.	Write the total no of questions attempted? Write the pair of equations linear equation s in two variables by given situation.	ube.com/@Math Army Real life problem

Summative assessment plan- only where relevant

1. The auto fare for the first kilometer is fixed and is different from the rate per km for the remaining distance. A man pays Rs. 57 for the distance of 16 km and Rs. 92 for a distance of 26 km. Find the auto fare for the first kilometer and for each successive kilometer.

2. The sum of the numerator and denominator of a fraction is 4 more than twice the numerator. If the numerator and denominator are increased by 3, they are in the ratio 2: 3. Determine the fraction.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students

Chapter Plan (Unit plan/ lesson plan)

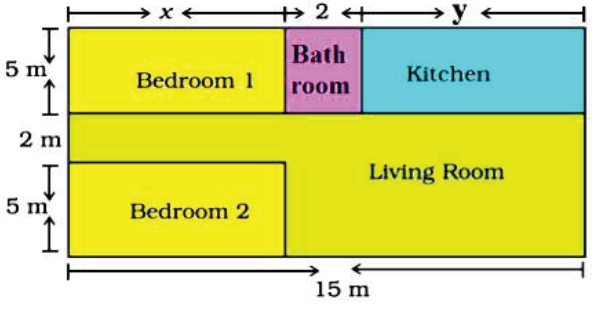
Period plan (40 mins class)

Class: 10th
Chapter: PAIR OF LINEAR EQUATION IN 2 VARIABLES
Total no. of periods for this chapter: 10
Period no: 10/10
Subtopic: Case based questions

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
Study the comprehension and Answer the question	**Teacher discusses some case study questions in groups. 4 x 10min = 40min** 1. The taxi charges in Hyderabad are fixed, along with the charge for the distance covered. For a distance of 10 km., the charge paid is ₹220. For a journey of 15 km. the charge paid is ₹310. i. What are the fixed charges ii. What is the charge per km? iii. How much does a person have to pay for travelling a distance of 25 km? iv. Verify the consistency of the equations. 2. A test consists of 'True' or 'False' questions. One mark is awarded for every correct answer while ¼ mark is deducted for every wrong answer. A student knew answers to some of the questions. Rest of the questions he attempted by guessing. He answered 120 questions and got 90 marks.		

i. If answer to all questions he attempted by guessing were wrong, then how many questions did he answer correctly?
ii. How many questions did he guess?
iii. If answer to all questions he attempted by guessing were wrong and answered 80 correctly, then how many marks he got?
iv. If answer to all questions he attempted by guessing were wrong, then how many questions answered correctly to score 95 marks?

3. Amit is planning to buy a house and the lay out is given below. The design and the measurement has been made such that areas of two bedrooms and kitchen together 95m^2.



(Image taken from google)

i. Based on the above information, answer the following questions.
ii. Form the pair linear equations in two variables from this situation.
iii. Find the length of the outer boundary of the lay out.
iv. Find the area of each bed room kitchen in the layout.
v. Find the area of living room in the lay out.
vi. Find the cost of laying tiles in kitchen at the rate of ₹₹50m^2.

	4. 3.8 men and 12 boys can finish a piece of work in 10 days while 6 men and 8 boys can finish it in 14 days. Find the time taken by one man alone and that by one boy alone to finish the work. Answer the following questions i. Form the pair linear equations in two variables from this situation. ii. Find the time taken by one man can finish the work alone? iii. Find the time taken by one boy can finish the work alone?		

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Period No. 10/10
(WORK SHEET)

Teacher engages the students in solving problems as many as possible and the rest of the problems may be given as assignment.

LEVEL 1

1. Do the following pair of linear equations have no solution? Justify your answer.

(i) $2x + 4y = 3$
$12y + 6x = 6$

(ii) $x = 2y$
$y = 2x$

(iii) $3x + y - 3 = 0$
$2x + \frac{2}{3}y = 2$

2. Do the following equations represent a pair of coincident lines? Justify your answer.

(i) $3x + \frac{1}{7}y = 3$
$7x + 3y = 7$

(ii) $-2x - 3y = 1$
$6y + 4x = -2$

(iii) $\frac{x}{2} + y + \frac{2}{5} = 0$
$4x + 8y + \frac{5}{16} = 0$

3. Are the following pair of linear equations consistent? Justify your answer.

(i) $-3x - 4y = 12$
$4y + 3x = 12$

(ii) $\frac{3}{5}x - y = \frac{1}{2}$
$\frac{1}{5}x - 3y = \frac{1}{6}$

(iii) $2ax + by = a$
$4ax + 2by - 2a = 0;\ a, b \neq 0$

(iv) $x + 3y = 11$
$2(2x + 6y) = 22$

4. For the pair of equations

$\lambda x + 3y = -7$

$2x + 6y = 14$

to have infinitely many solutions, the value of λ should be 1. Is the statement true? Give reasons.

5) For all real values of c, the pair of equations x – 2y = 8 5x – 10y = c have a unique solution. Justify whether it is true or false.

6) The line represented by x = 7 is parallel to the x–axis. Justify whether the statement is true or not

LEVEL 2

1. For which value(s) of λ , do the pair of linear equations $\lambda x + y = \lambda^2$ and x + λy = 1 have
(i) no solution?
(ii) infinitely many solutions?
(iii) a unique solution?

2. For which value(s) of k will the pair of equations kx + 3y = k – 3 12x + ky = k have no solution?

3. For which values of a and b, will the following pair of linear equations have infinitely many solutions?
x + 2y = 1 (a – b) x + (a + b) y = a + b – 2

4. Find the value(s) of p in
(i) to (iv) and p and q in

(v) for the following pair of equations:

(i) 3x – y – 5 = 0 and 6x – 2y – p = 0, if the lines represented by these equations are parallel

(ii) – x + py = 1 and px – y = 1, if the pair of equations has no solution.

(iii) – 3x + 5y = 7 and 2px – 3y = 1, if the lines represented by these equations are intersecting at a unique point.

(iv) 2x + 3y – 5 = 0 and px – 6y – 8 = 0, if the pair of equations has a unique solution.

(v) 2x + 3y = 7 and 2px + py = 28 – qy, if the pair of equations have infinitely many solutions

11. By the graphical method, find whether the following pair of equations are consistent or not. If consistent, solve them.

(i) 3x + y + 4 = 0, 6x – 2y + 4 = 0

(ii) $x - 2y = 6$ $3x - 6y = 0$ (iii) $x + y = 3$ $3x + 3y = 9$

LEVEL 3

12. Draw the graph of the pair of equations $2x + y = 4$ and $2x - y = 4$. Write the vertices of the triangle formed by these lines and the y-axis. Also find the area of this triangle.

13. Write an equation of a line passing through the point representing solution of the pair of linear equations $x+y = 2$ and $2x-y = 1$. How many such lines can we find?

14. If $x+1$ is a factor of $2x^3 + ax^2 + 2bx + 1$, then find the values of a and b given that
$2a-3b = 4$.

15. The angles of a triangle are x, y and 40°. The difference between the two angles x and y is 30°. Find x and y.

16. Two years ago, Salim was thrice as old as his daughter and six years later, he will be four years older than twice her age. How old are they now?

17. The age of the father is twice the sum of the ages of his two children. After 20 years, his age will be equal to the sum of the ages of his children. Find the age of the father.

18. Two numbers are in the ratio 5 : 6. If 8 is subtracted from each of the numbers, the ratio becomes 4 : 5. Find the numbers.

19. There are some students in the two examination halls A and B. To make the number of students equal in each hall, 10 students are sent from A to B. But if 20 students are sent from B to A, the number of students in A becomes double the number of students in B. Find the number of students in the two halls.

20. A shopkeeper gives books on rent for reading. She takes a fixed charge for the first two days, and an additional charge for each day thereafter. Latika paid Rs 22 for a book kept for six days, while Anand paid Rs 16 for the book kept for four days. Find the fixed charges and the charge for each extra day

LEVEL 4

1. Graphically, solve the following pair of equations: $2x + y = 6$ $2x – y + 2 = 0$ Find the ratio of the areas of the two triangles formed by the lines representing these equations with the x-axis and the lines with the y-axis.

2. Determine, graphically, the vertices of the triangle formed by the lines $y = x$, $3y = x$, $x + y = 8$

3. Draw the graphs of the equations $x = 3$, $x = 5$ and $2x – y – 4 = 0$. Also find the area of the quadrilateral formed by the lines and the x–axis.

4. The cost of 4 pens and 4 pencil boxes is Rs 100. Three times the cost of a pen is Rs 15 more than the cost of a pencil box. Form the pair of linear equations for the above situation. Find the cost of a pen and a pencil box.

5. Ankita travels 14 km to her home partly by rickshaw and partly by bus. She takes half an hour if she travels 2 km by rickshaw, and the remaining distance by bus. On the other hand, if she travels 4 km by rickshaw and the remaining distance by bus, she takes 9 minutes longer. Find the speed of the rickshaw and of the bus.

4 QUADRATIC EQUATIONS

1062CH04

[Goto https://epathshala.nic.in]

https://epathshala.nic.in/topics.php?ln=en

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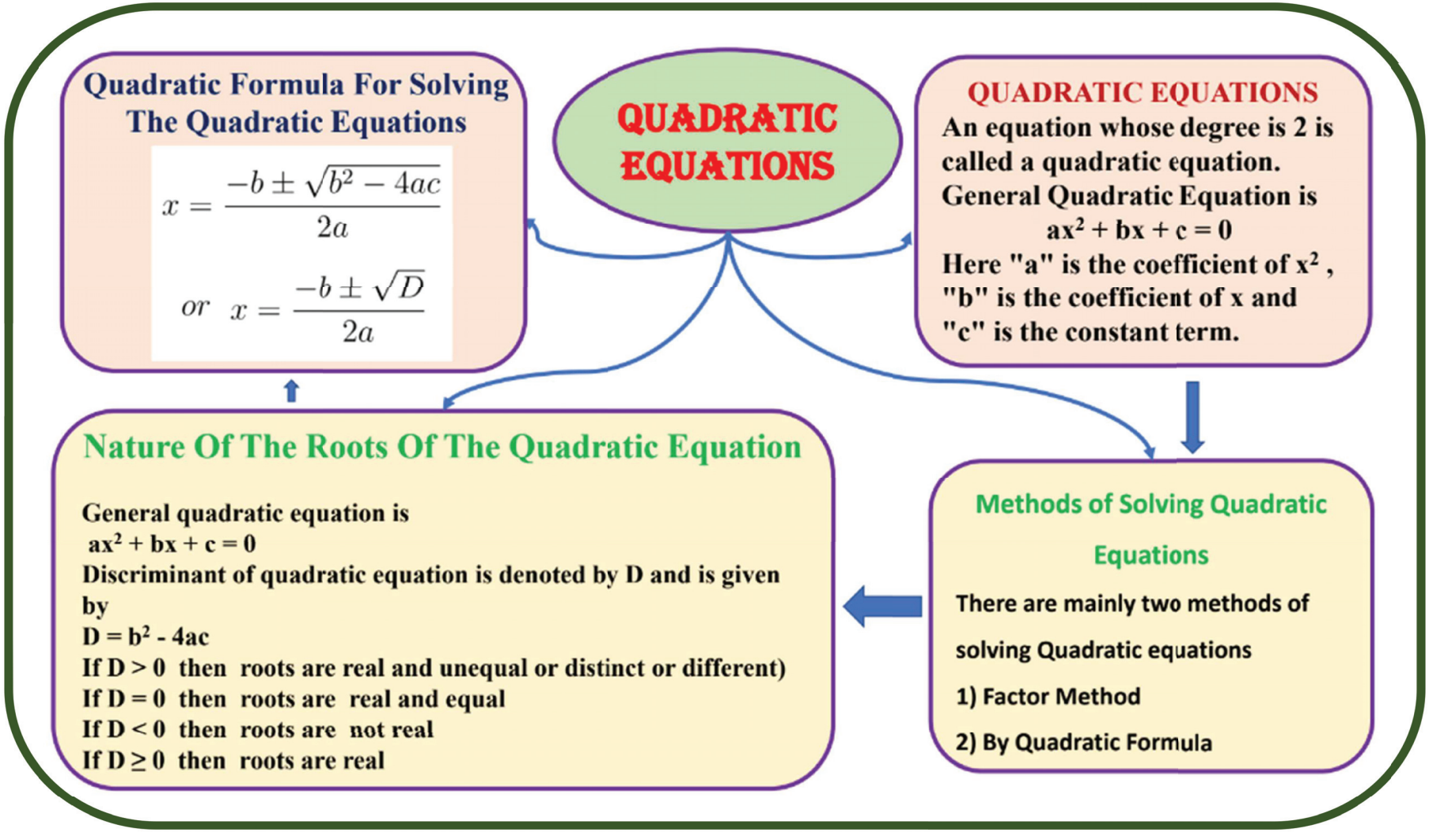
THE FOLLOWING CURRICULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPTER

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-3: Discovers and proves algebraic identities and the models real- life situations in the form of equations to solve them	C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled
CG-10: Knows and appreciates important contributions of mathematicians from India and around the world	C-10.1: Recognizes the important contributions made by mathematicians (Indian and others) in the field of Mathematics (such as evolution of members, geometry, algebra) C-10.2: Recognizes modern contributions to Mathematics made in both India and abroad, and understands the next frontiers and the next major open questions in the field of Mathematics
CG-11: Explores connections of Mathematics with other subjects	C-11.1: Applies mathematical knowledge and tools to analyses problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports

MIND MAP



And also discuss

Situational problems based on quadratic equations related to day-to-day activities

PERIOD WISE PLAN

Learning Outcome: Demonstrates strategies of finding roots and determining the nature of roots of a quadratic equation.

PERIOD NO.	TEACHING TOPIC	LEARNING OUTCOMES/Objectives
1	Introduction Through Real Life Situations	Students able to express the given real-life situation in to quadratic equation.
2	Problems Related to Preparing Quadratic Equations form a Given Situation (Work Sheet 1)	Students able express the given real-life situation in to quadratic equation
3	Standard form of a quadratic equation and verification	Give the examples of real-life situations which leads Quadratic equations (quadratic functions) verify the given equation is quadratic or not.
4	Solutions of quadratic equation by factorization	Learner able to find roots of Quadratic equations
5	Situational problems based on quadratic equations related to day-to-day activities (Work Sheet 2)	solve situational problems based on quadratic equations related to day-to-day activities
6	Derivation of Quadratic formula	Finding roots of quadratic equations using quadratic formula
7	Nature of roots in Q.E.	Find Nature of roots for a quadratic equation
8	Questions based on Discriminant and Nature of roots of a Q.E (work sheet 3)	Finding discriminant and find the nature of roots
9	Case Based questions	The comprehension and problem-solving skills
10	Situational problems based on quadratic equations related to day-to-day activities (work sheet 3)	Apply the concept of quadratic equations In Situational problems based on quadratic equations related to day-to-day activities

Period plan (40 mins class)

Class: 10th

Chapter: Quadratic equations

Total no. of periods for this chapter:10

Period no :1/10

Key concepts: 1. Introduction 2. Definition of Quadratic Equation 3. Solution of a Quadratic Equation by Factorization 4. Nature of roots

Sub Topic: Introduction Through Real Life Situations

CG-3: Discovers and proves algebraic identities and the models real- life situations in the form of equations to solve them

CG-10: Knows and appreciates important contributions of mathematicians from India and around the world

CG-11: Explores connections of Mathematics with other subjects

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled. **C-10.1: Recognizes the important contributions made by mathematicians (Indian and others) in the field of Mathematics (such as evolution of members, geometry, algebra)**	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing) 10 min** 1.Give some examples for polynomials. 2.identify the quadratic polynomial in the following? $x^2 - 5x + \frac{7}{x}, x^3 - 4x^2 + 5{,}4 - x + x^2$ 3.Which of the following is a standard form of quadratic polynomial? $i)\ ax^2 + \frac{b}{x} + c, a \neq 0$ $ii)\ \frac{a}{x^2} + bx\text{^}2 + c, b \neq 0$ iii)$ax^2 + bx + c, a \neq 0$ **Teacher uses real life situations to introduce quadratic equations 20 minutes** Consider the following situation. For instance, suppose a charity trust decides to build a prayer hall having a carpet area of 300 square metres with its length one metre more than twice its breadth. What should be the length and breadth of the hall? **(Teacher should give step by step instructions to prepare above situation in mathematically)** **Students in pairs read the statement and attempt to draw a mathematical model and present.** **F**igure for the above data is drawn based on the discussion with the class. 300sq.meters x 2x+1 **Suppose the breadth of the hall is *x* metres. Then, its length should be _____ metres.**	What is the shape of the hall? What is the relationship between the length and breadth mentioned in the statement? What is the known value in the given situation? What is the degree of the obtained equation?	**Charts related to quadratic equations** https://www.youtube.com/watch?v=PI0tMeGzEBM SOURCE:: https://www.youtube.com/@Bodhaguru **Introduction of Q.E**

C-10.2: Recognizes modern contributions to Mathematics made in both India and abroad, and understands the next frontiers and the next major open questions in the field of Mathematics **C-11.1: Applies mathematical knowledge and tools to analyses problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports** **express the given real-life situation in to quadratic equation.**	**Write the expression from the known situation.** [Teacher guides to equate the area of the hall to 300 square meters. And prepare an equation.] $2x^2 + x - 300 = 0$ **Teachers gets students to work in pair the following quadratic situation** **Rani has a square metal sheet. She removed squares of side 9 *cm*. from each corner of this sheet. Of the remaining sheet, she turned up the sides to form an open box as shown. The capacity of the box is 144 cc. Can we find out the dimensions of the metal sheet?** [Teacher note: Use the above scaffolding to get students to frame the quadratic equation.] Teacher will explain the contribution of different mathematics in solving quadratic equation 10 minutes https://youtu.be/GeTTLbJ3B10?si=C333BiBTlD0PPdM_ (The above link is related history of quadratic formula teacher can use video to explain history and contribution of mathematicians in solving quadratic equations. Teacher could mention about how maths evolved based on the needs of man.)	Name the kind of equation it represents. Assignment: 1. John and Jaivanti together have 45 marbles. Both of them lost 5 marbles each, and the product of the number of marbles they now have is 124. We would like to find out how many marbles they had to start with. Prepare a model and frame quadratic equation using the above situation.	https://www.youtube.com/watch?v=LUaPnlFtnq8 **E CONTENT INTRODUCTION OF Quadratic Equations**

Summative assessment plan- only where relevant

1. Represent the following situations in the form of quadratic equations
   A train travels a distance of 480 km at a uniform speed. If the speed had been 8 km/h less, then it would have taken 3 hours more to cover the same distance. We need to find the speed of the train.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th

Chapter: Quadratic equations

Total no. of periods for this chapter:10

Period no :2/10

Sub Topic: Problems Related to Preparing Quadratic Equations form a Given Situation (Work Sheet)

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and	**Teacher makes the students into small groups and ask them to represent the given real-life situations in the form of quadratic equation and present it Infront of the class. 40min** Represent the following situations mathematically 1.Sports committee of Kaspa Municipal High School wants to construct a Kho-Kho court of dimension 29 m. × 16 m. This is to be a rectangular enclosure of area 558 m^2. They want to leave space of equal width all around the court for the spectators. What would be the width of the space for spectators? Would it be enough?	How do you know the equation framed is quadratic? What is the variable used here? Compare the equation framed to the standard form and tell the values of a, b and c.	

draws conclusions about a situation being modelled. C-11.1: Applies mathematical knowledge and tools to analyse problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports **<u>Learning Out come</u>** **Students able express the given real-life situation in to quadratic equation**	2. The hypotenuse of a right triangle is 25 cm. We know that the difference in lengths of the other two sides is 5 cm. We would like to find out the length of the two sides? 3. The area of a rectangular plot is 528 m^2. The length of the plot (in meters) is one more than twice its breadth. We need to find the length and breadth of the plot. 4. A motor boat heads upstream a distance of 24km on a river whose current is running at 3 km per hour. The trip up and back takes 6 hours. Assuming that the motor boat maintained a constant speed, what was its speed? 5. Two water taps together can fill a tank in $3\frac{9}{8}$ hours. The tap of larger diameter takes 10 hours less than the smaller one to fill the tank separately. Find the time in which each tap can separately fill the tan		

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th **Chapter: Quadratic equations** **Total no. of periods for this chapter:10** **Period no :3/10** **Sub Topic: Standard form of a quadratic equation and verification**			
Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled. C-11.1: Applies mathematical knowledge and tools to	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing) 5 minutes** 1. which of the following is not a quadratic equation. (i) $2x^2+5x-7=0$ (ii) $7x^2-5=0$ (iii) $6x^2=0$ (iv) $2x+3=0$ 2. For the given quadratic equation $x^2 + 5x + 6 = 0$ come up with a situation. Utilitarian values: **Teachers explains how of quadratic equation is applied or seen in real life context.** 20 min **When the rocket is fired upward, then the path of the rocket is mathematically represented as quadratic equation.**		https://diksha.gov.in/dial/2EI94Y SOURCE:: DIKSHA **E CONTENT INTRODUCTION OF Quadratic Equations**

analyse problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports

Learning Out come

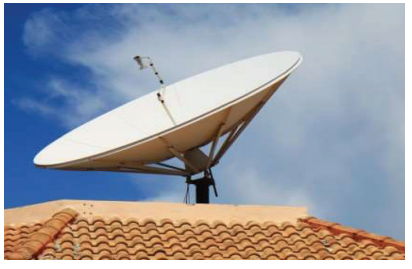
demonstrates strategies of finding roots and determining the nature of roots of a quadratic equation

Learning Outcome:

Give the examples of real-life situations which leads quadratic equations (quadratic functions)

verify the given equation is quadratic or not.

Shapes of the satellite dish, reflecting mirror in a telescope, lens of the eye glasses and orbits of the celestial objects are defined by the quadratic equations



https://youtu.be/dGagFk1Baxk?si=pSrE-EiBqzeQ1-1w
The video is about
Quadratic Equations in Real Life.
Teachers can use the video to tell the importance of utilitarian values.

Teacher makes the students to verify the given equation is quadratic or not 15 minutes
Teacher will make students into groups and ask students to simplify the given equations and verify its degree.
Check whether the following are quadratic equations:
i)$(x-2)^2+1=2x-3$ (ii) $x(x+1)+8=(x+2)(x-2)$
(iii) $x(2x+3)=x^2+1$ (iv) $(x+2)^3=x^3-4$

Given $(x-2)^2+1=2x-3$

1. Simplify the above equation.

1.Collect some real-life situations which represent quadratic functions.

Formative assessment:
Check whether the following equations are quadratic or not?

(i) $x^2-6x-4=0$
(ii) $x^3-6x^2+2x-1=0$
(iii) $7x=2x^2$
iv). $x(x+1)+8=(x+2)(x-2)$
v). $x(2x+3)=x2+1$
vi) $(x+2)^3=x3-4$

Click Here

https://www.youtube.com/watch?v=dGagFk1Baxk

	2. Compare with standard form of a quadratic equation. 3. Conclude. Follow the same steps for remaining questions Remaining problems solve in groups and present Infront of the class [Note: As you can see, often we need to simplify the given equation before deciding whether it is quadratic or not.]		

Summative assessment plan- only where relevant

1. Check whether the following are quadratic equations.

$i)\ (x+1)^2 = 2(x-3)$
$ii)\ x^2 - 2x = (-2)(3-x)$
$iii)\ (x-2)(x+1)$
$iv)\ (x-3)(2x+1) = x(x+5)$
$v)\ (2x-1)(x-3) = (x+5)(x-1)$
$vi)\ x^2 + 3x + 1 = (x-2)^2$
$vii)\ (x+2)^3 = 2x(x^2-1)$
$viii)\ x^3 - 4x^2 - x + 1 = (x-2)^3$

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Quadratic equations
Total no. of periods for this chapter:10
Period no :4/10
Sub Topic: Solutions of quadratic equation by factorization

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled. C-11.1: Applies mathematical knowledge and tools to analyses problems/situations in multiple subjects across Science, Social Science, Visual	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing) 10 minutes** 1.what is the value of x^2-1 at x=1 and -1. 2. is -2 is zero of the polynomial x^2-x-6. 3.What is the zero of the linear polynomial 2x-3? 4.Is zero of the linear polynomial 2x-3 satisfying 2x-3=0 5.What are the zeroes of quadratic polynomial $x^2 - 3x - 4$. 6.Is zeroes of the quadratic polynomial $x^2 - 3x - 4$ are satisfying quadratic equation $x^2 - 3x - 4 = 0$ take x^2-5x+6=0 Value of x | x^2-5x+6 LHS | RHS | IS LHS=RHS	Find the solutions 3x+5=0 $(x+1)^2 = 0$ $x^2 - 9 = 0$ (x+5)(x-9)=0 Ho many zeroes a quadratic polynomial have? What are the roots of the x^2-5x+6=0	https://www.youtube.com/watch?v=0FN-Xl-_8-o

Arts, Music, Vocational Education and Sports

Learning Outcome: Learner able to find roots of Quadratic equations

2	4-10+6=0	0	YES
-2	4+10+6=20	20	N0
3	9-15+6=0	0	YES
-3	9+15+6=30	0	no

For what values of the above equation satisfy?

Teacher explains Factorization method to solve quadratic equation **20 minutes**

(split the middle term.)

Whole class activity

1.Find the roots of the equation $2x^2 - 5x + 3 = 0$

Factorize the quadratic equation into two linear factors.

[Teacher note: If learner not able to recap the previous concepts teacher has to guide the students to make factorize expression.]

(2x-3) (x-1)=0

What is the degree of each of the factor?

What would be the value of x?

Teacher explains,

On equating each of the factor to zero we have

2x – 3 = 0 gives x = 3/2

X – 1 = 0 gives x = 1

In pairs students verify x=3/2 and x=1 are roots of $2x^2 - 5x + 3 = 0$

Now teacher will give some model questions and ask them to solve and verify the roots

1.Find the roots of the $6x^2 - x - 35 = 0$.

2. Verify $\sqrt{3}\ and\ -\sqrt{3}$ are zeroes of x^2-3

Teacher further extends solving of quadratic equation of the form ax + b/x = c

1. **Find the roots of the quadratic equation**

$$x - \frac{1}{3x} = \frac{1}{6}$$

Describe roots of a quadratic equation in your own words?

1.Find for what value of x the equation $x^2 + 3x - 4 = 0$.

2.Find the roots of the following quadratic equation by factorization method.

$\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$

3.Three students were asked how would they verify their solution of a quadratic equation (x-2)(x-5)=0 Shown below are their responses.

Student 1 said "in the first bracket must equal to2, I n the seconds bracket x must equal to 5"
Student 2 S said "in the first bracket must equal to2, in the seconds bracket x can have any real number"

Student 3 said "Both the bracket should always have the same x value so x=2 or 5 in both the brackets"

Whose response is correct

a) Only Student I
b) b) only Student 3
c) Only students I and 2
d) All students 1,2 and 3.

finding roots of a quadratic equation using factorization

https://www.youtube.com/watch?v=LubhDiXrw-Y&t=68s
SOURCE:: https://www.youtube.com/@TicTacLearnEnglish

(problems)

https://www.youtube.com/watch?v=Ji36kzTkFOc&t=54s
SOURCE:: https://www.youtube.com/@TicTacLearnEnglish

(problems)

	Teacher shows how to convert the given $x - \frac{1}{3x} = \frac{1}{6}$ into standard form as $3x^2 - 3x - 6 = 0$. **Students then factorize and find roots of the equation.** **[Teacher note: Take more problems like the above and shows how to convert standard form].** **Teacher makes the students into groups and ask to solve the question by following, the following instructions** **(using factorization of quadratic equation)** 1.Convert the given equation in to standard form. 2.Then find the roots by using factorization method. **[Note: Techer can use the videos to teach finding roots of quadratic equation by factorization method]**	4.Find the roots of following equation x $x - \frac{1}{x} = 3$	SCAN ME https://diksha.gov.in/dial/2ES56L

Summative assessment plan- only where relevant

1.The Sum of two numbers is 15. If the sum of their reciprocals is $\frac{3}{10}$,find the numbers.$\frac{1}{x} + \frac{1}{15-x} = \frac{3}{10}$

2. Find two consecutive integers, sum of whose squares is 365.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Quadratic equations
Total no. of periods for this chapter:10
Period no :5/10
Sub Topic: Situational problems based on quadratic equations related to day-to-day activities (Work Sheet 2)

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled. C-11.1: Applies mathematical knowledge and tools to analyse problems/situations in multiple subjects across Science, Social Science, Visual	**Teacher makes the students into small groups and ask them to solve the following questions using the concept factorization of quadratic equations and ask them to present Infront of the classroom.** **1. The altitude of a right triangle is 7 cm less than its base. If the hypotenuse is 13 cm, find the other two sides.** **Teacher makes the students into groups and ask them to solve the problem by following instructions** 1.draw right triangle. 2.Ask them to prepare a quadratic equation using Pythagoras theorem. 3.Learners are asked to factorize the quadratic equation. 4.Ask them to select suitable root and then verify. Solve the following 2.The speed of a boat in still water is 11 km/hr. It can go	1. Solve $3x^2 - 7x + 2 = 0$ by factorization method 2.The base of a triangle is 4cm longer than its altitude. If the area of the triangle is 48 sq.cm then find its base and altitude. 3.The area of rectangular field is 80 sq.m. If the length of the field is 5m more than the width find the dimension of the field 4. The sum of two numbers is 8 and 15 times the sum of their reciprocals is also 8. Find the numbers.	

Arts, Music, Vocational Education and Sports **Learning Outcome:** **solve situational problems based on quadratic equations related to day-to-day activities**	12 km upstream and return downstream to the original point in 2 hrs. 45 min. Find the speed of the stream Sum of the areas of two squares is 468 m^2. If the difference of their perimeters is 24 m, find the sides of the two squares. 4.The sum of two natural numbers is 8. Determine the numbers, if the sum of their reciprocals is $\frac{8}{15}$ 5.The sum of ages of father and his son is 45 years.5 years ago, the product of their ages was 124.Determine their present ages. 6.Places A and B are 100 km apart on a highway. One car starts from A and another from B at the same time. If the cars travel in the same direction at different speeds, they meet in 5 hours. If they travel towards each other, they meet in 1 hour. What are the speeds of the two cars?		

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

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3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to student

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th

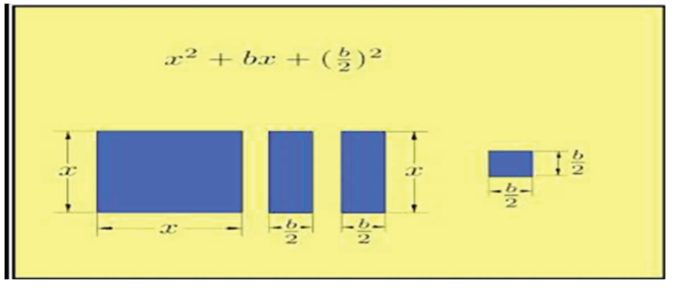
Chapter: Quadratic equations

Total no. of periods for this chapter:10

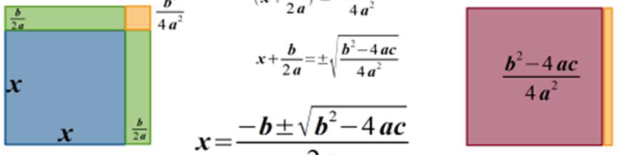
Period no :6/10

Sub Topic: Derivation of Quadratic formula

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled. C-3.3: Learns Brahmagupta's quadratic formula (in both	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing) 10 minutes** 1.Find the roots $x^2 - 5x + 6 = 0$ by factorization method. 2.Find the roots of $x^2 - 20x + 100 = 0$ without factorization. 3. Find the roots of $x^2 - 4 = 0$ 4. Find the roots of $x^2 + 4x - 4 = 0$ **Teacher introduces the topic:** 25min		**Thick card board sheets,** **sketch pens**

symbolic and poetic form) and its derivation, and uses it to solve some of the poetic puzzles of Bhaskara as well as modern- day problem. C-11.1: Applies mathematical knowledge and tools to analyse problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports Learning Outcome: **Finding roots of quadratic equations using quadratic formula**	**[Teacher Note:** **The quadratic equation $x^2 + 4x - 4 = 0$ cannot be solved neither factorization method nor changing it into a complete square.]** **Here we use quadratic formula for solving quadratic equations.** **Whole Class Activity** **Teacher derives the formula with the help of step-by-step logical instructional questions** **<u>Derivation of the formula</u>** $ax^2 + bx + c = 0$ $\Rightarrow ax^2 + bx = -c$ $\Rightarrow x^2 + \frac{b}{a}x = -\frac{c}{a}$ **How this will be represented in geometrically?**  	1.Write the roots of quadratic equation $px^2 + qx + r = 0, p \neq 0$ 2. Find the roots of a quadratic equation $2x^2 - 2\sqrt{2}x + 1 = 0$ using quadratic formula.	https://www.youtube.com/watch?v=jd0wZHsg86E&t=77s SOURCE:: https://www.youtube.com/@TicTacLearnEnglish **Quadratic formula** https://www.youtube.com/watch?v=P3vq2yiTY1s SOURCE:: https://www.youtube.com/@TicTacLearnEnglish (Problems)

$$x^2 + \frac{b}{a}x + \frac{b^2}{4a^2} = \frac{b^2-4ac}{4a^2}$$



(image taken from goggle)

1.Find roots of $x^2 + 4x - 4 = 0$

Group Activity (Teacher make groups and ask students to solve the question using formula by following the given instructions)

Procedure

1.Comping with $ax^2 + bx + c = 0$ then write a, b and c

2. Find $b^2 - 4ac$

3. If $b^2 - 4ac \geq 0$ then use quadratic formula and find roots of the equation.

Problem:

2. If a polygon of 'n' sides has $\frac{1}{2}$n (n–3) diagonals. How many sides will a polygon having 65 diagonals? Is there a polygon with 50 diagonals?

Following the step-by-step instructions students solve the problem in group activity

Equating $\frac{1}{2}$n (n–3) to 65.

Represent the above into quadratic equation.

If n is positive integer

3.The product of the digits of a two-digit positive number is 24. If 18 is added to the number, then the digits of the number are interchanged. Find the number.

Formative assessment:

1.Find the roots of the quadratic equation

$a^2b^2x^2 + b^2x - a^2x - 1 = 0$

2. $solve\frac{1}{x} - \frac{1}{x-2} = 3$

3. Find the roots of the following quadratic equation by the factorization method

$4\sqrt{3}x^2 + 5x - 2\sqrt{3}=0$

4. The length of a rectangular plot is greater than thrice its breadth by 2 m. The area of the plot is 120 sq. m. Find the length and breadth of the plot.

https://www.youtube.com/watch?v=gFb1TQt1YnkSOURCE:: https://www.youtube.com/@TicTacLearnEnglish

(Problems)

https://youtu.be/TF-V5QDY-ZQSOURCE:: https://www.youtube.com/@Mathpapa

derivation of quadratic fomula

	Use quadratic formula find the value of n. Now apply the same rule for 50 diagonals and find number of sides of a polygon		

Summative assessment plan- only where relevant

1.A two-digit number is such that the product of digits is 12. when 36 is added to the number the digits interchange their places find the two-digit number

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

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5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Quadratic equations

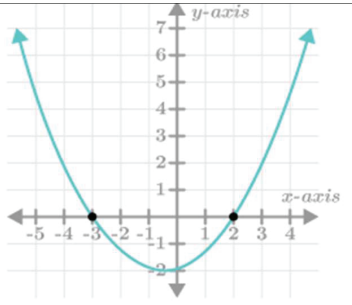
Total no. of periods for this chapter:10
Period no :7/10
Sub Topic: Nature of roots in Q.E.

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled. C-11.1: Applies mathematical knowledge and tools to analyze problems/situations in multiple subjects across	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing) 10 minutes** 1. Find the roots of quadratic equation $x^2 - x - 12 = 0$ 2. Find the roots of quadratic equation $x^2 + 6x + 9 = 0$ 3. Find the roots of quadratic equation $x^2 + 2x + 9 = 0$ 4.Write three quadratic equations one having two distinct real solutions, one having no real solution and one having exactly one real solution. 5. What is the use of finding $b^2 - 4ac\ before$ using quadratic formula. **Nature of roots: 5 min**	The roots of quadratic equation are $x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$ then $b^2 - 4ac$ | Roots real/not real $b^2 - 4ac > 0$ | $b^2 - 4ac = 0$ | $b^2 - 4ac < 0$ |	

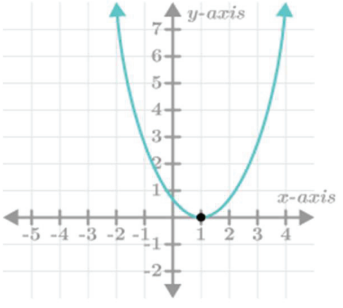
Science, Social Science, Visual Arts, Music, Vocational Education and Sports

Learning Outcome:

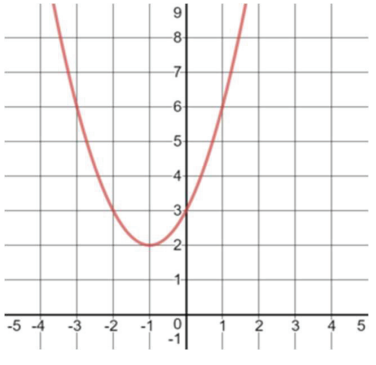
Find Nature of roots for a quadratic equation



1.Identify the roots of the quadratic equation by observing the graph.



2. Identify the roots of the quadratic equation by observing the graph.



Quadratic equation	Nature of roots
$x^2 + 4x - 3 = 0$	
$x^2 + 10x + 25 = 0$	
$x^2 + 4x + 9 = 0$	

Explain the benefits of evaluating the discriminant of a quadratic equation before attempting to solve it. What does its value signifies?

https://www.youtube.com/watch?v=DzwOj72dHG0

SOURCE::

https://www.youtube.com/@TicTacLearnEnglish

Nature of roots

https://www.youtube.com/watch?v=MPLD_6KQIpQ

SOURCE::

https://www.youtube.com/@TicTacLearnEnglish

Nature of roots

3. Identify the roots of the quadratic equation by observing the graph.

4. By observing the above 3 graphs describe about roots In your own words?

Teacher should discuss with the students about nature of roots 10 min

[Techer Note: $b^2 - 4ac$ determines whether the quadratic equation $ax^2 + bx + c = 0$ has real roots or not, $b^2 - 4ac$ is called the discriminant of this quadratic equation]

1. Find the discriminant of the quadratic equation $2x^2 - 4x + 3 = 0$, and hence find the nature of its roots.

Compare with $ax^2 + bx + c = 0, a \neq 0$ and find discriminant
$b^2 - 4ac$.

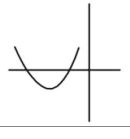
Teacher Note:
The nature of roots
(i) two distinct real roots, if $b^2 - 4ac > 0$,
(ii) two equal real roots, if $b^2 - 4ac = 0$,
(iii) no real roots, if $b^2 - 4ac < 0$.

Graphical representation of nature of roots 15min

Activity

Match the following

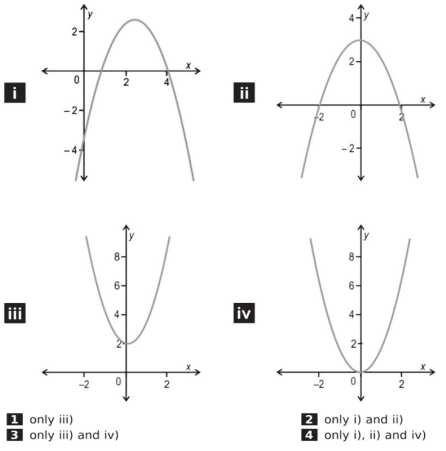
Graphical Representation of Q.E Discriminant ($D = b^2 - 4ac$)



D<0

Q: 2 Aman solved a quadratic equation and found its roots to be real.

Which of these could represent the graph of the equation Aman solved?

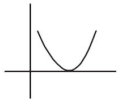


1 only iii)
2 only i) and ii)
3 only iii) and iv)
4 only i), ii) and iv)

Formative assessment:
1.For what value of k the equation $kx^2 - 6x - 2 = 0$ has equal roots?
2. For the quadratic equation $x2 - 2x + 1 = 0$ find the value of $x + \frac{1}{x}$.

https://youtu.be/45DHvXidhnc
SOURCE:: https://www.youtube.com/@trinadhvideoshub9537

Video on Nature of roots



D>0

D=0

(Teacher makes the students into groups ask them to solve the following problems)

1.Find the values of k for the following quadratic equation, so that they have two equal roots. $2x^2 + k x + 3 = 0$
Equating discriminant is zero and find the value of k

2.A pole has to be erected at a point on the boundary of a circular park of diameter 13 meters in such a way that the differences of its distances from two diametrically opposite fixed gates A and B on the boundary is 7 meters. Is it possible to do so? If yes, at what distances from the two gates should the pole be erected?

Teacher should guide the students in drawaing relevant figure to the given problem and encourage the students to apply pythagoras theorem in solving the problem
Using the diagram find the distance between the two gates.
https://youtu.be/Wjw4PqOlp7s
Video relating to the solution of the problem.

Summative assessment plan- only where relevant

1.Is it possible to design a rectangular mango grove whose length is twice its breadth, and the area is 800 m^2? If so, find its length and breadth.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th

Chapter: Quadratic equations

Total no. of periods for this chapter:10
Period no :8/10
Sub Topic: Questions based on Discriminant and Nature of roots of a Q.E (work sheet 3)

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and draws conclusions about a situation being modelled. C-11.1: Applies mathematical knowledge and tools to analyze problems/situations in multiple subjects across Science, Social Science, Visual	**Teacher makes the students into groups and entrust the following question regarding Discriminant and Nature of roots of a quadratic equation to solve them by Discussion with guidance of teacher and ask them to present in the class room.** **1.** Find the values of k for which roots of the equation $x^2 - 8kx + 2k = 0$ are equal. **2.** $kx(x - 2) + 6 = 0$ has equal roots. **3.** Find the Nature of roots of the quadratic equation		https://www.youtube.com/watch?v=IxsWNEuUuAc SOURCE:: https://www.yout

Arts, Music, Vocational Education and Sports Learning Outcome: Finding discriminant and find the nature of roots	$\sqrt{2}x^2 - \frac{3}{\sqrt{2}}x + \frac{1}{\sqrt{2}} = 0$ **4.** For what value of k does $(k - 12)\,x^2 + 2\,(k - 12)\,x + 2 = 0$ have equal roots?		ube.com/@TicTac LearnEnglish problems on nature of roots

Summative assessment plan- only where relevant

1. Is the following situation possible? If so, determine their present ages. The sum of the ages of two friends is 20 years. Four years ago, the product of their ages in years was 48.
2. Is it possible to design a rectangular park of perimeter 80 and area 400 m^2? If so, find its length and breadth.

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Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

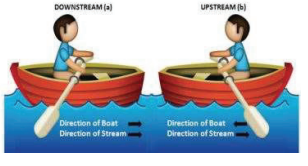
4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th **Chapter: Quadratic equations** **Total no. of periods for this chapter:10** **Period no :9/10** **Sub Topic: Case Based questions**			
Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
Learning outcome: **The comprehension and problem-solving skills**	**Teacher makes the students into groups and discuss comprehensive type questions in the group and encourage to solve case Based questions.** Raj and Ajay are very close friends. Both the families decide to go to Ranikhet by their own cars. Raj's car travels at a speed of x km/h while Ajay's car travels 5 km/h faster than Raj's car. Raj took 4 hours more than Ajay to complete the journey of 400 km. **1. What will be the distance covered by Ajay's car in two hours?** a) 2(x + 5) km b) (x – 5) km c) 2(x + 10) km d) (2x + 5) km	What is the data given in the problem?	

	2. Which of the following quadratic equation describe the speed of Raj's car? a) $x^2 - 5x - 500 = 0$ b) $x^2 + 4x - 400 = 0$ c) $x^2 + 5x - 500 = 0$ d) $x^2 - 4x + 400 = 0$ **3. What is the speed of Raj's car?** a) 20 km/hour b) 15 km/hour c) 25 km/hour d) 10 km/hour **4. How much time took Ajay to travel 400 km?** a) 20 hours b) 40 hours c) 25 hours d) 16 hours 2.The speed of a motor boat is 20 km/hr. For covering the distance of 15 km the boat took 1 hour more for upstream than downstream.   **1. Let speed of the stream be x km/hr. then speed of the motorboat in upstream will be** a) 20 km/hr	Explain the procedure to frame the quadratic equation speed of Raj's car?	

	b) (20 + x) km/hr c) (20 – x) km/hr d) 2 km/hr **2. What is the relation between speed, distance and time?** a) speed = (distance)/time b) distance = (speed)/time c) time = speed x distance d) speed = distance x time **3. Which is the correct quadratic equation for the speed of the current?** a) $x^2 + 30x - 200 = 0$ b) $x^2 + 20x - 400 = 0$ c) $x^2 + 30x - 400 = 0$ d) $x^2 - 20x - 400 = 0$ **Answer:** c) $x^2 + 30x - 400 = 0$ **4. What is the speed of current?** a) 20 km/hour b) 10 km/hour c) 15 km/hour d) 25 km/hour **5. How much time boat took in downstream?** a) 90 minutes		

	b) 15 minutes c) 30 minutes d) 45 minutes		

Summative assessment plan- only where relevant

A quadratic equation can be defined as an equation of degree 2. This means that the highest exponent of the polynomial in it is 2. The standard form of a quadratic equation is $ax^2 + bx + c = 0$, where a, b, and c are real numbers and $a \neq 0$. Every quadratic equation has two roots depending on the nature of its discriminant, $D = b^2 - 4ac$.
Based on the above information, answer the following questions.

(i) Which of the following quadratic equation have no real roots?

(a) $-4x^2 + 7x - 4 = 0$ (b) $-4x^2 + 7x - 2 = 0$
(c) $-2x^2 + 5x - 2 = 0$ (d) $3x^2 + 6x + 2 = 0$

(ii) Which of the following quadratic equation have rational roots?

(a) $x^2 + x - 1 = 0$ (b) $x^2 - 5x + 6 = 0$
(c) $4x^2 - 3x - 2 = 0$ (d) $6x^2 - x + 11 = 0$

(iii) Which of the following quadratic equation have irrational roots?

(a) $3x^2 + 2x + 2 = 0$ (b) $4x^2 - 7x + 3 = 0$
(c) $6x^2 - 3x - 5 = 0$ (d) $2x^2 + 3x - 2 = 0$

(iv) Which of the following quadratic equations have equal roots?

(a) $x^2 - 3x + 4 = 0$ (b) $2x^2 - 2x + 1 = 0$
(c) $5x^2 - 10x + 1 = 0$ (d) $9x^2 + 6x + 1 = 0$

(v) Which of the following quadratic equations has two distinct real roots?

(a) $x^2 + 3x + 1 = 0$ (b) $-x^2 + 3x - 3 = 0$
(c) $4x^2 + 8x + 4 = 0$ (d) $3x^2 + 6x + 4 = 0$

Teachers' reflections and experience

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Quadratic equations
Total no. of periods for this chapter:10
Period no :10/10
Sub Topic: Situational problems based on quadratic equations related to day-to-day activities (work sheet 3)

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
Learning outcome: **Apply the concept of quadratic equations In Situational problems based on quadratic equations related to day-to-day activities** C-3.2: Models and solves contextualized problems using equations (e.g., simultaneous linear equations in two variables or single polynomial equations) and	**Teacher makes the students into groups and entrust concept Based quests/interdisciplinary questions and ask them to solve and present Infront of the class. Teacher should help the students attend students whenever they ask for help. 40 min** 1.In a class test, the sum of Kamal's marks in Maths and English is 40. Had he got 3 marks more in Maths and 4 marks less in English, the product of their marks would have been 360. Find his marks in two subjects. 2.Two pipes can together fill a tank in $3\frac{1}{3}$ minutes. If one pipe takes 3 minutes more than the other to fill it, find the time in which each pipe can fill the tank. 3.A peacock is sitting on the top of a pillar which is 9 m high. From a point 27 m away from the bottom of the pillar, a snake is coming to its hole at the base of the pillar. Seeing the snake, the peacock pounces on it. If their speeds are equal, at what distance from the hole is the snake caught?		

draws conclusions about a situation being modelled. C-11.1: Applies mathematical knowledge and tools to analyses problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports	4.A train travels at a uniform speed for a distance of 63 km and then travels a distance of 72 km at an average speed of 6 km/h more than its original speed. If it takes 3 hours to complete the total journey, what is the original speed of the train? 5.By increasing the speed of a bus by 10 km/hr, it takes one and half hours less to cover a journey of 450 km. Find the original speed of the bus.		

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

CLASS-X
MATHEMATICS WORKSHEET 4
CHAPTER-4: QUADRATIC EQUATIONS

VERY SHORT ANSWER TYPE QUESTIONS

Q1. Show that $x = -3$ is the solution of the equation $x^2 + 6x + 9 = 0$.

Q2. For what value of k are the roots of quadratic equation $3x^2 + 2kx + 27 = 0$ real and equal?

Q3. Write the nature of roots of quadratic equation $4x^2 + 4\sqrt{3}x + 3 = 0$.

Q4. If a and b are the roots of the equation $x^2 + ax - b = 0$, then find a and b.

Q5. If $x = 3$ is one root of the quadratic equation $x^2 - 2kx - 6 = 0$, then find the value of k. (CBSE 2018)

Q6. Which of the following are quadratic equations

a) $x^3 - x = x^2 + 2$

b) $\sqrt{x} + 4 = x + 1$

c) $(x + 1)(x^2 - 2) = (x + 3)^3$

WORKSHEET:5

SHORT ANSWER TYPE QUESTIONS

Q7. Solve for x:

a) $x^2 - 2(a^2 + b^2)x + (a^2 - b^2)^2 = 0$

b) $2x^2 + ax - a^2 = 0$

c) $p^2x^2 + (p^2 - q^2)x - q^2 = 0$

d) $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$

e) $(a+b)^2x^2 + 8(a^2 - b^2)x + 16(a - b)^2 = 0$

f) $1/(a + b + x) = 1/a + 1/b + 1/x$, $a \neq 0$, $b \neq 0$, $x \neq 0$.

Q8. If $ad \neq bc$, then prove that the equation $(a^2 + b^2)x^2 + 2(ac + bd)x + (c^2 + d^2) = 0$ has no real roots.

Q9. If $\sin\theta$ and $\cos\theta$ are roots of the equation $ax^2 + bx + c = 0$, prove that $a^2 - b^2 + 2ac = 0$.

Q10. If one root of the equation $3x^2 - kx - 2 = 0$ is 2, find the value of k. Also find the other root.

Q11. If -5 is a root of the quadratic equation $2x^2 + px - 15 = 0$ and the quadratic equation $p(x^2 + x) + k = 0$ has equal roots, find the value of k.

Q12. Find the value of k for which the roots of the quadratic equation $(k - 4)x^2 + 2(k - 4)x + 2 = 0$ are equal.

Q13. Find the value of k for which the equation $x^2 + kx + 64 = 0$ has real roots.

Q14. If the roots of the equation $(b - c)x^2 + (c - a)x + (a - b) = 0$ are equal then prove that $2b = a + c$.

Q15. If the roots of the equation $(c^2 - ab)x^2 - 2(a^2 - bc)x + b^2 - ac = 0$ are equal, then prove that either $a = 0$ or $a^3 + b^3 + c^3 = 3abc$.

Q16. If the roots of the equation $(1 + m^2)x^2 + 2mcx + (c^2 - a^2) = 0$ are equal, then prove that $c^2 = a^2(1 + m^2)$.

WORKSHHET :: 6

LONG ANSWER TYPE QUESTIONS

Q17. A train travels at a certain average speed for a distance of 63km and then travels at a distance of 72km at an average speed of 6km/hr more than its original speed. If it takes 3 hours to complete total journey, what is the original average speed? (CBSE 2018)

Q18. An aeroplane left 30 minutes later than its scheduled time and in order to reach its destination 1500km away in time, it has to increase its speed by 250 km/hr from its usual speed, determine its usual speed. (CBSE 2018)

Q19. Two water taps together can fill a tank in 1⅞ hours. The tap with longer diameter takes 2 hours less than the tap with smaller one to fill the tank separately. Find the time in which each tap can fill the tank separately. (CBSE 2019)

Q20. A takes 6 days less than the time taken by B to finish a piece of work. If both A and B together can finish the work in 4 days, find the time taken by B to finish the work.

Q21. (a) $(x+1)/(x-1) + (x-2)/(x+2) = 3,\ x \neq 1, -2$

(b) $(3x-4)/7 + 7/(3x-4) = 5/2,\ x \neq 4/3$

5 ARITHMETIC PROGRESSIONS

1062CH05

[Gotohttps://epathshala.nic.in]

https://epathshala.nic.in/topics.php?ln=en

THE FOLLOWING CURRICULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPT

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-2: Builds deductive and inductive logic to prove theorems related to numbers and their relationships	
CG-3: Discovers and proves algebraic identities and the models real- life situations in the form of equations to solve them	C-3.2: Models and solves contextualized problems using equations and draws conclusions
CG-9: Develops computational thinking, i.e., deals with complex problems and is able to break them down into a series of simple problems that can then be solved by suitable procedures/algorithms	C-9.1: Decomposes a problem into subproblems C-9.2: Describes and analyses a sequence of instructions being followed C-9.3: Analysis similarities and differences among problems to make one solution or procedure work for multiple problems C-9.4: Engages in algorithmic problem solving to design such solutions.
CG-11: Explores connections of Mathematics with other subjects	C-11.1: Applies mathematical knowledge and tools to analyse problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sport

MIND MAP

CHAPTER 5 ARITHMETIC PROGRESSION

SEQUENCE: An arrangement of numbers in a definite order according to some rule is called a sequence.
The terms of the sequence are denoted by $t_1, t_2, t_3, t_4, \ldots\ldots\ldots$ or $a_1, a_2, a_3, a_4, \ldots\ldots\ldots\ldots\ldots$

SERIES: If the terms of a sequence are connected by plus (or minus) sign, is called a series.
Example: $2 + 4 + 6 + 10 + \ldots\ldots\ldots$

PROGRESSION: A sequence following some definite rule is called a progression.
ARITHMETIC PROGRESSION: A sequence is called arithmetic progression if the difference of a term and its previous term is always same.

General Arithmetic Progression:-

$a, a + d, a + 2d, a + 3d, \ldots\ldots\ldots, a + (n - 1)d$

n^{th} term of sequence is : $t_n = a + (n-1)d$

TYPES OF ARITHMETIC PROGRESSION

Finite Arithmetic Progression : When number of terms of an AP sequence are countable then AP is called Finite AP, otherwise it is called infinite sequence

Sum of the first n terms of AP is

$$S_n = \frac{n}{2}[2a + (n-1)d] \text{ or } S_n = \frac{n}{2}[a + l]$$

Sum of n terms from the end of the sequence

$$S_n = \frac{n}{2}[2l - (n-1)d]$$

PERIOD WISE PLAN

PERIOD NO.	TEACHING TOPIC	LEARNING OUTCOMES
1	Introduction Through Real Life Situations (observing different kind of patterns)	Produce pattern inorder to observe that succeeding terms are obtained by adding a fixed number to preceeding term.
2	Introduction Through Real Life Situations (observing different kind of patterns)	Produce pattern iinorder to observe that succeeding terms are obtained by adding a fixed number to preceeding term.
3	Identifying A.P in a given pattern by verification	Distinguish between finite and infinite AP in order to determine the nature and write the last term of the given AP
4	n^{th} Term of an AP	Calculate nth term of a given AP in order to find its terms and their nature.
5	problems based on n^{th} term of AP	Calculate the nth term of a given APin order to solve for a real life word problem.
6	More applicative (related to real life situations) problems on nth term of AP	Calculate the nth term of a given APin order to solve for a real life word problem.
7	Sum of first n terms of AP	Calculate the sum of a given AP in order to solve for various question
8	Application problems on S_n	Calculate the last term of a given AP in order to find the solution ofr a real life word problem
9	Activity to reinforce the formula Sn	Develops strategies in order to apply the concept of AP to daily life situations.
10	Case based questions	Use appropriate formula to calculate the last term of a given AP

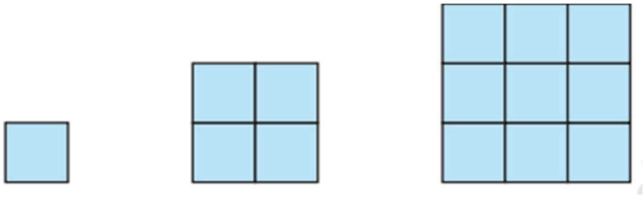
Chapter Plan (Unit plan/ lesson plan)

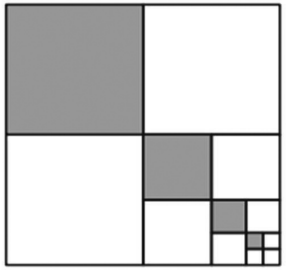
Period plan (40 mins class)

Class: 10th
Chapter: Arithmetic Progressions
Total no. of periods for this chapter:10
Period no :1/10
Sub Topic: Introduction Through Real Life Situations (observing different kind of patterns)

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations and draws conclusions C-11.1: Applies mathematical knowledge and tools to analyze problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports	**Teacher encourages the students to do the following activities to find different patterns. Teacher makes the students into groups and ask them to do the following activity and note down the outcomes (Numbers) and recognize the pattern** Activity1: (5 minutes) Arranging cup house.  Get the students to look at the arrangement and ask the following questions		https://diksha.gov.in/dial/2FTND7

Produce pattern iinorder to observe that succeeding terms are obtained by adding a fixed number to preceeding term.	Starting from top to bottom 1) What is the number of cups in the top row? 2) What is the number of cups in the 2nd row? 3) What is the number of cups in the 3rd row? 4) What pattern do you observe in this tower? **Activity-2**: Suppose you were given 100 tea cups to display. How would you arrange them? Students present their model. (5 min.) (Teacher Note:] Teacher asks the learners to the following activity individually and note down their observations. **Activity-3:** **(5 min.)** Reena applied for a job and got selected. She has been offered a job with a starting monthly salary of ₹ 8000, with an annual increment of ₹ 500 in her salary. Her salary (in `) for the 1st, 2nd, 3rd, . . . years will be, respectively 8000, 8500, 9000, ... Observe the above situation and write Reena's salary for the next 5 years. **Activity-4** **(5 min.)** 	Observe the pattern seen in each of the display presented.	e content SCERT introduction

	The lengths of the rungs of a ladder decrease uniformly by 2 cm from bottom to top. The bottom rung is 45 cm in length. The lengths (in cm) of the 1st, 2nd, 3rd, . . ., 8th rung from the bottom to the top. Write length of the rungs from bottom to top. **Activity-5** (5 min.) Shakila puts ` 100 into her daughter's money box when she was one year old and increased the amount by ` 50 every year. The amounts of money (in `) in the box on the 1st, 2nd, 3rd, 4th, . . . birthday was 100, 150, 200, 250, . . ., respectively. What pattern do you observe in this situation? Tell me the amount deposited when she was 8 years old. **Activity-6** (5 min.) In a savings scheme, the amount becomes $\frac{5}{4}$ times of itself after every 3 years. The maturity amount (in `) of an investment of ` ₹ 8000 after 3, 6, 9 and 12 years will be, respectively: 10000, 12500, 15625, 19531.25 What pattern do you observe in this situation? Activity-7 (5 min)  The number of unit squares in squares with side 1, 2, 3, . . . units are, respectively 1, 4, 9, ……. What pattern do you observe in this situation? Is this pattern the same as the previous one? **Activity-8** **(10 min)** Hema put Rs. 1000 into her daughter's money box when she was one year old and increased the amount by Rs. 500 every year. The amount of money (in Rs.) in the box on	**Teacher asks the learners to write their observation on a piece of paper and submit it to the teacher.**	

	her 1st, 2nd, 3rd, 4th ..... birthday would be. 1000, 1500, 2000, 2500, ... respectively.  The fraction of first, second, third .... shaded regions of the squares in the following figure will be respectively. $\frac{1}{4}, \frac{1}{16}, \frac{1}{64}, \frac{1}{256}$ .... Write your observations from the above activities. In the above all activities is it possible to find that the succeeding terms are obtained by adding a fixed number. **Teacher Note**: In this chapter, we shall discuss some of these patterns in which succeeding terms are obtained by adding a fixed number to the preceding terms. What do you call such patterns?	Formative assessment: 1.Collect different patterns at your Sourroundings. 2.Does Roll numbers of your class follows any Pattern.	

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Arithmetic Progressions
Total no. of periods for this chapter:10
Period no :2

Sub Topic: Introduction Through Real Life Situations (observing different kind of patterns)

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations and draws conclusions C-9.1: Decomposes a problem into subproblems C-9.2: Describes and analyses a sequence of instructions being followed	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing)** (10 min.) Consider the following lists of numbers I. 1, 2, 3, 4, . . . II 100, 70, 40, 10, . . . III – 3, –2, –1, 0, . . . IV 3, 3, 3, 3, . . . V. –1.0, –1.5, –2.0, –2.5, . . . VI. Identify 1st and 3rd terms in the above each of the lists. can you write the next term in each of the lists above?		

C-9.3: Analysis similarities and differences among problems to make one solution or procedure work for multiple problems C-9.4: Engages in algorithmic problem solving to design such solutions. C-11.1: Applies mathematical knowledge and tools to analyze problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports	If so, how will you write it? In the above lists how do we get successive terms? Write three more successive terms. **Teacher introduces the Arithmetic progression (Teacher gives more focus on definition and terms in Arithmetic Progression) (5 min.)** 1.How do we say the fixed number? And how do we represent it? 2. Write Nature of common difference? 3.If we denote the first term of an AP by a_1, second term by a_2, . . ., n^{th} term by a_n and the common difference by d. Then the AP becomes a_1, a_2, a_3, . . ., a_n. Then How can we find common difference d. **Find common difference of an AP 5,7,9,11,13,15…...** **Teacher takes real life examples to explain AP. (25 min.)** 1. If the heights (in cm) of some students of a school standing in a queue in the morning assembly are 147, 148, 149, . . ., 157 then find first term and common difference. 2. The minimum temperatures (in degree Celsius) recorded for a week in the month of January in a city, arranged in ascending order are – 3.1, – 3.0, – 2.9, – 2.8, – 2.7, – 2.6, – 2.5 Write next three terms in the above A.P?	Find common differences in each of AP 1.2,5,7,9,11 2.3.9.15. 21.. 3.-7, -9, -11, -13…. 1.Which of these are Arithmetic Progressions and why? (a) 2, 3, 5, 7, 8, 10, 15, ... (b) 2, 5, 7, 10, 12, 15, ... (c) -1, -3, -5, -7, ... (ii) Write 3 more Arithmetic Progressions. Formative Assessment 1. Is set of even natural numbers forms an A.P? 2.If first term of an A.P is x and common difference is y Then write list of terms in A. P 3.Why does 2,5,8,11,15 forms an A.P. 4. Does list of prime numbers forms an A.P	https://diksha.gov.in/dial/2G3JEU introduction of A.P e content https://www.youtube.com/watch?v=Zpbn2ZjL9-w Real life examples of AP from Enjoy Math

Produce pattern iinorder to observe that succeeding terms are obtained by adding a fixed number to preceeding term.	3. Make a positive Arithmetic progression in which the Common difference is a small positive quantity. 4. Make an AP in which the common difference is big(large)positive quantity. 5. Make an AP in which the common difference is negative. 6. If first term of AP is a and common difference is d Then Write list of terms in A.P 7. Write the general form of A.P?	5. The total savings (in ₹) after every month for 10 months when ₹ 50 are saved each month are 50, 100, 150, 200, 250, 300, 350, 400, 450, 500. Write first term and common difference.	

Summative assessment plan-only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

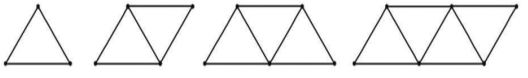
4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Arithmetic Progressions
Total no. of periods for this chapter:10
Period no :3
Sub Topic: Identifying A.P in a given pattern by verification

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations and draws conclusions C-9.1: Decomposes a problem into subproblems C-9.2: Describes and analyses a sequence of instructions being followed C-9.3: Analysis similarities and differences among problems to make one solution or procedure work for multiple problems	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing)** (10 min.) **ACTIVITY:** Make the following figures with match sticks  i) Write down the number of match sticks required for each figure. (ii) Can you find a common difference in members of the list? (iii) Does the list of these numbers form an AP? **The following situations, does the list of numbers involved make an arithmetic progression, and why? (10 min.)**		**Match sticks**

C-9.4: Engages in algorithmic problem solving to design such solutions.

C-11.1: Applies mathematical knowledge and tools to analyse problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports

Distinguish between finite and infinite AP in order to determine the nature and write the last term of the given AP

1.The taxi fare after each km when the fare is ₹20 for the first km and rises by 8 for each additional km.

2. The cost of digging a well, after every meter of digging, when it costs 150 for the first meter and rises by ₹50 for each subsequent meter.

Teacher Note:
Teacher asks to the students identify finite A.P and infinite A.P (5 min.)

A. P	Mention Finite/infinite
Multiple 5 less than 100	
Set of natural numbers	
1,1,1,1,1……	

Do this Activity (15 min.)
Teacher make the students into groups and instructed to do the following step by step activity.

1.Take any Arithmetic Progression.

2. Add a fixed number to each and every term of AP. Write the resulting numbers as a list.

3. Similarly subtract a fixed number from each and every term of AP. Write the resulting numbers as a list.

4. Multiply and divide each term of AP by a fixed number and write the resulting numbers as a list.

5. Check whether the resulting lists are AP in each case.

Write three examples for finite AP and three for infinite AP?

If a fixed number is added/subtracted/multiplied/divided to each term in a given A.P, is the resulting pattern forms A.P? Justify your Answer?

Which of the following forms an AP? If they form AP then write next two terms

1. 1, – 1, – 3, – 5, . . .

2. – 2, 2, – 2, 2, – 2, . . .

3.1, 1, 1, 2, 2, 2, 3, 3, 3, . . .

(iv) x, 2x, 3x, 4x .....

	6. What is your conclusion? Example: Verify the given list of terms forms an A.P or not? 4, 10, 16, 22, . . . Find $a_2 - a_1$, $a_3 - a_2$, $a_4 - a_3$ $a_2 - a_1 = 10 - 4 = 6$ $a_3 - a_2 = 16 - 10 = 6$ $a_4 - a_3 = 22 - 16 = 6$ is $a_{k+1} - a_k$ is same every time? Are the given list of terms are form A.P. What is common difference? Write next two terms?	**Formative assessment:** In the situation, does the list of numbers involved make an arithmetic progression, and why? 1. The amount of air present in a cylinder when a vacuum pump removes 1 4 of the air remaining in the cylinder at a time. 2. Write an A.P having 4 as the 1st term and -3 as the common difference	

Summative assessment plan- only where relevant

Which of the following are APs? If they form an AP, find the common difference d and write three more terms.
(i) 2, 4, 8, 16, . . . (ii) – 1.2, – 3.2, – 5.2, – 7.2, . . . (iii) – 10, – 6, – 2, 2, . . . (iv) 0.2, 0.22, 0.222, 0.2222, . . . (v) 0, – 4, – 8, –12, . . .

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Arithmetic Progressions
Total no. of periods for this chapter10
Period no :4
Sub Topic: n^{th} Term of an AP

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
CG-3: Discovers and proves algebraic identities and the models real- life situations in the form of equations to solve them CG-9: Develops computational thinking, i.e., deals with complex problems and is able to break them down into a series of simple problems that can then be solved by suitable procedures/algorithms CG-11: Explores connections of Mathematics with other subjects	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing) (10 min)** **Activity:** Let us consider the situation Reena applied for a job and got selected. She has been offered the job with a starting monthly salary of ₹8000, with an annual increment of ₹ 500. What would be her monthly salary for the fifth year. Find salary for second year? Find salary for third year? Write the list of salaries for continuous 5 years? ₹8000, ₹8500, ₹9000, ₹9500, ₹10000 **Teacher instructed to make the students to write the terms as follows** $₹(8000 + (2-1)500)$=₹8500 $₹(8000 + (3-1)500) = ₹9000$		

Calculate nth term of a given AP in order to find its term and their nature	₹$(8000 + (4 - 1)500) = ₹9500$ ₹$(8000 + (5 - 1)500) = ₹10000$ Ask the students to write salary for 6th year by observing the above pattern. Ask the students to write salary for 20th year by observing the above pattern. **Teacher introduces the nth term of AP. (5 min.)** **Teacher will show the video and ask the children to write their observations** 1.Write the general form of A.P? Teacher shows how to write each term in general form in the following manner. 1st term a_1 =a+0d=a+(1-1) d 2nd term a_2=a + d=a+(2-1) d 3rd term a_3=a+2d=a+(3-1) d Teacher asks the learners to observe the above pattern and write nth term from their observation. Teacher makes the learners into groups and ask them to solve and present to reinforce the concept nth term of AP. 1.Find the 10th term of the AP: 2, 7, 12,…. 2.Find nth term of AP:1,3,5,7,9,11……. [Teacher plays the video for explain model problems] (25 min.) 3. Which term of the AP: 21, 18, 15, . . . is – 81? Also, is any term 0? Give reason for your answer. [Teacher gives hint to consider nth term as -81 to solve the question] **Teacher makes the students in to groups and ask them to solve and complete the table**	1.Find the 20th term of A.P :3,5,7,9,11……	**Tic TacLearn English 4 min. video on nth term of AP** **Tic TacLearn English 4 min. video on nth term of AP**

	Fill in the blanks in the following table given that a is 1st term, d is common difference, a_n is nth term of the AP a | d | n | a_n 7 | 3 | 8 | … −18 | … | 10 | 0 … | −3 | 18 | −5 −18.9 | 2.5 | … | 3.6 3.5 | 0 | 105 | …	**Formative Assessment:** 1. Find the value of k for which 2k + 7, 6k - 2 and 8k + 4 form 3 consecutive terms of an AP 2. Find the value of the middle term of the following A.P -6, -2, 2...58	

Summative assessment plan- only where relevant

1.Find the 25th term of the AP -5, -5/2,0,5/2…….

2. if a_n = 5-11n find the common difference.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Arithmetic Progressions
Total no. of periods for this chapter:10
Period no :5
Subtopic: problems based on n^{th} term of AP

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations and draws conclusions C-9.1: Decomposes a problem into subproblems C-9.2: Describes and analyses a sequence of instructions being followed C-9.3: Analysis similarities and differences among problems to make one solution or procedure work for multiple problems	**Teacher reinforces the concept of n^{th} term of AP By solving following problems through group/individual activity. (20 min.)** **Teacher asks the students to solve the problems in pairs and present Infront of the class.** 1. Determine the AP whose 3rd term is 5 and the 7th term is 9. 2. Check whether 301 is a term of the list of numbers 5, 11, 17, 23, ... 3. The 17th term of an AP exceeds its 10^{th} term by 7. Find the common difference 4.Which term of A. P 3,15,27, 39… …. will be 132 more than its 54^{th} term using $a_n = a_{54} + 132$, find n.	1.How many two-digit numbers are divisible by 3? 2. Check whether – 150 is a term of the AP: 11, 8, 5, 2 . . . 3.Find the 31st term of an AP whose 11^{th} term is 38 and the 16th term is 73 4.How many two-digit numbers are divisible by 2?	https://www.youtube.com/watch?v=525Dwouk7a8 The video is relating to solve problems of nth term of AP.

C-9.4: Engages in algorithmic problem solving to design such solutions. C-11.1: Applies mathematical knowledge and tools to analyze problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports Calculate the nth term of a given APin order to solve for a real life word problem.	5. Subba Rao started work in 1995 at an annual salary of ₹5000 and received an increment of ₹200 each year. In which year did his income reach ₹ 7000? **Activity (Group)** Teacher makes the learners into groups and help the students wherever necessary to fill the Given Boxes. In the following AP'S find the missing terms in the boxes (20 min.) Explanation of activity (Clink the link or scan the QR code) (i) 2, ☐, 26 (ii) ☐, 13, ☐, 3 (iii) 5, ☐, ☐, $9\frac{1}{2}$ (iv) −4, ☐, ☐, ☐, ☐, 6 (v) ☐, 38, ☐, ☐, ☐, −22	Formative assessment: 1. Show that x – y, x and x + y form consecutive terms of an A.P 2. Calculate how many multiples of 7 are there between 100 and 300.	https://youtu.be/3VGWDPfK3V4?si=HDaSsIBw7IKGfmi8

Summative assessment plan- only where relevant

1.The p^{th} term of an AP is q and q^{th} term is p. Find its $(p+q)^{th}$
2. Determine the AP whose third term is 16 and the 7th term exceeds the 5th term by 12

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Arithmetic Progressions
Total no. of periods for this chapter:10
Period no :6/10
Sub Topic: More applicative (related to real life situations) problems on nth term of AP

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations and draws conclusions C-9.1: Decomposes a problem into subproblems C-9.2: Describes and analyses a sequence of instructions being followed C-9.3: Analysis similarities and differences among problems to make one solution or procedure work for multiple problems	**Teacher makes the students into groups and ask the student to solve the questions and present them Infront of the class (40 min.)** 1.In a flower bed, there are 23 rose plants in the first row, 21 in the second, 19 in the third and so on. There are 5 rose plants in the last row. How many rows are there in the flower bed? 2. Reshma saves Rs 32 during the first month, Rs 36 in the second month and Rs 40 in the third month. If she continues to save in this manner, in how many months will she save Rs 2000? 3. A manufacturer of radio sets produced 800 units in the third year and 700 units in the seventh year. Assuming that the product increases uniformly by a fixed number every year, find (i) the production in the first year (ii) the production in the 10th year Explanation		**4 min. doubtnut video to solve 3rd question**

C-9.4: Engages in algorithmic problem solving to design such solutions. C-11.1: Applies mathematical knowledge and tools to analyze problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports Calculate the nth term of a given APin order to solve for a real life word problem.	4. The sum of four consecutive numbers is 32. And the ratio of the product of the 1st and last term of the product of two middle terms is 7:15 Find the numbers. Explanation		**4 min. doubtnut video to solve 4th question**

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th **Chapter: Arithmetic Progressions** **Total no. of periods for this chapter:10** **Period no :7**			
Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations and draws conclusions C-9.1: Decomposes a problem into subproblems C-9.2: Describes and analyses a sequence of instructions being followed C-9.3: Analysis similarities and differences among problems to make one solution or procedure work for multiple problems	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing) (10 min)** **Consider the situation** Shakila put ₹100 into her daughter's money box when she was one year old, ₹150 on her second birthday, ₹200 on her third birthday and will continue in the same way. How much money will be collected in the money box by the time her daughter is 21 years old. Identify the number of rupees put in the money box in each year? Teacher makes the students into small groups and ask them to discuss the challenges they faced to solve such problems? (supporting questions to help students) Don't you think it would be a tedious and time-consuming process? Can we make the process shorter?		

C-9.4: Engages in algorithmic problem solving to design such solutions. C-11.1: Applies mathematical knowledge and tools to analyze problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports Calculate the sum of a given AP in order to solve for various question	**Teacher introduces the topic through an activity** (10 min) Ask the learners to make two sets of number cards from 1 to 10 Stick the cards from 1 to 10 in ascending order on Board. Stick the cards from 10 to 1 in descending order on Board below each card of the above. Find sum of each column Ask the students to find sum of first 10 natural numbers in the following procedure? S=1+2+3+4+5+…… +10 S=10+9+8+7+…… +1 2S=11+11+11+……+11(10 terms) S=$\frac{10\times11}{2}=55$ **Note: Gauss was asked to find the sum of the positive integers from 1 to 100 when he was 10 years old.** **He immediately replied that the sum is 5050.** Teacher guides the students to find sum of 1st 100 natural numbers by following the same above procedure Teacher explains sum of 1st n terms of AP through 5 min. video. **Derive the formula for finding sum of 1st n natural numbers** 15minutes Now let us generalize the process for standard form of Ap Write General form of A.P? Let a, a + d, a+2d, .a+(n-1)d are n terms of AP. Ask the students Write S as sum of first n terms. Re write the terms of S in reversing order. Add and find 2S. Obtain the formula by finding S. 1.Find the sum of the first 22 terms of the AP: 8, 3, –2,… Find a, d, and n 5 min Write the S_n and find the S_{22}	Find sum of 1st 30 natural numbers using gauss method. 1. Find the sum of the following APs: (i) 2,7, 12, to 10 terms ii) -37, -33, -29…...to 12 terms iii) 0.6,1.7,2.8….to 100 terms Write the formula S_n.	https://youtu.be/9RTmt8FPZ98 **5 min. Tic TacLearn English video on Sn of AP**

Summative assessment plan- only where relevant

1. Find the sum of the first 40 positive integers divisible by 6.
2. Find the sum of the first 15 multiples of 8.
3. Find the sum of the odd numbers between 0 and 50

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Arithmetic Progressions
Total no. of periods for this chapter:10
Period no :8
Sub Topic: Application problems on S_n

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C-3.2: Models and solves contextualized problems using equations and draws conclusions C-9.1: Decomposes a problem into subproblems C-9.2: Describes and analyses a sequence of instructions being followed C-9.3: Analysis similarities and differences among problems to make one solution or procedure work for multiple problems	**Teacher asks the following question and testing of Previous knowledge happens (Teacher note: This is individual work followed by pair sharing and whole group sharing) (10 min.)** 1. Write the formula for Sn in AP. 2. Explain the terms in the above Sn formula? 3. Find the Sum of terms in A.P 2+5+8+11+……. (20 terms) 4. Find 1+3+5+7+…… +101 5. How do you find Sn when you know 1st and last terms. **<u>Teacher derives auxiliary formula using Sn.</u> <u>(10 min.)</u>** **Whole class activity: Teacher guides the students to convert the formula of Sn in terms of a and l (last term a_n)** 1.What is the sum of first 10 natural numbers. 2.What is the sum of first 9 natural numbers.	1. Find the sums given below: (i) 7 + 1 10 2 + 14 + . . . + 84 (ii) 34 + 32 + 30 + . . . + 10 (iii) –5 + (–8) + (–11) + . . . + (–230)	

C-9.4: Engages in algorithmic problem solving to design such solutions. Calculate the last term of a given AP in order to find the solution ofr a real life word problem	3.How do you get 10^{th} term of AP using the above Sums. 4. What is your conclusion. **[Remark: The n^{th} term of an AP is the difference of the sum to first n terms and the sum to first (n – 1) terms of it, i.e., $a_n = S_n - S_{n-1}$]** **Teacher makes the students into groups and solve the following questions. (20 min.)** 1.How many terms of the AP: 24, 21, 18, . . . must be taken so that their sum is 78? Teacher asks to write a, d and Sn. teacher asks the learners to Substitute the values in Sn formula and simplify then find n. Teacher makes the students into pairs and ask them to find solution and present Infront of the class. 1.A manufacturer of T.V. sets produced 600 sets in the third year and 700 sets in the seventh year. Assuming that the production increases uniformly by a fixed number every year, find the total production in first 7 years	Find the sum of: (i) the first 1000 positive integers (ii) the first n positive integers If the sum of the first 14 terms of an AP is 1050 and its first term is 10, find the 20th term Formative assessment: 1.How many terms of the AP: 9, 17, 25, . . . must be taken to give a sum of 636? 2.The first term of an AP is 5, the last term is 45 and the sum is 400. Find the number of terms and the common difference.	

Summative assessment plan- only where relevant

9. If the sum of first 7 terms of an AP is 49 and that of 17 terms is 289, find the sum of first n terms.
10. Show that $a_1, a_2, \ldots, a_n, \ldots$ form an AP where an is defined as below: (i) $a_n = 3 + 4n$ (ii) $a_n = 9 - 5n$ Also find the sum of the first 15 terms in each case.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Arithmetic Progressions
Total no. of periods for this chapter:10
Period no :9
Sub Topic: Activity to reinforce the formula Sn

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-3.2: Models and solves contextualized problems using equations and draws conclusions C-9.1: Decomposes a problem into subproblems C-9.2: Describes and analyses a sequence of instructions being followed C-9.3: Analysis similarities and differences among problems to make one	**Group Activity** **In the given table a represents first term and d is common difference a_n is nth term and Sn is sum of 1st n terms of AP** **40 min.** **Under guidance of teacher students will complete the following table** a | d | a_n | n | Sn 5 | 3 | 50 | ? | ? 7 | ? | a_{13}=35 | ? | S_{13}=? ? | 3 | a_{12} = 37 | ? | S_{12}=? ? | ? | a_3 = 15 | ? | S_{10} = 125 ? | 5 | a_9=? | ? | S_9 = 75 2 | 8 | ? | ? | Sn = 90 8 | ? | 62 | ? | Sn =210	**Assignment:** Question numbers page no. 69 & 5.3 18,19 and 20	https://youtu.be/SasRMdcqkrg?si=8EB0Jh0qKmhtZ7am 25 min. Green Board Classes video on solving

solution or procedure work for multiple problems C-9.4: Engages in algorithmic problem solving to design such solutions. C-11.1: Applies mathematical knowledge and tools to analyze problems/situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education and Sports Develops strategies in order to apply the concept of AP to daily life situations.	Teacher makes the students into groups and ask them to fill in the blanks using relevant information and using relevant formulas.		problems related AP https://youtu.be/gqesGDm1hM0?si=mTgKK6_LIRycQ78p 6 min. Math Army video to solve given SA question.

Summative assessment plan- only where relevant

1. 200 logs are stacked in the following manner: 20 logs in the bottom row, 19 in the next row, 18 in the row next to it and so on (see Fig. 5.5). In how many rows are the 200 logs placed and how many logs are in the top row?

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Arithmetic Progressions
Total no. of periods for this chapter:10
Period no :10
Sub Topic: Case based questions

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
	Whole class activity **Teacher discusses case-based questions.** **Teacher asks the students to read the case carefully.** **By asking small questions comprehend the case.** **20min** **The students of a school decided to beautify the school on the annual day by fixing colorful on the straight passage of the school. They have 27 flags to be fixed at intervals of every 2 meter. The flags are stored at the position of the middle most flag. Ruchi was given the responsibility of placing the flags. Ruchi kept her books where the flags were stored. She could carry only one flag at a time. How much distance did she cover in completing this job and returning back to collect her books? What is the maximum distance she travelled carrying a flag?** 1.How much distance covered to pick up first flag? 2.How much distance covered to pick up 2^{nd} ,3^{rd} ,4^{th} flags respectively? 3. Verify the above list of numbers (distances) forms an AP? 4. How much distance did she cover in completing this job and returning back to collect her books? 5. What is the maximum distance she travelled carrying a flag?		

	Whole class activity **Teacher discusses another case-based question.** **Teacher asks the students to read the case carefully.** **By asking small questions comprehend the case.** **20min** Your elder brother wants buy a car and plans to take loan From a bank for his car. He repays his total loan of ₹118000 by paying every month starting with 1st instalment of ₹1000. If he increases the instalment by hundred rupees every month. Answer the following. 1.The amount paid by him in 30th installment is a) ₹3900 b) ₹3500 c) ₹37000 d) ₹3600 2.The amount paid by him in the 30 installments is a) ₹37000 b) ₹73500 c) ₹75300 d) ₹75000 3. what amount does he still have to pay after 30th instalment a) ₹45500 b) ₹49000 c) ₹44500 d) ₹54000 4. If total instalments are 40 then paid in the last instalment a) ₹4900 b) ₹3900 c) ₹5900 d) ₹9400 5. The ratio of the 1st instalment to the last instalment is a) 1:49 b) 10:49 c) 10:39 d) 39:10		

Summative assessment plan- only where relevant

A contractor on construction job specifies a penalty for delay of completion beyond a certain date as follows: Rs 200 for the first day, Rs 250 for the second day, Rs 300 for the third day etc. the penalty for each succeeding day being Rs 50 more than for the preceding day. How much money the contractor has to pay as penalty if he has delayed the work by 30 days?

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

WORK SHEET

Level 1

1. In an AP, if d = –4, n = 7, a_n = 4, then a is

(A) 6 (B) 7 (C) 20 (D) 28

2. In an AP, if a = 3.5, d = 0, n = 101, then a_n will be

(A) 0 (B) 3.5 (C) 103.5 (D) 104.5

3. The list of numbers – 10, – 6, – 2, 2, ... is

(A) an AP with d = – 16 (B) an AP with d = 4 (C) an AP with d = – 4 (D) not an AP.

4. The 11th term of the AP: –5, –5 2, 0, 5 2, ...is

(A) –20 (B) 20 (C) –30 (D) 30

Level 2

5. The sum of the 5th and the 7th terms of an AP is 52 and the 10th term is 46. Find the AP.

6. Find the 20th term of the AP whose 7th term is 24 less than the 11th term, first term being 12.

7. If the 9th term of an AP is zero, prove that its 29th term is twice its 19th term.

8. Find whether 55 is a term of the AP: 7, 10, 13, --- or not. If yes, find which term it is

Level 3

9. The famous mathematician associated with finding the sum of the first 100 natural numbers is

(A) Pythagoras (B) Newton (C) Gauss (D) Euclid

10. If the first term of an AP is –5 and the common difference is 2, then the sum of the first 6 terms is

(A) 0 (B) 5 (C) 6 (D) 15

11. The sum of first 16 terms of the AP: 10, 6, 2... is

(A) –320 (B) 320 (C) –352 (D) –400

12. In an AP if a = 1, an = 20 and Sn = 399, then n is (A) 19 (B) 21 (C) 38 (D) 42 18. The sum of first five multiples of 3 is

(A) 45 (B) 55 (C) 65 (D) 75

LESSON PLAN / PERIOD PLAN

Class : 10

Subject : Mathematics

Chapter No. : 6

Chapter Name : TRIANGLES

1062CH06

https://epathshala.nic.in/topic-d.php?id=1062CH06

CURRICULAR GOALS & COMPETENCIES

THE FOLLOWING CURRICULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPTER

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-4: Analysis characteristics and properties of two-dimensional geometric shapes and develops mathematical arguments to explain geometric relationships	C-4.1: Describes relationships including congruence of two-dimensional geometric shapes (such as the lines angles triangles) to make and test conjectures and solve problems C-4.2: Proves theorems using Euclid's axioms and postulates for triangles and quadrilaterals, and applies them to solve geometric problems
CG-7: Begins to perceive and appreciate the axiomatic and deductive structure of Mathematics	C-7.3: Proves theorems using Euclid's axioms and postulates - for angles, triangle, quadrilaterals, circles, area-related theorems for triangles and parallelograms
CG-10: Knows and appreciates important contributions of mathematicians from India and around the world	C-10.1: Recognizes the important contributions made by mathematicians (Indian and others) in the field of Mathematics (such as evolution of members, geometry, algebra)

MIND MAP

Triangles

Theorems

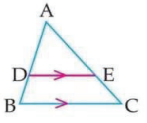
Summary

In ΔABC, let $DE \parallel BC$. Then,

(i) $\frac{AD}{DB} = \frac{AE}{EC}$

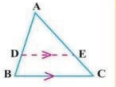
(ii) $\frac{AB}{DB} = \frac{AC}{EC}$

(iii) $\frac{AD}{AB} = \frac{AE}{AC}$



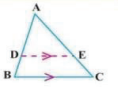
1. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

If, $DE \parallel BC$ then $\frac{AD}{DB} = \frac{AE}{EC}$

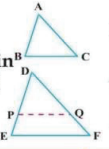


2. If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.

If $\frac{AD}{DB} = \frac{AE}{EC}$ then, $DE \parallel BC$



3. If in two triangles, corresponding angles are equal, then their corresponding sides are in the same ratio (or proportion) and hence the two triangles are similar.(AAA criterion)

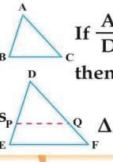


If $\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$

then, $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$

$\Delta ABC \sim \Delta DEF$

4. If in two triangles, sides of one triangle are proportional to (*i.e.*, in the same ratio of) the sides of the other triangle, then their corresponding angles are equal and hence the two triangles are similiar.(SSS criterion)

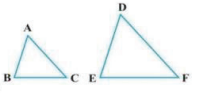


If $\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$

then, $\angle A = \angle D$, $\angle B = \angle E$, $\angle C = \angle F$

$\Delta ABC \sim \Delta DEF$

5. If one angle of a triangle is equal to one angle of the other triangle and the sides including these angles are proportional, then the two triangles are similar.(SAS criterion)



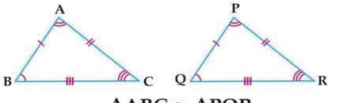
If $\frac{AB}{DE} = \frac{AC}{DF}$ & $\angle A = \angle D$

then, $\Delta ABC \sim \Delta DEF$

Similarity

(i) Corresponding angles are equal

(ii) Corresponding sides are in the same ratio



$\Delta ABC \sim \Delta PQR$

PERIOD WISE PLAN

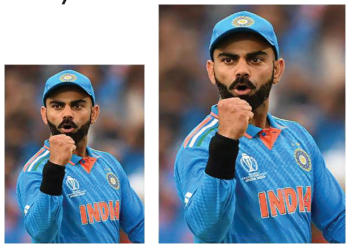
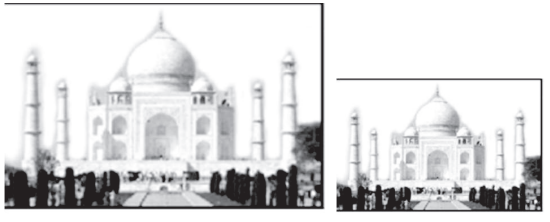
PERIOD NO.	TEACHING TOPIC	LEARNING OUTCOMES
1	Recall of previous knowledge, Similar Figures, Similar Polygons	Recall the previous knowledge, provides examples and non-examples of similar figures and polygons.
2	Definition of Similar Triangles and Basic Proportionality Theorem	Explain the conditions for similarity of two triangles, distinguishes between congruency and similarity of triangles, uses appropriate symbols, recalls that areas of triangles with same base and between same parallel lines are equal and proves BPT.
3	Converse of Basic Proportionality Theorem	To prove converse of BPT.
4	Numerical and theoretical Applications of BPT and its Converse	Apply BPT and its Converse.
5	Criteria for Similarity of Triangles – AAA Similarity	To prove converse of AAA Similarity.
6	Criteria for Similarity of Triangles – SSS Similarity	To prove converse of SSS Similarity.
7	Criteria for Similarity of Triangles – SAS Similarity	To prove converse of SAS Similarity.
8	Numerical Applications on Criterion for Similarity of Triangles	Apply Criterion for Similarity of Triangles
9	Case based question	Able to apply concept of similarity different situations

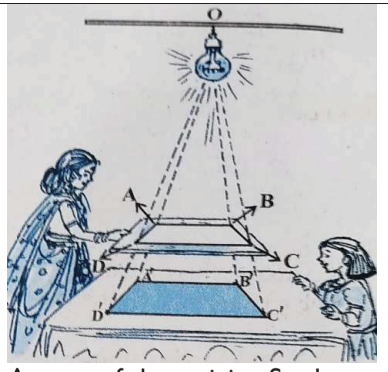
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Triangles
Total no. of periods for this chapter:9
Period no :1/9
Sub Topic: Similar Figures, Similar Polygons

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-4.1: Describes relationships including congruence of two-dimensional geometric shapes (such as the lines angles triangles) to make and test conjectures and solve problems	**Recall of previous knowledge: 10 min** Teacher asks the following questions and testing the previous knowledge (Individual Work followed by pair sharing and whole grouping sharing): 1. Observe all the ceiling fans in our class room. How they look like? Compare their shapes. (Teacher Note: Teacher should ensure that the students recall the congruent figures) 2. Do you see some other congruent figures in daily life? List few examples. 3. Teacher draws some triangles on the IFP's / Green Boards (some congruent and some non-congruent). Teacher asks the students to identify congruent triangles from them. 4. Teacher makes the students recall some properties of triangles that result in due to congruence of triangles.	1. When do two triangles are congruent? 2. What is the symbol for congruence of two figures? 3. State SAS congruence rule. 4. Is AAS congruence rule same as ASA congruence rule? Give reasons.	**Videos from (Tic-Tac learn English)** https://www.youtube.com/watch?v=rPQ2IooGRPg https://www.youtube.co

	Introduction to Similar Figures: (10 min.) Teacher shows some similar pictures to children and make them observe the term SIMILARITY and explains that Similarity means Same Shape and not necessarily the same size. And the similarity of two figures is represented by the symbol ~.   Teacher emphasizes that similar figures are the magnifications or diminished versions of original pictures, and points out that the extent of magnification or diminishing is indicated by Scale Factor = Ratio of Corresponding Lengths. **Similar Polygons: (20 min.)** Teacher makes a group of students to demonstrate an activity and guides them to do the job. ACTIVITY:	5. In a triangle ABC, AB=AC. What can you conclude about the angles? 6. Rama says that each angle of an equilateral triangle is 60^0. Do you agree? 1. Give some examples of Similar geometrical figures.	m/watch?v=jHDPwGfMJ9k **(TIC TacLearn English video part 1 & 2 on Intro of Similar Triangles)**



As part of the activity, Students place a quadrilateral (ABCD) under light vertically and observe its shadow (A'B'C'D') under it on a table. The students observe that the quadrilateral ABCD and its shadow quadrilateral A'B'C'D' are similar. Also, Students measure the sides and angles of the two and notice the following:

(i) $\angle A = \angle A', \angle B = \angle B', \angle C = \angle C', \angle D = \angle D'$ and

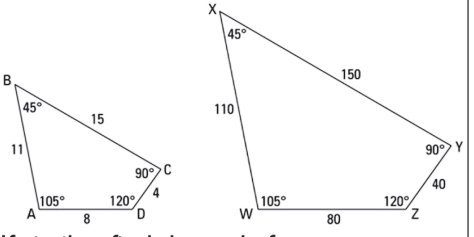
(ii) $\frac{AB}{A'B'} = \frac{BC}{B'C'} = \frac{CD}{C'D'} = \frac{DA}{D'A'}$.

Teacher generalizes the similarity of two polygons as: "Two polygons with same number of sides are similar if (i) the corresponding angles are equal and (ii) corresponding sides are in the same ratio (proportion)."
(Teacher Note: Teacher should assist students to understand the meaning of CORRESPONDENCE)

Recap:1. Identify similar figures in your surroundings

2.Write about similarity in your own words?

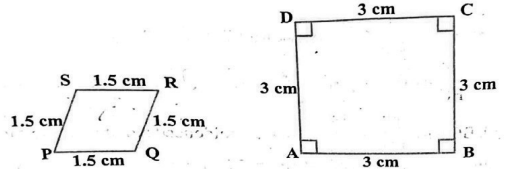
1. In the figure given below, check whether the two figures are similar or not.



If similar, find the scale factor.

Summative assessment plan- only where relevant

1. Give two different examples of pair of
   (i) Similar figures
   (ii) Non-Similar figures
2. State whether the following quadrilaterals are similar or not?



Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

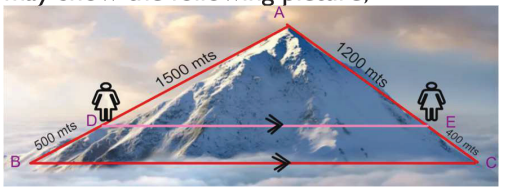
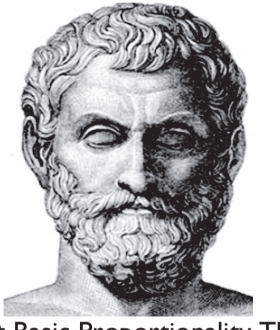
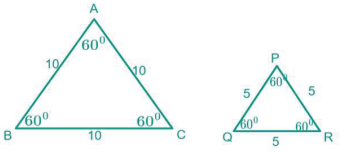
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

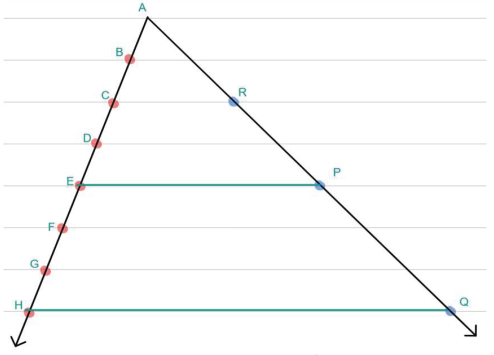
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Triangles
Total no. of periods for this chapter:9
Period no :2/9
Sub Topic: Definition of Similar Triangles & Basic Proportionality Theorem (Thales Theorem)

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-4.1: Describes relationships including congruence of two-dimensional geometric shapes (such as the lines angles triangles) to make and test conjectures and solve problems **C-4.2: Proves theorems using Euclid's axioms and postulates for triangles and quadrilaterals, and applies them to solve geometric problems** **C-7.3: Proves theorems using Euclid's axioms and**	**Recall of definition of Similar Polygons and defining Similar Triangles: (5 min)** Teacher asks the following questions and testing the previous knowledge: 1. Teacher displays two similar polygons, say two squares, on the IFP / Green Board, and asks students to recollect, what they represent. (Teacher Note: Teacher should make the students recall the idea of similar polygons learnt in previous class) 2. If the two similar polygons have three sides, what can we call them? **Basic Proportionality Theorem (Thales Theorem): (15 min)**	1.When two triangles are similar? 2.Give two examples of non-similar figures? 3.In the given figure, check whether the two triangles are similar or not?	

postulates - for angles, triangle, quadrilaterals, circles, area-related theorems for triangles and parallelograms **C-10.1: Recognizes the important contributions made by mathematicians (Indian and others) in the field of Mathematics (such as evolution of members, geometry, algebra)**	Teacher introduces the Basic Proportionality Theorem by showing some daily life situations, for example, teacher may show the following picture,  and ask the relationship between the distances shown. (Teacher Note: Teacher should ensure that students are given freedom to express different inferences) Teacher then expresses the role of the Greek mathematician THALES and his contribution in mathematics.  Teacher states that Basic Proportionality Theorem is proposed by this mathematician Thales which is useful in the above situation. ACTIVITY (Pair Work) Teacher pairs the students and asks the group to following activity:	 	History of THALES



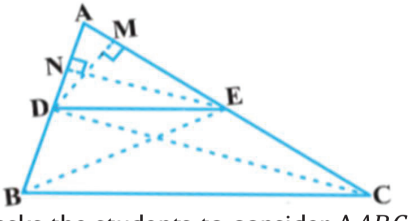
Take a single ruled sheet of paper. Mark a point A on a line. Draw two rays starting at A and mark points and join segments as shown in the figure (Teacher may display the picture).

Teacher asks the students the following questions:

1. Is EP//HQ?
2. What is the ratio AE/EH?
3. What is the ratio AP/PQ?
4. Are the two ratios equal?

PROOF of Basic Proportionality Theorem: (20 min)

Teacher proves the theorem by discussion and question and answers.



Teacher asks the students to consider ΔABC with point D on AB and point E on AC such that DE//BC. Teacher makes the students that We are to prove that AD/DB =

1. Join CR, and check the ratios AC/CH and AR/RQ, and compare. State reasons.

2.Write Thales theorem on your own words.

Activity

Basic Proportionality Theorem

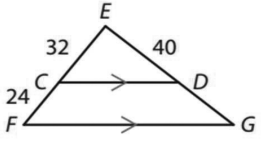
https://www.youtube.com/watch?v=yEKTmUimT-Q

Thales Theorem by NCERT Official

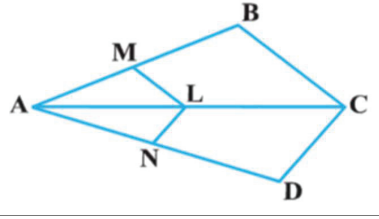
	AE/EC. Teacher asks the students to find the following: 1. Area of ΔADE with base AD, and Area of ΔADE with base AE. (Teacher has to advise to draw the altitudes DM and EN). 2. Area of ΔBDE with base BD and ΔDEC with base EC. Teacher asks the students to notice that $ar(\Delta BDE)$= $ar(\Delta DEC)$. (Teacher Note: Teacher should ensure that the students recall the equality of areas of triangles on same base and between same parallels, and apply here) Teacher now asks to utilize $\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{ar(\Delta ADE)}{ar(\Delta DEC)}$ and draw conclusion that AD/DB = AE/EC. Teacher concludes that "If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio."	1. Why we consider areas of ΔADE in two different ways? 2. Why we consider areas of ΔBDE and ΔDEC ? 3. Why EN is altitude to base DB in ΔBDE ?	

Summative assessment plan- only where relevant

1. In the figure, CD//FG. Find DG.



2. In the figure, LM//CB and LN//CD. Prove that $\frac{AM}{AB} = \frac{AN}{AD}$.



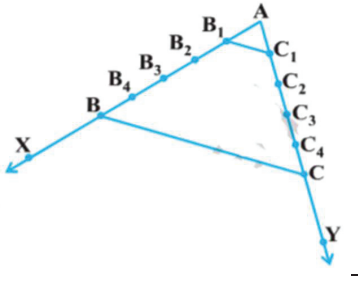
Teachers' reflections and experiences:

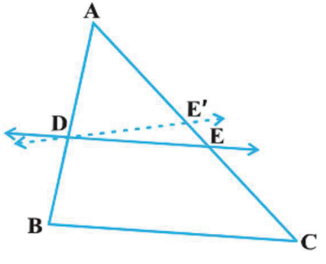
1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Triangles
Total no. of periods for this chapter:9
Period no :3/9
Sub Topic: Converse of Basic Proportionality Theorem

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-4.1: Describes relationships including congruence of two-dimensional geometric shapes (such as the lines angles triangles) to make and test conjectures and solve problems **C-4.2: Proves theorems using Euclid's axioms and postulates for triangles and quadrilaterals, and applies them to solve geometric problems** **C-7.3: Proves theorems using Euclid's axioms and postulates - for angles, triangle, quadrilaterals,**	**Recall of the statement of BPT: (5 min)** Teacher asks the following questions and testing the previous knowledge: 3. Recall the Basic Proportionality Theorem statement **ACTIVITY (Pair Work) (15 min)** Teacher pairs the students and asks the group to following activity:  	If in triangle ABC, if DE//BC, then how can we get AD/AB = AE/AC? 1. How can you measure the $\angle AB_1C_1$, $\angle ABC$? 2. By which property, $B_1C_1 // BC$? 3. By taking points B_3, C_3 , whether the ratios $\frac{AB_3}{B_3B}$, $\frac{AC_3}{C_3C}$ are equal?	

circles, area-related theorems for triangles and parallelograms **C-10.1: Recognizes the important contributions made by mathematicians (Indian and others) in the field of Mathematics (such as evolution of members, geometry, algebra)**	Teacher asks the students to draw an angle XAY as shown in the figure. Mark points B_1, B_2, B_3, B_4 and B on ray AX such that $AB_1 = B_1B_2 = B_2B_3 = B_3B_4 = B_4B = 1$ cm. Mark points C_1, C_2, C_3, C_4 and C on ray AY such that $AC_1 = C_1C_2 = C_2C_3 = C_3C_4 = C_4C = 2$ cm. Join B, C and also join B_1, C_1. Teacher asks the students to measure the values of AB_1, AB. Also find the values of AC_1, AC. Find the values of $\frac{AB1}{AB}$ and $\frac{AC1}{AC}$. Students notice that $\frac{AB1}{AB} = \frac{AC1}{AC}$. Also, $B_1C_1 // BC$. Teacher informs students to do the same activity by taking two points other than B_1, C_1. And observe that we will get the same result. After repeating this activity, students generalize that If a line divides the two sides of a triangle in the same ratio, then the line is parallel to third side. **Converse of Basic Proportionality Theorem: (20 min)** Statement: If a line divides the two sides of a triangle in the same ratio, then the line is parallel to third side.  Teacher proves the theorem by discussion and question and answers. (Note: Teacher should explain about componendo and divendo) From the statement, student to write, what is given data.	In triangle ABC, if D and E are points on AB and AC respectively such that AD/AB = AE/AC, are DE and BC parallel? How can we get AD/AB=AE/AC?	video on proving Converse of Thales Theorem

	From the statement, student to write, what is required to prove. Teacher informs to students to take points E' such that DE'//BC. Teacher asks the students, what result they get using BPT for the points D, E' Teacher asks the students to compare the given data and the data obtained just now. (Teacher Note: Teacher guides the students to get EC=E'C). Teacher asks the students to observe the figure and what is the possibility for the points E and E'? (Teacher Note: Teacher ensures that students notice that E and E' coincide.) So, teacher conveys that DE//BC. Teacher concludes that "If a line divides the two sides of a triangle in the same ratio, then the line is parallel to third side."	Write converse of Thales theorem?	

Summative assessment plan- only where relevant

3.

E and F are points on the sides PQ and PR respectively of ΔPQR. For each of the following, state whether. EF ||QR or not?

(i) PE = 3.9 cm EQ = 3 cm PF = 3.6 cm and FR = 2.4 cm

(ii) PE = 4 cm, QE = 4.5 cm, PF = 8 cm and RF = 9 cm.

(iii) PQ = 1.28 cm PR = 2.56 cm PE = 1.8 cm and PF = 3.6 cm

Teachers' reflections and experiences:

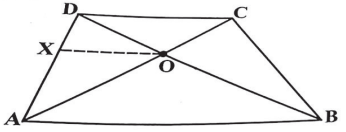
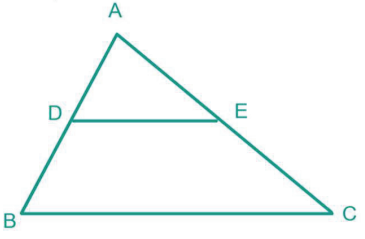
1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Triangles
Total no. of periods for this chapter:9
Period no :4/9
Sub Topic: Numerical applications of BPT and its converse

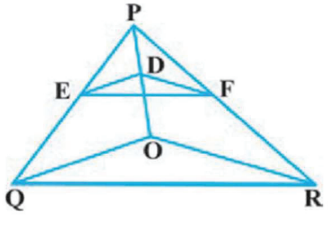
Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-4.1: Describes relationships including congruence of two-dimensional geometric shapes (such as the lines angles triangles) to make and test conjectures and solve problems **C-4.2: Proves theorems using Euclid's axioms and postulates for triangles and quadrilaterals, and applies them to solve geometric problems**	**Recall of the statements of BPT and its converse.: (10 min)** Teacher asks the following questions and testing the previous knowledge: 1. In given triangles, when can we apply BPT? 2. If a line is parallel to one side of a triangle, what can we conclude about the other sides? 3. If a line divides two sides of a triangle in same ratio, then how is this line inclined to the third side? **Problem – 1 (15 min)**		

C-7.3: Proves theorems using Euclid's axioms and postulates - for angles, triangle, quadrilaterals, circles, area-related theorems for triangles and parallelograms **C-10.1: Recognizes the important contributions made by mathematicians (Indian and others) in the field of Mathematics (such as evolution of members, geometry, algebra)**	Teacher displays the following problem on IFP or writes on Green Board: ABCD is a trapezium in which AB || DC and its diagonals intersect each other at the point O. Show that $\frac{AO}{BO} = \frac{CO}{DO}$.  Teacher asks the students to draw trapezium ABCD with diagonals intersecting at O, and draw OX//AB. Teacher proves the statement by asking the questions. 1. In triangle ADC, Is OX//DC? 2. What can we apply here (BPT or its Converse)? 3. What result do we get? 4. In triangle ADB, Is OX//AB? (why?) 5. What result do we get here? 6. Can we get a new result by comparing the last two results obtained? 7. Are they equal? 8. Write your conclusion? **Problem – 2 (15 min)** Prove that, the line joining the mid points of any two sides of a triangle is parallel to the third side.  Teacher asks the students to draw triangle ABC and mark mid points D, E on sides AB, AC respectively, and join DE. Teacher proves the result by asking the questions.	Assignment: The diagonals of a quadrilateral ABCD intersect at O. If $\frac{AO}{BO} = \frac{CO}{DO}$.Show that ABCD is Trapezium What is given? What is to be prove? Assignment: Prove that, a line drawn through the midpoint of one side of a triangle and parallel to another side, bisects the third side.	**BPT and its applications** https://www.youtube.com/watch?v=jR8wbl-uz_0 https://www.youtube.com/watch?v=OFnEEdARA3U https://www.youtube.com/watch?v=wJK-FOjV-kw **(Tic TacLearn English videos relating to Basic Proportion**

	1. Here D, E are the mid points. So, can it impart any information about some ratios? 2. Is AD/DB = AE/EC? 3. If these ratios are equal, can we say DE is parallel to BC and why? 4. Is this completing our result? by taking two points other than B_1, C_1. And observe that we will get the same result. After repeating this activity, students generalize that If a line divides the two sides of a triangle in the same ratio, then the line is parallel to third side. Teacher asks the students to compare the given data and the data obtained just now. (Teacher Note: Teacher guides the students to get EC=E'C). Teacher asks the students to observe the figure and what is the possibility for the points E and E'? (Teacher Note: Teacher ensures that students notice that E and E' coincide.) So, teacher conveys that DE//BC. Teacher concludes that "If a line divides the two sides of a triangle in the same ratio, then the line is parallel to third side."		**ality theorem)**

Summative assessment plan- only where relevant

1. In the figure, DE//OQ and DF//OR. Show that EF//QR.



Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
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4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

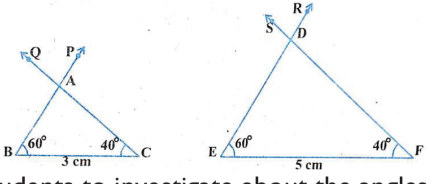
Chapter Plan (Unit plan/ lesson plan)

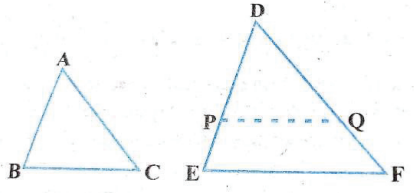
Period plan (40 mins class)

Class: 10th
Chapter: Triangles
Total no. of periods for this chapter:9
Period no :5/9

Sub Topic: Criteria for Similarity of Triangles – AAA Similarity

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-4.1: Describes relationships including congruence of two-dimensional geometric shapes (such as the lines angles triangles) to make and test conjectures and solve problems **C-4.2: Proves theorems using Euclid's axioms and postulates for triangles and quadrilaterals, and applies them to solve geometric problems** **C-7.3: Proves theorems using Euclid's axioms and**	**Recall of the statements of BPT and its converse.: (5 min)** Teacher asks the following questions and testing the previous knowledge: 1.In given triangles, when can we apply BPT? 2.If a line is parallel to one side of a triangle, what can we conclude about the other sides? 3.If a line divides two sides of a triangle in same ratio, then how is this line inclined to the third side? 4.How do you verify the given triangles are similar? Teacher introduces **Criteria for Similarity of Triangles** Teacher asks the students, how to verify two triangles similar. What measurements are needed to prove two triangles similar as per definition?		**Criterion for**

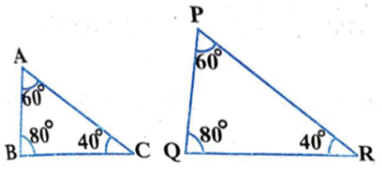
postulates - for angles, triangle, quadrilaterals, circles, area-related theorems for triangles and parallelograms	Teacher conveys that it is not necessary to have all the measurements of the triangles for this task. Using some Similarity theorems (called Criteria), we can do the check with few measurements only. (30 min.) https://www.youtube.com/watch?v=i1cfQGyDKFw (28 min. NCERT Official video on Criteria of similarity of triangles and areas similar of triangles) **AAA Similarity:** Teacher conveys that, as per AAA Similarity, If corresponding angles of two triangles are equal, then they are similar. Teacher induced this criterion using the following activity. **ACTIVITY: (Pair work)** Teacher makes the students into groups the students in pairs and asks the students to draw two different triangles ABC and DEF with angle measurements $\angle B = \angle E = 60^0$, $\angle C = \angle F = 40^0$ and BC = 3 cm and EF = 5 cm.  Teacher asks the students to investigate about the angles at A and D. Teacher asks the students to measure the lengths AB, AC, DE, DF. Also, teacher asks the students to find the ratios AB/DE, BC/EF and AC/DF. Teacher asks the students observe the ratios and interpret. Teacher concludes that the corresponding angles are equal and ratios of corresponding sides are equal and hence the triangles are similar. **AAA Similarity Theorem:**	Assignment: Repeat the activity with another two triangles with other angle measurements and verify the result.	**Similarity of Triangles** https://www.youtube.com/watch?v=5XT79GjhiIs https://www.youtube.com/watch?v=zEY_dTf_wJY https://www.youtube.com/watch?v=4JETmNW93CA

	If in two triangles, if corresponding angles are equal, then their corresponding sides are in the same ratio, and hence the triangles are similar. Proof: Teacher draws two triangles ABC and DEF such that $\angle A = \angle D$, $\angle B = \angle E$ and $\angle C = \angle F$.  Teacher marks points P, Q on DE, DF respectively such that AB=DP and AC=DQ and joins P, Q. Teacher explains the proof by asking questions. 1. Are the triangles ABC and DPQ congruent? Give reasons. 2. Is DP/DE = DQ/DF? Does it mean AB/DE = AC/DF? Why? 3. How can we relate these equal ratios with the ratio BC/EF? (Teacher Note: Teacher should ensure that student identifies that the choice of points on DE, EF or DF, EF works here). 4. Compare the three ratios. 5. Are the triangles ABC and DEF similar now, as per definition of similarity? Conclusion: 5 min Teacher concludes that "If in two triangles, if corresponding angles are equal, then their corresponding sides are in the same ratio, and hence the triangles are similar."	1. Why the points P, Q are chosen in the proof? 2. In the figure chosen, AB<DE. If the figure is chosen with AB>DE, how would we approach? 3. Can two triangles be similar, if two angles of one triangle are equal to two angles of another triangle? 4. Can we call AAA similarity as AA similarity? Give Reasons.	**(Each 3 to 4 min. Tic TacLearn videos on AAA similarity)**

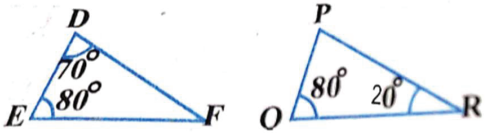
Summative assessment plan- only where relevant

1. Among the pairs of triangles given, check whether the triangles are similar or not .

(a)



(b)



Teachers' reflections and experiences:

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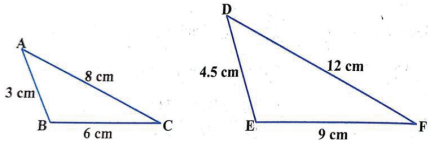
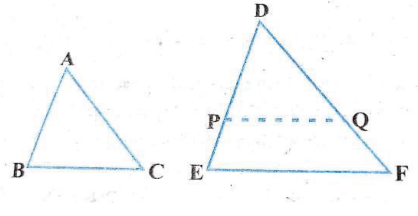
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Triangles
Total no. of periods for this chapter:9
Period no :6/9
Sub Topic: Criteria for Similarity of Triangles – SSS Similarity

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-4.1: Describes relationships including congruence of two-dimensional geometric shapes (such as the lines angles triangles) to make and test conjectures and solve problems **C-4.2: Proves theorems using Euclid's axioms and postulates for triangles and quadrilaterals, and applies them to solve geometric problems** **C-7.3: Proves theorems using Euclid's axioms and postulates - for angles, triangle, quadrilaterals, circles, area-related**	**Recall of the statements of BPT and its converse.: (5 min)** Teacher asks the following questions and testing the previous knowledge: 1. In given triangles, when can we apply BPT? 2. If a line is parallel to one side of a triangle, what can we conclude about the other sides? 3. If a line divides two sides of a triangle in same ratio, then how is this line inclined to the third side **SSS Similarity:** Teacher conveys that, as per SSS Similarity, if corresponding sides of two triangles are proportional, then they are similar. Teacher induced this criterion using the following activity.		**Geometry Box** **GeoGebra**

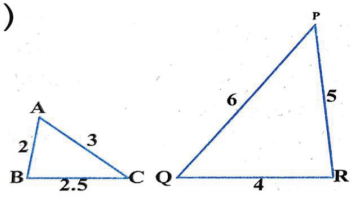
theorems for triangles and parallelograms	**ACTIVITY: (Pair work) (15 min)** Teacher groups the students in pairs and asks the students to draw two different triangles ABC and DEF with the following measurements: AB=3cm, BC=6cm, AC=8cm, DE=4.5cm, EF=9cm and DF=12cm  Teacher asks the students to calculate the ratios AB/DE, BC/EF, AC/DF check their equality. Also, teacher asks the students to measure the angles of the two triangles and check their equality. (Teacher Note: Teacher may also ask the students to take triangle cuts and place on the other to check the overlap of angles, implying that they are equal) Teacher concludes that if the corresponding sides are in same ratio (in proportion) then the corresponding angles are equal and hence the triangles are similar. **<u>SSS Similarity Theorem: (20 min)</u>** If in two triangles, if corresponding sides are in same proportion, then their corresponding angles are equal, and hence the triangles are similar. Proof: Teacher draws two triangles ABC and DEF such that AB/DE = BC/EF = AC/DF (<1)  	Assignment: Repeat the activity with another two triangles with other side measurements such that the ratios of side lengths are same and verify the result.	**SSS Similarity** https://www.youtube.com/watch?v=WuZ8ouldAus https://www.youtube.com/watch?v=60v6Exi3wxs https://www.youtube.com/watch?v=iuC61vO0qR4

	Teacher marks points P, Q on DE, DF respectively such that AB=DP and AC=DQ and joins P, Q. Teacher explains the proof by asking questions. 6. Is PQ//EF? Why? (Teacher Note: Teacher should give chance to students to discuss and answer) 7. Are the triangles DPQ and DEF are similar? What previous theorem helps here? 8. What sides are proportional in these two triangles? 9. Compare this proportional result with the given proportional result and observe. Is BC=PQ? 10. Compare triangles ABC and DPQ for congruence. Which congruence works here? 11. What are the corresponding equal angles we get here? 12. Compare these results with previous angle results and deduce the relationship between angles at B, C, E and F. 13. Apply the definition of similarity and check whether triangles ABC and DEF are similar? Teacher concludes that "If in two triangles, if corresponding sides are in same ratio, then their corresponding angles are equal, and hence the triangles are similar."	Assignment: Deduce the proof if AB/DE = BC/EF = AC/DF (>1).	**(3 to 6 min. Tic TacLearn videos on SSS similarity)**

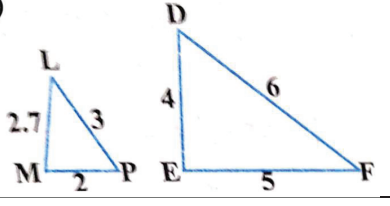
Summative assessment plan- only where relevant

2. Among the pairs of triangles given, check whether the triangles are similar or not .

(a)



(b)



Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
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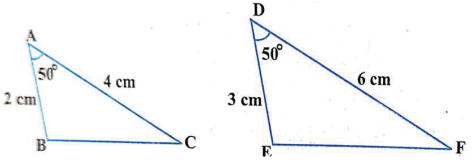
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

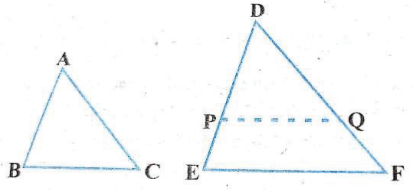
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Triangles
Total no. of periods for this chapter:9
Period no :7/9
Sub Topic: Criteria for Similarity of Triangles – SAS Similarity

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-4.1: Describes relationships including congruence of two-dimensional geometric shapes (such as the lines angles triangles) to make and test conjectures and solve problems **C-4.2: Proves theorems using Euclid's axioms and postulates for triangles and quadrilaterals, and applies them to solve geometric problems** **C-7.3: Proves theorems using Euclid's axioms and postulates - for angles, triangle, quadrilaterals,**	**Recall of the statements of BPT and its converse.: (5 min)** Teacher asks the following questions and testing the previous knowledge: 1. In given triangles, when can we apply BPT? 2. If a line is parallel to one side of a triangle, what can we conclude about the other sides? 3. If a line divides two sides of a triangle in same ratio, then how is this line inclined to the third side? **SAS Similarity:** Teacher conveys that, as per SAS Similarity, [If one angle of a triangle is equal to one angle of another triangle and		**SAS Similarity**

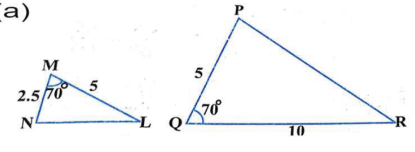
circles, area-related theorems for triangles and parallelograms	the sides including these angles are proportional then the two triangles are similar]. **ACTIVITY: (Pair work) (15 min)** Teacher makes the students into pairs the students in pairs and asks the students to draw two different triangles ABC and DEF with the following measurements: AB=2cm, $\angle A = 50^0$, AC=4cm, DE=3cm, $\angle D = 50^0$and DF=6cm.  Teacher asks the students to calculate the ratios AB/DE and AC/DF. Teacher asks the students to measure lengths of BC and EF and calculate ratio BC/EF, and check whether this ratio equals with the previous ratios or not. Measure $\angle B$, $\angle C$, $\angle E$ *and* $\angle F$ and check the equality of corresponding angles in the two triangles. (Teacher Note: Teacher should facilitate the students in reaching the equality of corresponding angles by any means) Teacher concludes that if one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional then the two triangles are similar. **<u>SAS Similarity Theorem: (20 min)</u>** If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional then the two triangles are similar. Proof: Teacher draws two triangles ABC and DEF such that $\angle A = \angle D$ and AB/DE = AC/DF (<1).	Assignment: Repeat the activity with another two triangles with other angle other side measurements such that same given conditions are met and verify the result.	**https://www.youtube.com/watch?v=5UQilNhg8ql** **(Tic TacLearn)** **https://www.youtube.com/watch?v=YWOEawNDR10** SAS criterion of similar triangles **(3 to 4 min. Tic TacLearn videos on SAS Criteria)**

	 Teacher marks points P, Q on DE, DF respectively such that AB=DP and AC=DQ and joins P, Q. Teacher explains the proof by asking questions. 14. Are the triangles ABC and DPQ congruent? Why? What conclusions we get here about other angles and sides? 15. Is PQ//EF? Why? (Teacher Note: Teacher should give chance to students to discuss and answer) 16. Is $\angle P = \angle E$? and $\angle Q = \angle F$? 17. Compare these angle results with the previous angle results to arrive at $\angle B = \angle E$? and $\angle C = \angle F$. 18. What do you get about all the angles of the two triangles ABC and DEF? Are they similar? Why? (Teacher Note: Teacher should ensure that students are able to apply AAA Similarity) Teacher concludes that "If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional then the two triangles are similar."	Assignment: Deduce the proof if AB/DE = AC/DF (>1).	

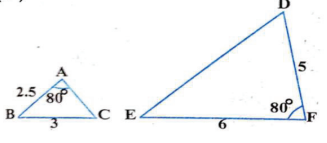
Summative assessment plan- only where relevant

3. Among the pairs of triangles given, check whether the triangles are similar or not .

(a)



(b)



Teachers' reflections and experiences:

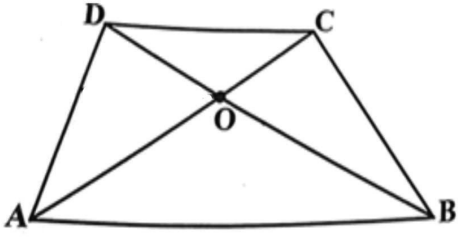
1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

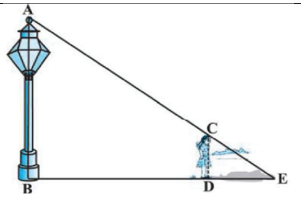
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Triangles
Total no. of periods for this chapter: 9
Period no: 8/9
Sub Topic: Numerical and theoretical applications on Criterion for Similarity of Triangles

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-4.1: Describes relationships including congruence of two-dimensional geometric shapes (such as the lines angles triangles) to make and test conjectures and solve problems **C-4.2: Proves theorems using Euclid's axioms and postulates for triangles and quadrilaterals, and applies them to solve geometric problems** **C-7.3: Proves theorems using Euclid's axioms and postulates - for angles, triangle, quadrilaterals,**	**Recall of the statements of BPT and its converse.: (10 min)** Teacher asks the following questions and testing the previous knowledge: 1 Teacher displays a pair of triangles with equal angles and asks whether they are similar? Teacher restates the AAA similarity. 2 Teacher asks student about other similarity criteria for the recall. (Teacher Note: Teacher should ensure that the student recollects SSS and SAS criteria.) **PROBLEM 1: (15 min)** Teacher displays a problem on IFP / Green Board.	1. What is AA similarity?	https://www.youtube.com/live/WRVgTZSuzZE?si=uNBq2OPNOZDh **(38 min. Vedantu**

circles, area-related theorems for triangles and parallelograms	Diagonals AC and BD of a trapezium ABCD with AB//DC intersect each other at point O. Using a similarity criterion of two triangles, show that $\frac{OA}{OC} = \frac{OB}{OD}$. Teacher asks the students to draw a trapezium ABCD with AB//DC. Join diagonals AC and BD and mark the intersecting point as O. Teacher makes the student identify the relation to be proved here, $\frac{OA}{OC} = \frac{OB}{OD}$.  Teacher makes the students prove the desired result and asks few questions wherever necessary. 1. What makes $\frac{OA}{OC} = \frac{OB}{OD}$? 2. What are conclusions derived from AB//DC? 3. What triangles are similar here? And how? At the end, teacher explains the entire process of the proof, to conclude. **PROBLEM 2: (15 min)** **Teacher makes the student into groups and ask them to solve.** A girl of height 90 cm is walking away from the base of a lamp post at a speed of 1.2 m/s. If the lamp post is 3.6 m above the ground, find the length of her shadow after 4 seconds. Teacher asks the students to visualize and draw a relevant diagram from the given data.	1. In trapezium ABCD, AB//DC, diagonals intersect at O. If OA=2x-3, OB=5, OC=x+1 and OD=10, then find x.	**video on Similar Triangles in one shot)**

	 Teacher asks to label the sketch and list the available information and what to find here. CD=90cm, AB=3.6m, DE=? Teacher makes the students observe that the heights in the two triangles are known whereas the base lengths are known. Teacher asks the students to relook at the question for any additional information that can help them find base lengths. BD= Distance travelled in 4 seconds at 1.2 m/s = (1.2 m/s)x(4 s) = 4.8 m Teacher asks students to notice any relationship between the heights and bases. (Teacher Note: Teacher should ensure that the students identify AA similarity in triangles ABE and CDE) Teacher asks the students to write the relationship and use it to find the unknown, DE.	Assignment: Repeat the activity with another two triangles with other angle other side measurements such that same given conditions are met and verify the result. 1. How many centimeters for 1 meter.? 2. What is the relation between distance, speed and time?	

Summative assessment plan- only where relevant

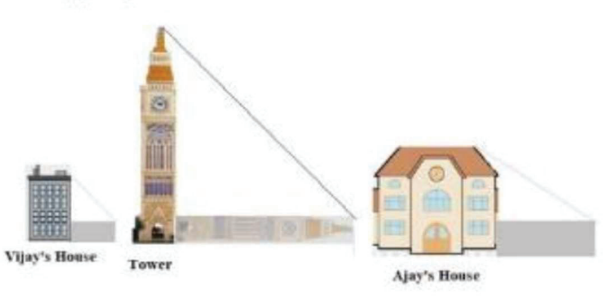
1. A vertical pole of length 6 metres casts a shadow 4 metres long on the ground and at the same time a tower casts a shadow 28 metres long. Find the height of the tower.
2. Malik is standing outside in the sun. Malik is 72 feet tall and his shadow is 60 feet long. Sulekha is standing near Malik. Sulekha's shadow is 56 feet long. Draw a diagram to represent this situation and use it to calculate Sulekha's height.

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th **Chapter: Triangles** **Total no. of periods for this chapter: 9** **Period no: 9/9** **Sub Topic: Numerical and theoretical applications on Criterion for Similarity of Triangles**			
Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
	Teacher introduces the case based or situation-based questions. And discussed with the students 40min **CASE STUDY 1:**  Vijay is trying to find the average height of a tower near his house. He is using the properties of similar triangles. The height of Vijay's house if 20m when Vijay's house casts a shadow 10m long on the ground. At the same time, the tower casts a shadow 50m long on the ground and the house of Ajay casts 20m shadow on the ground.		

1. What is the height of the tower?

a) 20m b) 50m c) 100m d) 200m

2. What will be the length of the shadow of the tower when Vijay's house casts a shadow of 12m?

a) 75m b) 50m c) 45m d) 60m

3. What is the height of Ajay's house?

a) 30m b) 40m c) 50m d) 20m

4. When the tower casts a shadow of 40m, same time what will be the length of the shadow of Ajay's house?

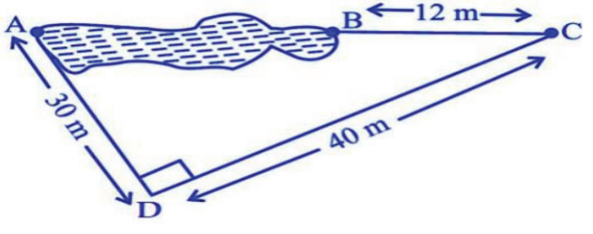
a) 16m b) 32m c) 20m d) 8m

5. When the tower casts a shadow of 40m, same time what will be the length of the shadow of Vijay's house?

a) 15m b) 32m c) 16m d) 8m

CASE STUDY 2:

Rohan wants to measure the distance of a pond during the visit to his native. He marks points A and B on the opposite edges of a pond as shown in the figure below. To find the distance between the points, he makes a right-angled triangle using rope connecting B with another point C are a distance of 12m, connecting C to point D at a distance of 40m from point C and the connecting D to the point A which is are a distance of 30m from D such the ADC=$90^{0.}$



	1. Which property of geometry will be used to find the distance AC? a) Similarity of triangles b) Thales Theorem c) Pythagoras Theorem d) Area of similar triangles 2. What is the distance AC? a) 50m b) 12m c) 100m d) 70m 3. Which is the following does not form a Pythagoras triplet? a) (7,24,25) b) (15,8,17) c) (5,12,13) d) (21,20,28) 4. Find the length AB? a) 12m b) 38m c) 50m d) 100m 5. Find the length of the rope used. a) 120m b) 70m c) 82m d) 22		

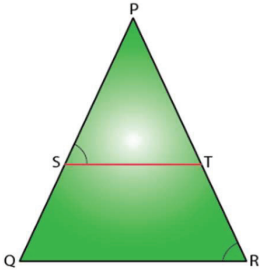
Summative assessment plan- only where relevant

Teachers' reflections and experiences:

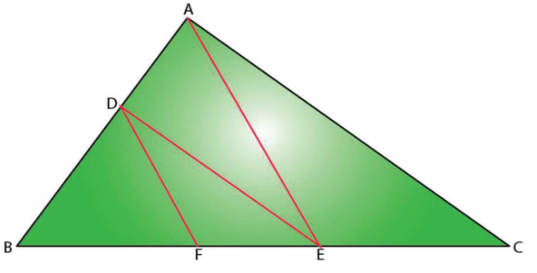
1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students

WORKSHEET – I

1: In the given figure, PS/SQ = PT/TR and ∠ PST = ∠ PRQ. Prove that PQR is an isosceles triangle.



2: In the figure, DE // AC and DF // AE. Prove that BF/FE = BE/EC.



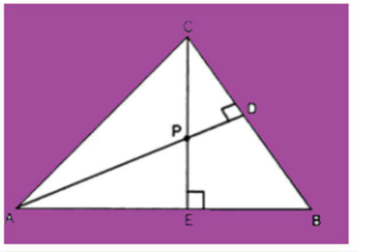
3: In the given figure, altitudes AD and CE of Δ ABC intersect each other at the point P. Show that:

(i) ΔAEP ~ Δ CDP

(ii) ΔABD ~ Δ CBE

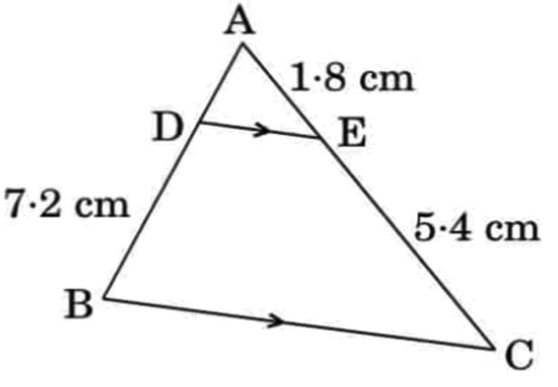
(iii) ΔAEP ~ ΔADB

(iv) Δ PDC ~ Δ BEC



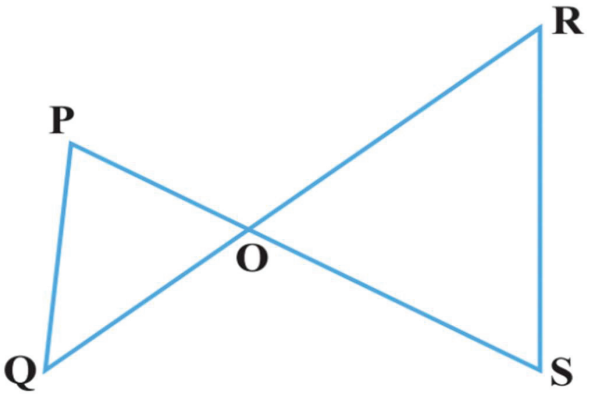
4: A vertical pole of length 6 m casts a shadow 4 m long on the ground and at the same time a tower casts a shadow 28 m long. Find the height of the tower.

5: In the figure, DE || BC. Find the length of side AD, given that AE = 1.8 cm, BD = 7.2 cm and CE = 5.4 cm.



WORKSHEET – 11

1. In the figure, if PQ || RS, prove that Δ POQ ~ Δ SOR.



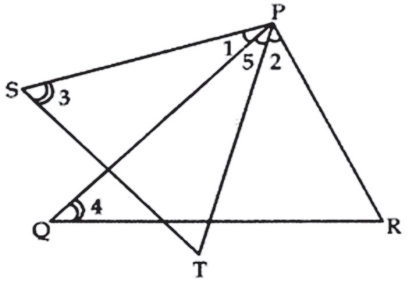
2. A foot of a 10 m long ladder leaning against a vertical wall is 6 m away from the base of the wall.

   Find the height of the point on the wall where the top of the ladder reaches.

3. Diagonals AC and BD of a trapezium ABCD with AB || DC intersect each other at the point O.

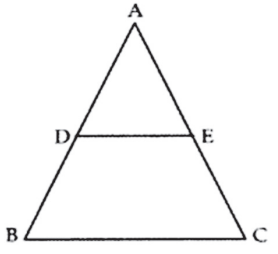
   Using a similarity criterion for two triangles, show that OA/OC = OB/OD.

4. In fig., ∠1 = ∠2 and ∠3 = ∠4. Show that PT. QR = PR. ST.



5. In $\triangle ABC$, D and E are the points on the sides AB and AC respectively such that DE || BC.

If AD = 6x – 7, DB = 4x – 3, AE = 3x – 3, and EC = 2x – 1 then find. the value of 'x'.



SCALE FACTOR

Case study:

A scale drawing of an object is the same shape at the object but a different size. The scale of a drawing is a comparison of the length used on a drawing to the length it represents. The scale is written as a ratio. The ratio of two corresponding sides in similar figures is called the scale factor

Scale factor= length in image / corresponding length in object

If one shape can become another using revising, then the shapes are similar. Hence, two shapes are similar when one can become the other after a resize, flip, slide or turn. In the photograph below showing the side view of a train engine. Scale factor is 1:200

This means that a length of 1 cm on the photograph above corresponds to a length of 200cm or 2 m, of the actual engine. The scale can also be written as the ratio of two lengths.

1. If the length of the model is 11cm, then the overall length of the engine in the photograph above, including the couplings (mechanism used to connect) is:

a) 22cm b) 220cm c) 220m d) 22m

2. What will affect the similarity of any two polygons?

a) They are flipped horizontally b) They are dilated by a scale factor

c) They are translated down d) They are not the mirror image of one another.

3. What is the actual width of the door if the width of the door in photograph is 0.35cm?

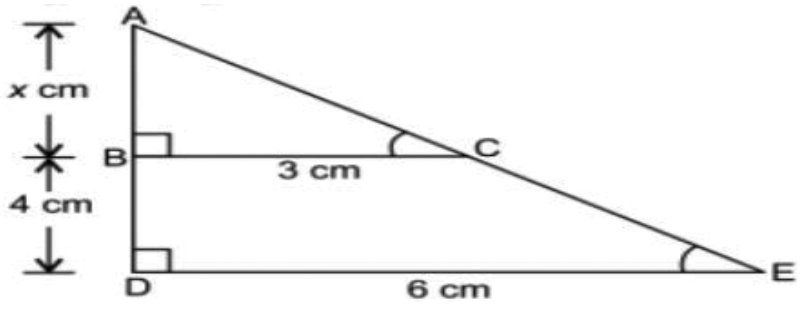
a) 0.7m b) 0.7cm c) 0.07cm d) 0.07m

4. If two similar triangles have a scale factor 5:3 which statement regarding the two triangles is true?

a) The ratio of their perimeters is 15:1 b) Their altitudes have a ratio 25:15

c) Their medians have a ratio 10:4 d) Their angle bisectors have a ratio 11:5

5. The length of AB in the given figure:



a) 8cm b) 6cm c) 4cm d) 10cm

Class 10

1062CH07

Link

Chapter Name – Co-ordinate Geometry

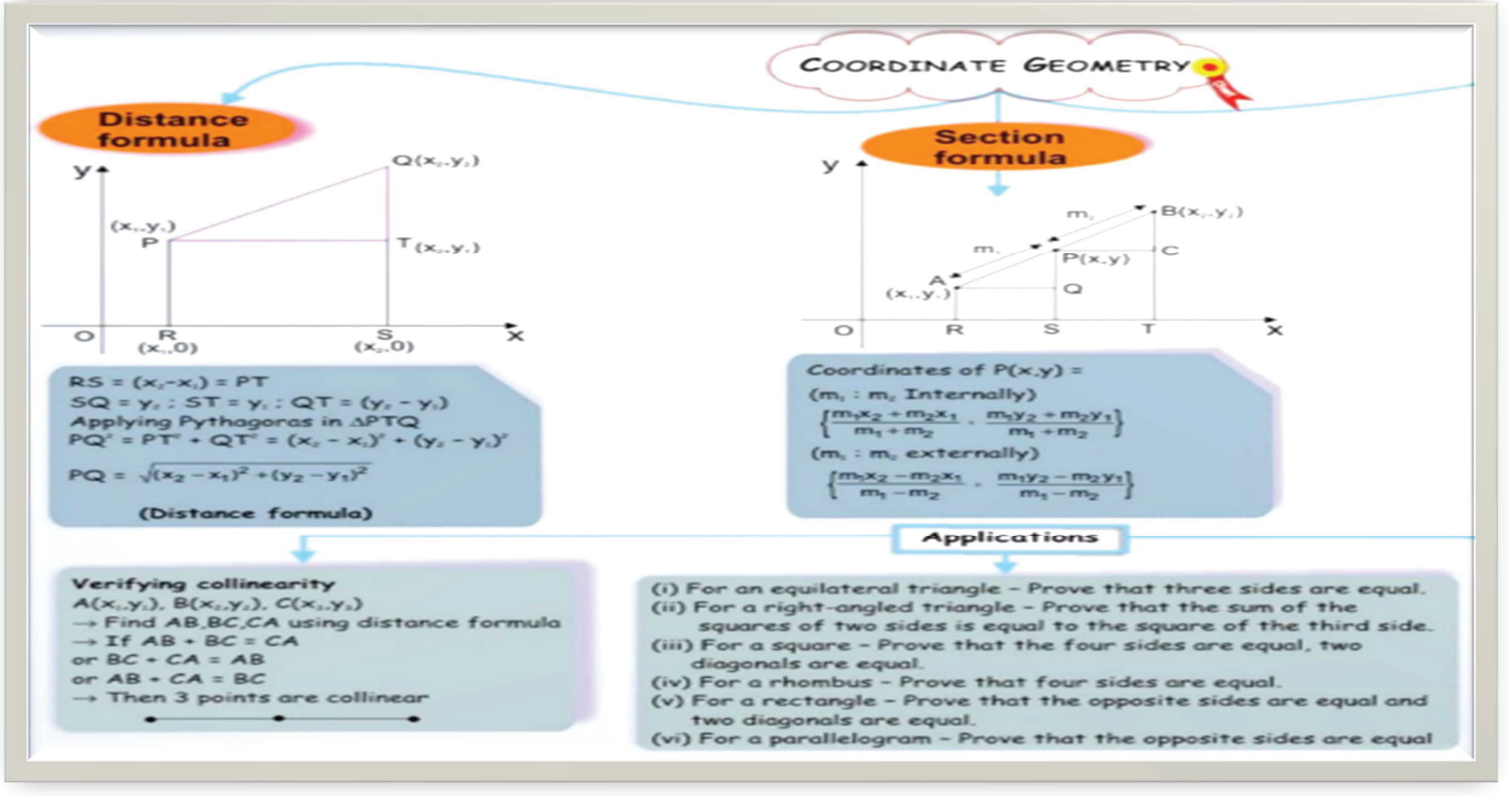
Chapter Plan (Unit plan/ lesson plan)

THE FOLLOWING CIRCULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPTER

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-4: Analysis characteristics and properties of two-dimensional geometric shapes and develops mathematical arguments to explain geometric relationships	**C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices**
CG-7: Begins to perceive and appreciate the axiomatic and deductive structure of Mathematics	**C-7.2: Visualizes and appreciates geometric proofs for algebraic identities and other proofs without words**

Class 10

MIND MAP



Class 10

Period Wise Plan

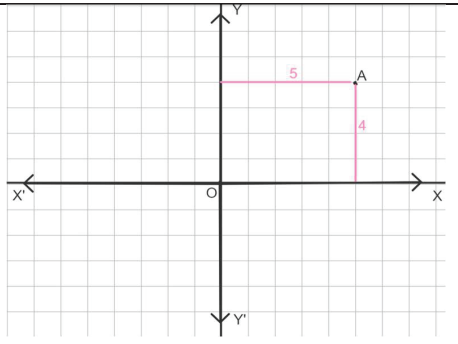
Period Number	Teaching Topics	Learning outcomes
1	Introduction to co-ordinate geometry	Students will learn how to plot points on a coordinate plane using ordered pairs (x, y) and understand the significance of each coordinate in locating a point.
2	Distance formula	Students will learn and apply the distance formula to find the distance between two points on the coordinate plane.
3	Problems based on distance formula	Enable to learners to think critically and solve problems based on Distance formula and used a multidisciplinary perspective
4	Section formula and midpoint formula	Students will learn and apply the section formula for find out the points on the line segment from the given ratio. Additionally, they will understand and use the midpoint formula to find the midpoint between two points.
5	Problems based on section formula	Enable to learners to think critically and solve problems based on section formula and used a multidisciplinary perspective
6	Problems based on midpoint formula	Enable to learners to think critically and solve problems based on midpoint formula and used a multidisciplinary perspective

Class 10

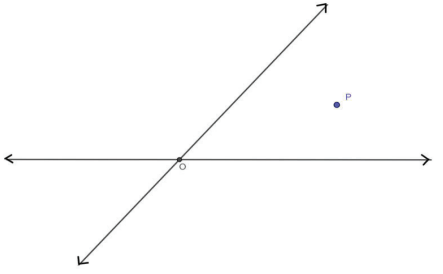
Period plan (40 mins class)

Class: 10th **Chapter: Coordinate Geometry** **Total no. of periods for this chapter: 6** **Period no: 1** **Sub Topic: Recapitulation of previous knowledge on Coordinate Geometry and Introduce the topic of Coordinate Geometry of Class 10.**			
Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
Students will learn how to plot points on a coordinate plane using ordered pairs (x, y) and understand the significance of each coordinate in locating a point.	Teacher asks the following questions and tests the previous knowledge: (10 min) 1. By plotting a point, A "." on the board, teacher asks the students, can you identify the exact location of the point on the board! Be open to the responses given by the students. And ask for the ways they arrived at. 2. Teacher conveys that we require a clear reference to be very precise. (Teacher Note: Teacher should ensure that there is a need of Coordinate axes to find the exact location of the given point.)	1. Can you locate a point with the following reference axes?	Grid Paper or Graph paper and stationery

Class 10



3. Teacher asks the students to identify the location of point A by observing the above figure. (Teacher Note: Teacher should ensure that the students identify the distance of the point A from x-axis is 4 units and from y-axis is 5 units)
4. Teacher asks the students to represent the position of the point A in terms of ordered pair. [Teacher Note: Teacher should ensure that students identify the distance from y-axis as x-coordinate (abscissa) and distance from x-axis as y-coordinate (ordinate) and place these as an ordered pair (5,4) to represent the position of point.]
5. Teacher asks the students; can you say the location of intersecting point of the two axes? (Teacher Note: Teacher should ensure that the students respond as (0,0) and make the students recall that it is called Origin.)



If possible, how can you? Explain!

2. What is the horizontal line and vertical line called?
3. What is the relation between these two lines?
4. What if the two lines are intersecting other than 90^0?

ACTIVITY 1: Game – Hit or Miss (15 min)

Material Required: Grid Paper or Graph Paper.
Process: Three persons A, B and C participate in this game. Person A will shade a 3x3 square box in his/her grid paper and wouldn't show it. And He/She will give clue in which quadrant it is in.
Person B will think and give a pair of coordinates and then Person A will say HIT if it is in or on the box, if not, he/she will say MISS. The process continues until Person A says HIT. Person C will observe how they are playing the game.

ACTIVITY 2 (15 min)

Teacher asks the students to write the coordinates of the points given in the figure.

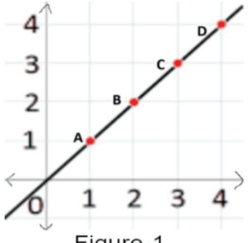


Figure-1

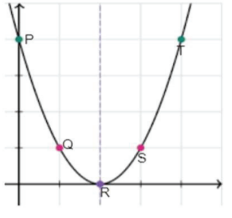


Figure-2

(Teacher Note: Teacher should facilitate students in identifying the coordinates of

5. Try the activity given in Text Book page number 99, under 2nd paragraph.

6. Plot the following points: P(-3,2), Q(-7,-3), R(6,-3) and S(2,2).
Join them in the given order to form a quadrilateral, and find its area.

7. Plot the following points on the graph sheet containing coordinate axes: A(1,3), B(-2,2), C(-4,1), D(-5,0), E(-4,-1), F(-2,2), G(1,-3), H(8,0), I(11,-3), J(10,0), K(11,3), L(8,0), M(2,2) and N(3,4) and join them in the given order. Also, plot another point P (-3,1) and circle it. What beautiful figure do you obtain?

	points with the technique learnt in previous class.) Questions to discussion: 1. Name the shape of the graphs in the figures given above. 2. Identify the type of graphs they represent. 3. Write the standard forms of equations these graphs represent. Teacher concludes that Coordinate Geometry has been developed as an algebraic tool for studying geometry of figures. It helps us to study geometry using algebra and understand algebra with the help of geometry. Teacher also communicates that Coordinate Geometry is widely applied in various fields such as Physics, Engineering, Navigation, Seismology and Arts.		

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

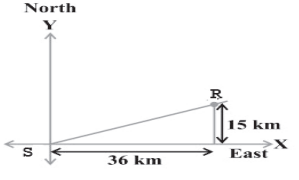
- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

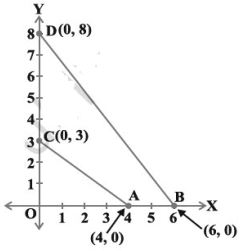
Class 10

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 7th
Chapter: Co-ordinate Geometry
Total no. of periods for this chapter: 06
Period no: 02
Sub Topic: DISTANCE FORMULA

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices.	7.2 Distance formula **Activity 1:** (10 min) Teacher asks the students to take a piece of paper and draw the given situation. • A town 'R' is located 36 km east and 15 km north of town 'S'. How would you find the distance from town S to town R without actually measuring it? • Students may draw the picture otherwise the teacher will give the graphic representation as shown in the fig.		**Graph sheets, GeoGebra, stationary.**
C-7.2: Visualizes and appreciates geometric proofs for algebraic identities and other 'proofs without words. **Learning outcome:** Students will learn and apply the distance formula to find the distance between two points on the coordinate plane.	 Teachers asks which property you will use to find the distance between S and R. Let us see another situation	1. Find the distance between the point A (7,3) and B (-4,3) 2. Find the distance of the point P (3, -4) from the origin.	https://youtu.be/z9gYxFV23I0?si=du_SFI6uWk90o3si 25 min. video of KVR

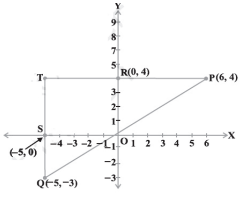
	 1. Suppose two points lie on the x-axis can you find the distance between them? 2. Consider two points A (4,0) and B (6,0) in the given figure. Now what is the distance between them? 3. Now, suppose we take two points on the y-axis. Then find the distance between them? 4. If the points C (0,3) and D (0,8) lie on the y-axis then what is the distance? 5. Next can you find the distance of A from C and the distance of B from D. Now If we consider two points not lying on co-ordinates axis, can we find the distance between them? • Let us take two points P(4,6) and Q(6,8) • Can you identify in which Quadrant they are located? • How can you apply Pythagoras theorem to find the distance between them? • Is it necessary to construct something (Teachers note: Teacher has to ensure that the student should know to draw PR and QS perpendicular to the x-axis form P and Q respectively and also draw a perpendicular from P on QS to meet QS at T) • Teacher asks, can you give the co-ordinates of R and S • What is the distance between R and S • Also, what is the distance between QS and PR + TR mark the distance of PT and QT		MATHS ACADEMY regarding Introduction & Distance formula

- Now apply the Pythagoras theorem and calculate the distance between PQ and give the answer.

Activity 2: **(10 min)**

Teacher asks how will you find the distance between two points in two different quadrants?

Let us see one more situation



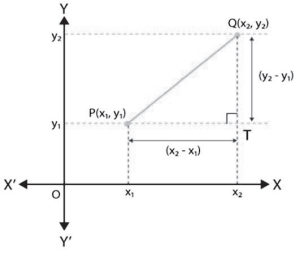
1. Consider the point P (6,4) and Q (-5, -3) now find the distance between these two points
2. Is there any idea how to find?

(Teachers note: Teacher has to ensure that the student identifies to draw QS perpendicular to x-axis also draw a perpendicular PT from the point 'P' on QS to meet y-axis at the point 'R')

3. Now find the length of PT and QT. Join QB use Pythagoras theorem. Find the length of QP.

Distance formula: **(20 min)**

Teacher explains the derivation of distance formula by repeating activity 3 with general points P (x_1, y_1) and Q (x_2, y_2).



- Teacher asks the students from fig. If OR=x_1, OS = x_2 then what is the length of RS?

https://www.youtube.com/watch?v=7Pry4wmMBpA

	• Also, if SQ=y_2, ST=PR=y then finds length of QT (Teachers note: Teacher has to ensure that students should identify PT=RS=x_2-x_1 and QT = y_2-y_1) • Teacher asks to apply the Pythagoras theorem in $\triangle PTQ$ (Teachers note: Teacher has to ensure that the students should apply the Pythagoras theorem and will get) $PQ^2 = PT^2 + QT^2$ $= (x_2-x_1)^2 + (y_2-y_1)^2$ $PQ = \sqrt{(x_2 - x_1)^2+(y_2 - y_1)^2}$ Teacher concludes that the distance between any two points P (x_1, y_1) and Q (x_2, y_2) is $PQ = \sqrt{(x_2 - x_1)^2+(y_2 - y_1)^2}$		

Summative assessment plan- only where relevant

1. Example 1 & 2 from Text book page number 102, 103.

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Class 10

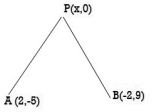
Chapter Plan(Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 7th
Chapter: Co-ordinate Geometry
Total no. of periods for this chapter: 06
Period no: 03
Key concepts: Distance between two points
Sub Topic: Problems based on distance formula

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices. **Learning Outcome:** Enable to learners to think critically and solve problems based on Distance formula and used a multidisciplinary perspective	**Teaching learning process activity 1: (10 min)** Teacher gives the following activity to test the previous knowledge of the students Match the following by calculating the distance between the points. Points — Distance 1. A (2,0), B (5,0) — a) $\sqrt{68}$ units 2. M (0,8), N (0,12) — b) $\sqrt{73}$ units 3. P (0,0), Q (-5,7) — c) 3 units 4. S (-5,6), T (3, -0) — d) 4 Units Teacher explains the problems based on the distance formula • Determine if the points (1,5) (2,3) and (-2, -11) are collinear. • To solve the problem teacher asks the following questions. 1. Give some real-life examples for collinear points? 2. Let us name the given points as P (1,5), Q (2,3) and R (-2, -11) (Teachers note: Find the distance between the points i.e. PQ, QR, RP and give instructions to check whether the sum of the lengths of any two distances is equal to the	1. Check the collinearity for the points A (9,6), B (7,4), C (0,3).	**Graph sheets, GeoGebra, stationary.**

	length of the third distance. If so, the given points are colinear.) (Teachers note: Teacher helps the students to solve the problem if necessary) **Activity 2:** **(5 min)** Match the following Quadrilateral type — Properties 1. Square — a) All sides are equal 2. Rectangle — b) Opposite sides are equal 3. Parallelogram — c) All sides are equal, diagonals are equal 4. Rhombus — d) Opposite sides are equal, diagonals are equal **Problem 2:** **(15 min)** Name the type if the quadrilateral formed. If any by the following points and give reasons for your answers. A (-11, -2) B (1,0) C (-1,2) D (-3,0) Teacher asks the students to fund the length of all the sides of quadrilateral by using distance formula i.e. AB, BC, CD, DA and also the length of the diagonals AC, BD. Check the relationship between the sides of the quadrilateral as well as the diagonals and give conclusion. (Teachers note: Teacher helps the students to solve the problem if necessary) **Problem 3:** **(10 min)** Find the point on the x-axis which is equidistant from (2, -5) and (-2,9) Teacher explains the given question by asking the following questions. 1. What is the general form of the point on the x-axis	2. If two vertices of an equilateral triangle be (0,0) (3,√3). Find the third vertex 3. Show that the quadrilateral whose vertices are (1,3) (2,6) (5,7) and (4,-4) is a Rhombus.	https://youtu.be/-qiEb6bPWLQ?si=EUA1Iu3LYkvrndEI 4 min. smart slate video regarding solving problems on distance formula

	 2. Find the distance between the point on the x-axis to the given points A (2, -5) and B (-2,9) i.e., PA, PB 3. Equate the two distances and find the value of variable? (Teachers note: Teacher will help the students while doing calculation if necessary)		

+Summative assessment plan- only where relevant

1. From Ex. 7.1 do the problems 4,5,8,9,10 problems.

Teachers' reflections and experiences:

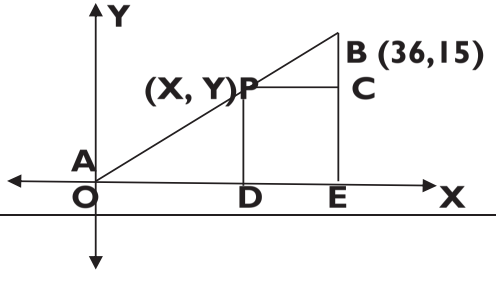
- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Class 10

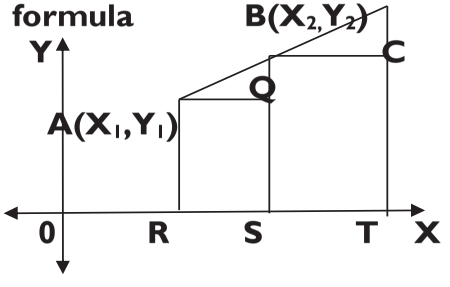
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Coordinate Geometry
Total no. of periods for this chapter: 6
Period no: 4
Sub Topic : 1) Section formula 2) Midpoint formula.

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/ assignments/self-assessment checklists/etc.	Material required
C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices	**Teaching Learning Process** **7.3 Section Formula:** **Activity:** **To understand the concept properly, teacher conducts an activity by giving the following situation. (15 min)**  	**Formative Assessment**	https://youtu.be/KowWdT5IcaQ?si=2ZAe_fUvZquHFTWp

Learning outcome: Students will learn and apply the section formula for find out the points on the line segment from the given ratio. Additionally, they will understand and use the midpoint formula to find the midpoint between two points. **C-7.2: Visualizes and appreciates geometric proofs for algebraic identities and other 'proofs without words**	**Let us recall the situation in Section 7.2 suppose a Telephone Company wants to position a relay tower at 'P' between A and B in such a way that the distance of the tower from 'B' is twice its distance from 'A':** ➢ **If 'P' lies on AB: it will divide 'AB' in the ratio 1:2, if we take 'A' as the origin 'o' and 1Km as one unit on both the axis. The co-ordinates of 'B' will be (36,15) in order to known the position of the tower we must know the position of 'P'.** ➢ **How do we find the position of co-ordinates of 'P'?** ➢ **Teacher asks the students to take the point 'P' as (x, y).** ➢ **Is the given information being sufficient to find the co-ordinates of 'P'.** ➢ **What are the extra constructions we have to do?** **(Teacher's note: Teacher should give instructions to the students, to find the position of 'P' there is a need to draw perpendiculars from 'P' and 'B' to the x-axis meeting it in 'D' and 'E' respectively. Draw PC ⊥ BE)** ➢ **Teacher asks the students from figure find the distances of OD, PC, BC & PD.**		**5 min.** **BIJU'S video explaining section formula** **Material** **Graph sheet** **stationary** **GeoGebra**

	➢ **Teacher asks the students to consider △OPD, and △BPC, and identify which criteria is applicable to prove these two triangles are similar from which that you have already studied in Ch: 6.** ➢ **Check and compare the ratio of the corresponding sides and from the equations.** **[Teachers note: Teacher should ensure that the students should do the calculation properly to get the point 'P' as (12,5)]** **(25 min)** **Teacher concludes that we can check that P (12,5) meets the condition that OP:PB=1:2.** ➢ **By showing this above activity, teacher explain how to obtain the general formula**  **Let us consider any two pints A(x,y) and B(X_2:Y_2) and assume that P(x,y) divide AB, internally in the ratio m_1:m_2 i.e., $\frac{PA}{PB}=\frac{m1}{m2}$ and the procedure we followed for the above activity is applicable for the derive the section formula)**	**1) Find the co-ordinates of a point A, where AB is a diameter of the circle with center (3, -1) and the point B (2,6)** **2) Find the co-ordinates of appoint P which divides the line segment joining the point (4,-3) and (9, 7) internally in the ratio 3:2.**	https://www.youtube.com/watch?v=VvlNYLS4Gys

	Teacher concludes that, so, the co-ordinates of the point P(x,y) which divides the line segment joining the points (x_1, y_1) and (x_2, y_2) is the ratio $m_1:m_2$ is **P(x , y) =($\frac{m1x2+m2x1}{m1+m2}$, $\frac{m1y1+m2y1}{m1+m2}$)** ➢ **(Teachers note: Teacher has to ensure that the student should identify that this formula can also be derived by drawing perpendiculars from A, P and B on the y-axis and proceedings as above)** **Special case:** **Teachers note: Teacher has to ensure that the midpoint of a line segment divide the line in the ratio 1:1. So, the co-ordinates of midpoint 'P'. of the line joining the points $A(x_1,y_1)$ and $B(x_2 y_2)$ is** $(\frac{1X1+1x2}{1+1}, \frac{1Y1+1Y2}{1+1})=(\frac{X1+X2}{2}, \frac{Y1+Y2}{2})$	**3) Find the midpoint of the line joining the points A (7,4) and B (6, -5)**	

Summative assessment plan- only where relevant

Find the coordinates of the point which divides the line segment joining the points (4, – 3) and (8, 5) in the ratio 3 : 1 internally

Teachers' reflections and experiences:

- Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?
- How well did the pedagogical strategies engage students and promote active participation in the learning process?
- How effective were the materials and resources used in this lesson?
- How well did the assessment strategies measure student understanding and achievement of the learning outcomes?

Class 10

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Coordinate Geometry
Total no. of periods for this chapter: 6
Period no: 5
Sub Topic : 1) Problems based on section formula

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/ assignments/self-assessment checklists/etc.	Material required
C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices Learning Outcome: Enable to learners to think critically and solve problems based on section formula and used a multidisciplinary perspective	**Teaching Learning Process** **Techer explain different model problems related section formula** Problem:1 (10 min) Find the coordinates of the points of trisection of the line segment joining (4,-1) (-2,-3). Teacher ask the Students to take any two points P and Q on the line segment joining the points A(4,-1) and B(-2,-3). ➢ (Teachers note: Teacher has to ensure that the student should come to know that Tri sectional point means, two points which divides the given line segment in to three equal parts AP, PQ, QR P divides AB in the ratio 1:2, Q divides AB in the ratio 2:1, 1:2 and 2:1 A P Q B ➢ Teacher explains the question as follows: -		https://youtu.be/XXjEX1hnbgM?si=Hvg_uDA_-_Yb--Ze 17 min. Math e Trics video on Section Formula and Mid-point

C-7.2: Visualises and appreciates geometric proofs for algebraic identities and other 'proofs without words	1) Name the given points as A(4,1) B (-2,-3) asks the Students, to find the co-ordinates of the point 'P'. Which divides the line segment 'AB' in the ratio 1:2, by using section formula? ➢ Also find the co-ordinates of the points 'Q' which divides the given line segments 'AB' in the ratio 2:1 by using section formula. (Teachers note: Teacher should help the students for substituting the values and getting the answer if necessary) Problem: 2 (15 min) Find the ratio in which the line segment joining the points (-3, 10) and (6,-8) divided by (-1,6). ➢ Teacher explains the problem by given the following instructions and asking questions. ➢ Name the given points as A(-3,10) B(6,-8) and let the point P(-1,6) divides line segment in to two parts in the ratio $m_1 : m_2$. ➢ A(-3,10) m_1 P(-1,6) m_2 B(6,-8) ➢ Write the section Formula and substitute the values. ➢ Equate the x co-ordinates and y co-ordinates ➢ Do proper calculation and get the ratio $m_1 : m_2$. (Teachers note: Teacher has to ensure that the student should do the proper calculation to get the answer) Problem 3: (15 min) Find the ratio in which the line segment joining A (1, -5) and B(-4,5) is divided by the x –axis. Also find the co-ordinates of the point of division. ➢ Teacher explains the given problem by giving the following instructions. ➢ Let the ratio in which the line segment joining A (1, -5) and B (-4,5) is divided by the x-axis be K:1. ➢ The co-ordinates of the point of division say		Material Requirement

	P (x, y). ➢ Teacher asks the students to apply the section formula and substitute all the given values. (Teachers note: Teach should give the instructions for the students that the y-co-ordinate of any point on the x-axis is '0') by equating y co-ordinate is '0'. Find the value of K?) Teacher concludes that the x-axis divides the line segment in the ratio 1:1 and the co-ordinates of the point of division P(x, y)=$(\frac{-3}{2},0)$	Formative Assessment 1) Point P divides the line Segment joining the points A(2,1) and B(5,-8) such that $\frac{AP}{AB}=\frac{1}{3}$. If P lies on the line 2x-y+k=0, find the value of k. 2) Find the ratio, in which the y-axis divides the line segment joining the points 3) (5, -6) and (-1,-4). Also, find the point of intersection.	

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

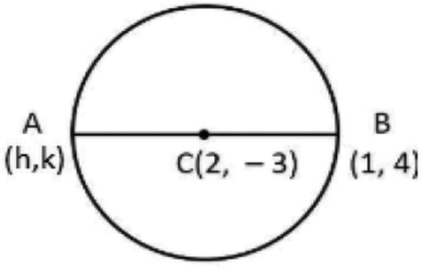
- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

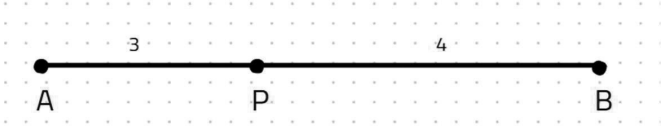
Class 10

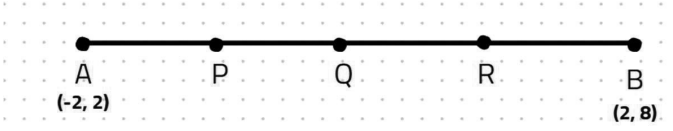
Chapter Plan (Unit plan/ lesson plan)

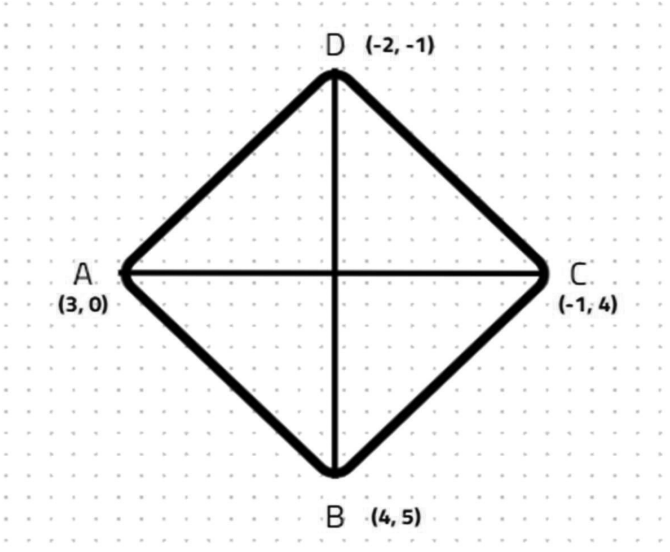
Period plan (40 mins class)

Class: 10th
Chapter: Coordinate Geometry
Total no. of periods for this chapter: 6
Period no: 6
Sub Topic: Problems based on midpoint formula.

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.	Material required
C-4.5: Specifies locations and describes spatial relationships using coordinate geometry, e.g., plotting a pair of linear equations and graphically finding the solution, or finding the area of triangle with given coordinates as vertices **Learning Outcome:** Enable to learners to think critically and solve problems based on midpoint formula and used a multidisciplinary perspective	Problem 1: (10 min) Find the co-ordinate of the point A where AB is the diameter of the circle its center is (2, -3) and B is (1, 4). ➢ Teacher asks the students to represent the given situation with the diagram.  ➢ Take the co-ordinate of the point A be (h, k)	Question no. 1 If (1, 2), (4, y), (X, 6) and (3, 5) are the vertices of a parallelogram taken in order, then find 'x' and 'y'.	

	➢ Midpoint AB is (2, -3) which is center of the circle. ➢ Co-ordinates of B = (1, 4) ➢ Apply the midpoint formula for the points A and B and equate with the point (2, -3) and give the co-ordinates of A. Problem 2: (10 min) If A, B are (-2, -2) and (2, -4) respectively, find the co-ordinates of 'P' such that AP = (3/7) AB and P lies on the line segment AB. ➢ Teacher explains the problem by giving following instructions:  a) The co-ordinates of points A and B are (-2, -2) and (2, -4) respectively. Since AP = (3/7) AB ➢ Find the ratio of AP:PB ➢ Is AP: PB=3:4 (how?) ➢ So in which ratio P divides AB ➢ Apply the section formula for A and B with ratio 3:4, we will get the co-ordinate point P. Problem 3: (10 min)		

	Find the co-ordinates of the point which divides the line segment joining A (-2, 2) and B (2, 8) into four equal parts. ➢ Teacher asks the students to draw the figure for the given condition.  (Teacher Note: Teacher has to ensure that the students should understood the three points P, Q and R are dividing the given line segment into the equal parts, which is AP = PQ = QR = RB) Solve the problem, Teacher asks the students to find co-ordinates of A. Apply midpoint formula for AB. ➢ To find the co-ordinates of P apply the midpoint formula for A and B. ➢ To find the co-ordinates of R apply midpoint formula for Q and B. Problem 4: (10 min) Find the area of a Rhombus, if it is vertices are (3, 0), (4, 5), (1, 4) and (-2, -1), taken in orders.	What is the ratio AP:AB? Write the coordinates of P? P is the midpoint of which line segment? Q is the midpoint of which line segment? R is the midpoint of which line segment?	

	(Teachers Note: the teacher has to ensure that the students should understand the given problem to solve.)  ➢ Teacher asks the students to draw the Rhombus with diagonals. ➢ Find the length of the diagonals AC and BO by using Distance formula. ➢ Write the formula for find the area of Rhombus. Area of Rhombus = (1/2) d1 * d2 Where d: Diagonal of Rhombus. ➢ Substitutes the values ➢ You will get the area of Rhombus. (Teacher Note: teacher should help the students while doing calculation if necessary.		

Summative assessment plan- only where relevant

Solve the problems 3 and 6 from exercise 7.2.

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Worksheet Number 1

Multiple Choice Questions

1. The midpoint of the lie segment AB is (0, 4). If the coordinates of B are (-2, 3) then the coordinates of A are?

   a) (2, 5)
   b) (-2, -5)
   c) (2, 9)
   d) (-2, 11)

2. If the point A is (4, 3) and B is (x, 5) are on the circle with a centre O (2, 3) then the value of an 'x' is?

   a) 0
   b) 1
   c) 2
   d) 3

3. If three points (0, 0), (3, $\sqrt{3}$), and (3, λ) form an equilateral triangle, then λ equals to?

a) 2
b) -3
c) -4
d) None of these

4. The distance between the points (a cosθ + b sinθ, 0) and (0, a sinθ + b cosθ), is

a) $a^2 + b^2$
b) $a^2 - b^2$
c) $\sqrt{a^2 + b^2}$
d) $\sqrt{a^2 - b^2}$

5. If AOBC is a rectangle whose three vertices are A(0, 3), O(0, 0), and B(5, 0), then the length of the diagonal is

a) 5
b) 3
c) $\sqrt{34}$
d) 4

Worksheet Number 2

Short Answer Questions

1. Find the distance of points P(x, y) from the origin.

2. If A is a point on the y-axis, whose ordinate is 3 and coordinates of point B are (-5, 2), then find the distance of AB.

3. P(-2, 5) and Q(3, 2) are two points. Find the coordinates of the points R on PQ such that PR = 2QR.

4. Find the coordinates of the point R on the line segment joining the point P(-1, 3), and Q(2, 5) such that PR = $\frac{3}{5}$PQ.

5. If the coordinates of one end of the diameter of a circle are (2, 3) and the coordinates of its center are (-2, 5). Find the coordinates of the other end of the diameter.

6. In what ratio does the X-axis divide the line segment joining the points (2. -3) and (5, 6)? Also, find the coordinates of points.

7. Find the coordinates of a point A, when AB is the diameter of the circle, whose centre is (4, -3) and B is (2, 6).

8. Find the perimeter of the triangle formed by points (0, 0), (1, 0), and (0, 1).

9. Find the value of k, for which the distance between the points A(k, -5) and B(2, 7) is 13 units.

10. Show that if the circle has its centre at the origin and a point P(5, 0) lies on it, then the points Q (6, 8) lie outside the circle.

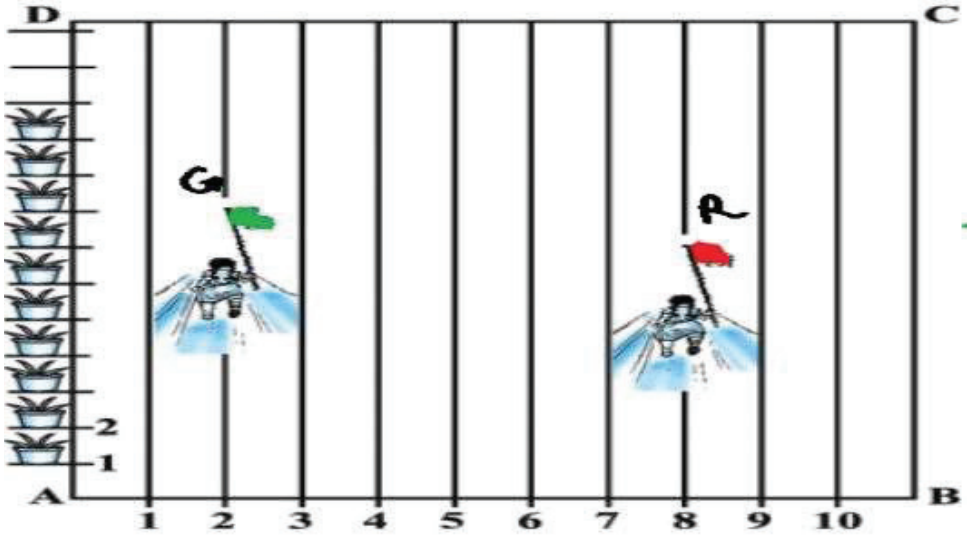
Worksheet Number 3

Case Based Questions

CASE STUDY 1:

In order to conduct Sports Day activities in your School, lines have been drawn with chalk powder at a distance of 1 m each, in a rectangular shaped ground ABCD, 100 flower pots have been placed at a distance of 1 m from each other along AD, as shown in given figure below. Niharika runs 1/4 th the distance AD on the 2nd line and posts a green flag. Preet runs 1/5th distance AD on the eighth line and posts a red flag.

Class 10



1. Find the position of green flag

a) (2,25) b) (2,0.25) c) (25,2) d) (0, -25)

2. Find the position of red flag

a) (8,0) b) (20,8) c) (8,20) d) (8,0.2)

3. What is the distance between both the flags?

a) $\sqrt{41}$ b) $\sqrt{11}$ c) $\sqrt{61}$ d) $\sqrt{51}$

4. If Rashmi has to post a blue flag exactly halfway between the line segment joining the two flags, where should she post her flag?

a) (5, 22.5) b) (10,22) c) (2,8.5) d) (2.5,20)

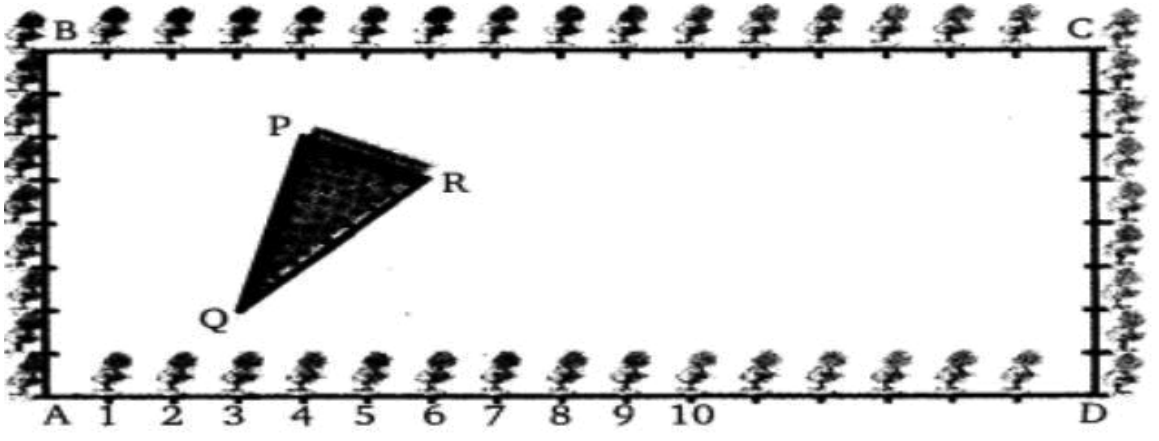
Class 10

5. If Joy has to post a flag at one-fourth distance from green flag, in the line segment joining the green and red flags, then where should he post his flag?

a) (3.5,24) b) (0.5,12.5) c) (2.25,8.5) d) (25,20)

CASE STUDY 2:

The class X students in Krishnagar school have been allotted a rectangular plot of land for their gardening activity. Saplings of Gulmohar are planted on the boundary at a distance of 1 m from each other. There is triangular grassy lawn in the plot as shown in the figure. The students are to sow seeds of flowering plants on the remaining area of the plot.



1. Taking A as origin, find the coordinates of P

a) (4,6) b) (6,4) c) (0,6) d) (4,0)

2. What will be the coordinates of R, if C is the origin?

a) (8,6) b) (3,10) c) (10,3) d) (0,6)

3. What will be the coordinates of Q, if C is the origin?

Class 10

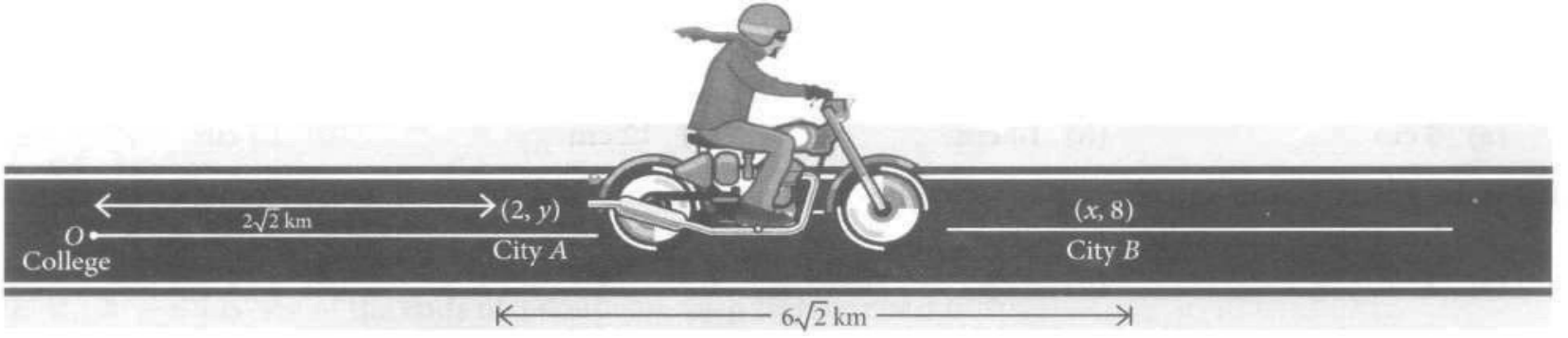
a) (6,13) b) b) (-6,13) c) (-13,6) d) (13,6)

4. Calculate the area of the triangles if A is the origin

a) 4.5 b) 6 c) 8 d) 6.25

5. Calculate the area of the triangles if C is the origin

a) 8 b) 5 c) 6.25 d) 4.5



A person is riding his bike on a straight road towards East from his college to city A and then to city B. At some point in between city A and city B, he suddenly realises that there is not enough petrol for the journey. Also, there is no petrol pump on the road between these two cities.

• Based on the above information, answer the following questions.

(i) The value of y is equal to

(a) 2	**(b) 3**	**(c) 4**	**(d) 5**

(ii) The value of x is equal to

(a) 4	**(b) 5**	**(c) 8**	**(d) 7**

(iii) If M is any point exactly in between city A and city B, then coordinates of M are

(a) 3,3	**(b) 4,4**	**(c) 5,5**	**(d) 6,6**

(iv) The ratio in which A divides the line segment joining the points O and M is

(a) 1:2	**(b) 2.1**	**(c) 3.2**	**(d) 2.3**

(v) If the person analyse the petrol at the point M(the midpoint of AB), then what should be his decision?

(a) Should he travel back to college	**(b) Should try his luck to move towards city B**
(c) Should be travel back to city A	**(d) None of these**

1062CH08

https://epathshala.nic.in/topic-d.php?id=1062CH08

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8. INTRODUCTION TO TRIGONOMETRY

Chapter Plan (Unit plan/ lesson plan)

The following curricular goals (CG) and competencies (C) will be developed through this Chapter

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-4: Analyses characteristics and properties of two-dimensional geometric shapes and develops mathematical arguments to explain geometric relationships**.**	**C-4.6:** Understands the definition of basic trigonometric functions, their history and motivation (including the introduction of sin and cos functions by Aryabhata using chords) and their utility across sciences.

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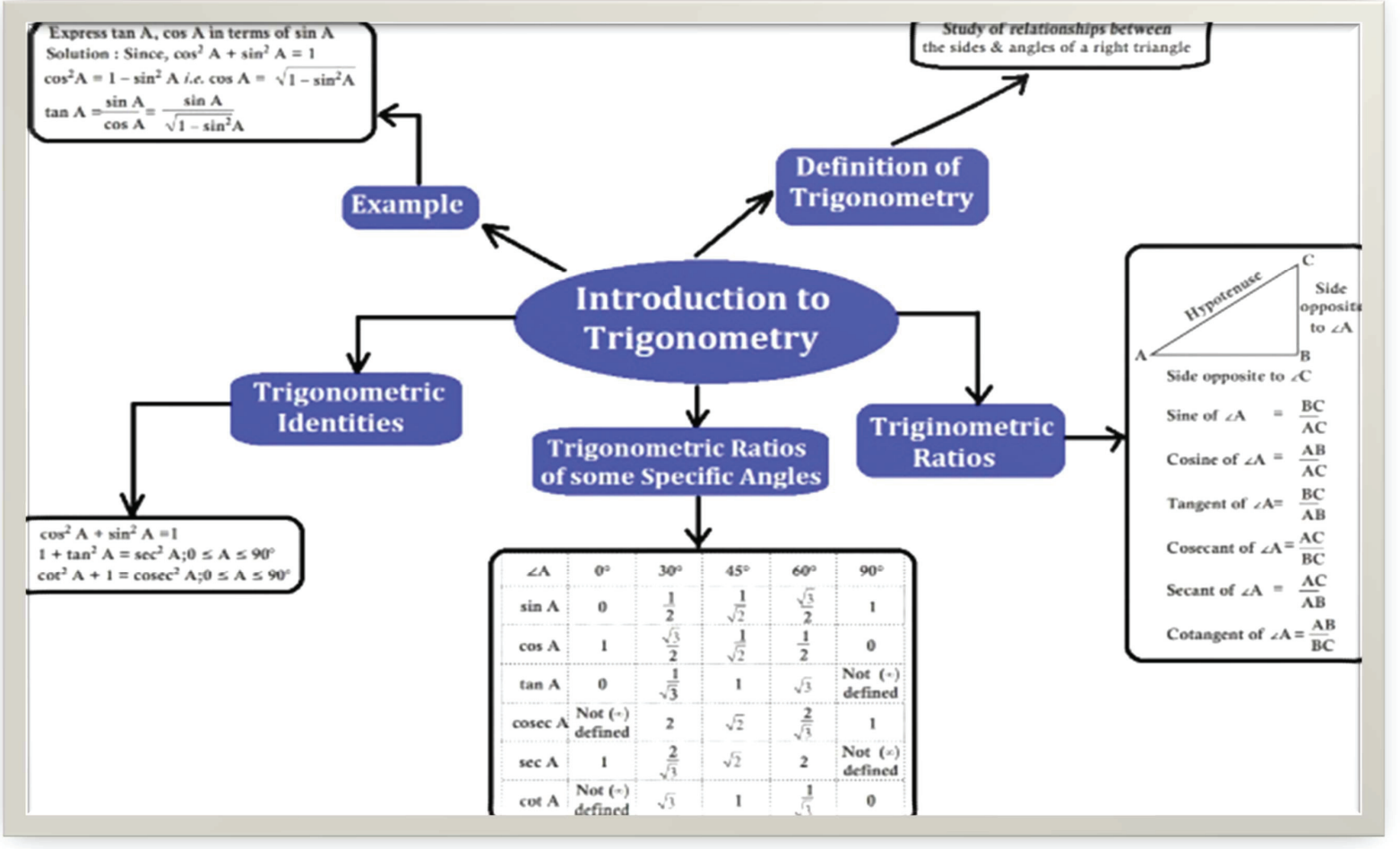
MIND MAP



∠A	0°	30°	45°	60°	90°
sin A	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos A	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan A	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not (∘) defined
cosec A	Not (∘) defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
sec A	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not (∘) defined
cot A	Not (∘) defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

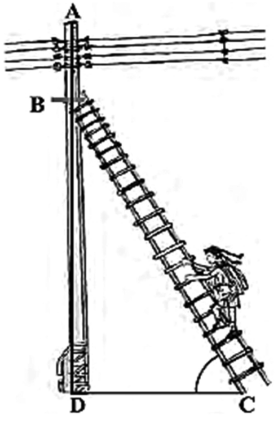
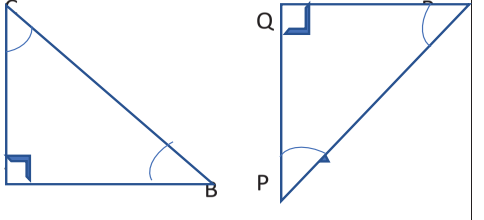
PERIOD WISE PLAN

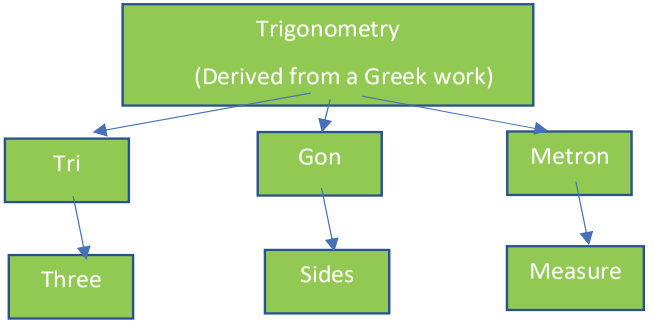
Period No	Teaching Topic	Learning Outcomes
1	Introduction of the Chapter	Identify the right-angled triangle and classify in the daily life situation.
2	Trigonometric Ratios	Determine all trigonometric ratios with respect to an acute angle.
3	Trigonometric Ratios of Angle 45^0	Derives proofs of the trigonometric ratios of 45^0 and apply to solve the problems.
4	Trigonometric Ratios of Specific Angle 30^0 and 60^0	Derives proofs of the trigonometric ratios of 30^0 and 60^0 and apply to solve the problems.
5	Trigonometric Ratios of Specific Angle 0^0 and 90^0	Derives proofs of the trigonometric ratios of 0^0 and 90^0 and apply to solve the problems.
6	Problems on Trigonometric Ratios	Finds a pattern linking the ratio of sides of a triangle with the angles.
7	Trigonometric Identities	Derive proofs of Trigonometric Identities .
8	Problems on Trigonometric Identities	Demonstrate knowledge of several trigonometric identities and use them to verify other identities.
9	Questions on Case Study Based (Worksheet I)	Finds the values of different trigonometric ratios and applies in the given questions.
10	Questions on Case Study Based (Worksheet II)	Determines all trigonometric ratios and identities with respect to a given acute angle and uses them in solving problems.

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th **Chapter: Introduction to Trigonometry** **Total no. of periods for this chapter: 10** **Period no: 1/10** **Sub Topic: Trigonometric Ratios**			
Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences. **Learning Outcome:**	**ACTIVITY-1 (10MINS)** • The teacher shows the images and ask how can we measure: • -Classroom - A person - Eiffel Tower   		

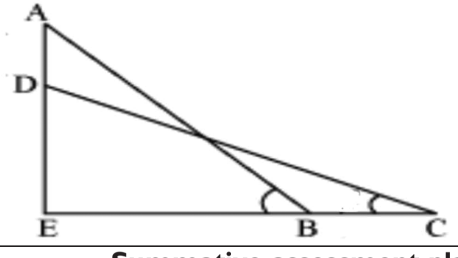
determines all trigonometric ratios and identities with respect to a given acute angle (of a right triangle) and uses them in solving problems	• Teacher noted the relevant answers from the students on the board • Teacher concludes that some of the objects can be measured by measuring instruments but some cannot **ACTIVITY-2: (15MINS)** • Teacher gives a situation: An electrician has to repair an electric fault. She needs to reach the top of the pole to undertake the repair work.  • Teacher asks the students to look at the picture and identify the 2 D shape. • What is the position of the electric pole to the ground? • If the height of the electric pole is x metres. i. Can you find the distance between the electric pole and the ladder on the ground ? ii. At which angle can you place the ladder to keep it stable ? • Talk to your peer and see how can you solve the questions ? • Teacher concludes by saying that the above statement can be solved by Trigonometry which is a branch of Mathematics. **Teacher explains the meaning of the word trigonometry by showing the picture (10MINS)**	 1. Identify Hypotenuse, opposite sides, adjacent sides for the given angles in the given triangles.	



- Trigonometry is the study of relationships between the sides and angles of a triangle. Some ratios of sides of a R.A.T with respect to its acute angles. We will first start with acute angles (0° to 90°).

Activity (5 Mints):

- Teacher takes another situation: A person is white washing the wall (AE) with the help of a ladder (AB) as shown in the figure:
  What will happen if he wants to white wash at a lower point (DE) on the wall,
  (i) What happens to the angle made by the ladder with the ground?
  (ii) What will be the change in the distance EB?



Summative assessment plan-only where relevant

Teachers' reflections and experiences:

1. Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2. How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3. How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

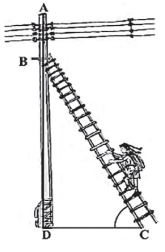
4. How effective were the Materials and resources used in the lesson?

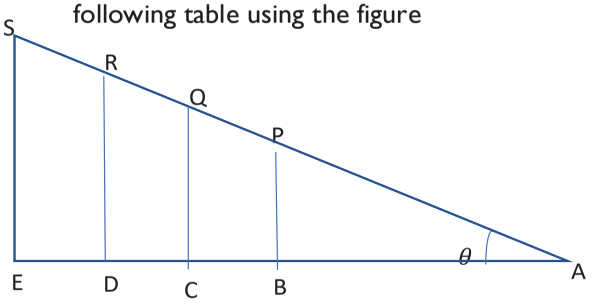
5. Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Introduction to Trigonometry
Total no. of periods for this chapter: 10
Period no: 2/10
Sub Topic: Trigonometric Ratios

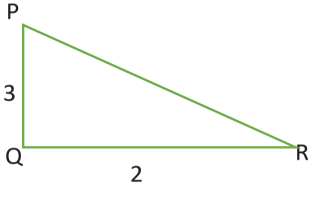
Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.	Material required
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences. **Learning Outcome:** determines all trigonometric ratios and identities with respect to a given acute angle	**Activity -1:** **Teacher recalls the previous class by taking the previous situation (15mins)** • Teacher asks the students to Think, in pair and Share about the questions with their friends - Name the triangle visible in the image. - What is the special name given to BC in your textbook? - Name the ∠BCD. - Mark the side opposite to ∠C - Which side will you mark as opposite to ∠B  **Activity-2:** **Teacher introduces the trigonometric ratios. (10 min)**		https://youtu.be/OY8L9E

(of aright triangle) and uses them in solving problems	•Teacher asks the student to complete the following table using the figure  **Length of the Hypotenuse** | **Length of the Opposite sides** | **Length of the Adjacent side** | **Opposite side / Hypotenuse** | **Adjacent side / Hypotenuse** | | | | | . • The teacher concludes the formulas from ΔPAB: Sine $\theta = \frac{opposite\ side}{Hypotenuse} = \frac{BP}{AP}$ Cos $\theta = \frac{adajacent\ side}{Hypotenuse}$ = AB/AP Tan $\theta = \frac{opposite\ side}{Hypotenuse}$ = PB/AB • Teacher asks the students to find the values of Sin θ, Cos θ, Tan θ for the ΔQAC, ΔRAD, ΔSAE • Teacher introduces the reciprocals of Sine, Cos and Tan Are cosec, sec and cot respectively	• Teacher asks the students to further find the formulas for Cosec θ, Sec θ and Tan θ Match the following Cosecθ $\frac{1}{cot\theta}$ Secθ $\frac{1}{sin\theta}$ Tanθ $\frac{1}{cos\theta}$	kx3QQ?si=sxzp5oLOMmMiQtaG https://youtu.be/UQt0EpCtea0?si=DEluuCdkrCJ5R0zV https://youtu.be/dCiyzp3g01Q?si=IzN2LSipTrKKYpE7 **4 to 6 min. videos from Tic TacLearn English**

	Teacher explains model problems based on trigonometric ratios 15 min **1.Given tan A = $\frac{4}{3}$, find the other trigonometric ratios of the angle A.** Draw relevant right triangle. By definition of tan A find the length of hypotenuse using Pythagoras theorem. Now find remaining trigonometric ratios of angle A using figure. 2. In triangle ABC, right-angled at B, if tan A = 1 , 3 find the value of: (i) sin A cos C + cos A sin C	Write the values of Sin A, Cos A, Sec A, Cosec A and Cot A . 1. State whether the following are true or false. Justify your answer. (i) The value of tan A is always less than 1. (ii) sec A = 12/ 5 for some value of angle A. (iii) cos A is the abbreviation used for the cosecant of angle A. (iv) cot A is the product of cot and A (v) sin θ = 4/ 3 for some angle θ.	

Summative assessment plan-only where relevant

If Tan A= 3/2 then find the value of Cos A? (Given angle Q is 90^0)



Solve exercise 8.1 , 3 , 7 &10 problems

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4.How effective were the Materials and resources used in the lesson?
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

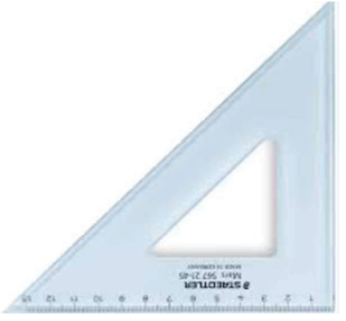
Class: 10th
Chapter: Introduction to Trigonometry
Total no. of periods for this chapter: 10
Period no: 3/10
Sub Topic: Trigonometric Ratios of 45^0

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences.	**The teacher recalls the previous knowledge (5 mins)** **Activity 1 (15 mins)** • The teacher will ask the students to take out their 'set square' from their geometry box • Teacher promotes discussion among peers on the following questions		

Learning OutCome :

determines all trigonometric ratios and identities with respect to a given acute angle (of aright triangle) and uses them in solving problems

- Can you identify the shape of the set square?
- What is the characteristics of the angles formed?
- Can you identify the different angles formed in the set square?
- Measure all the angles formed
- How will you measure all the angles?



- Teacher establishes when one angle is 90° and one of the other angles is 45° then the third angle is necessarily 45° (Since sum of the interior angles are 180°)

Activity 2 (20 mins)

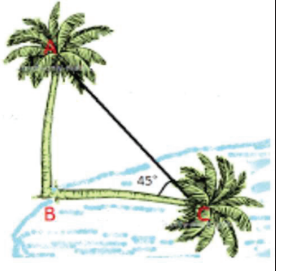
- Teacher gives a situation
- A shadow of a tree has fallen on the river making a shape of the triangle ΔABC
- Ask students why AB= BC
- Teacher mentions the three sides of the triangle as Perpendicular, base, Hypotenuse
- Now we will use P, B, H as short forms for the sides
  - We know Pythagoras theorem says:

    $H^2=P^2+B^2$

    $\Rightarrow H^2=P^2+P^2$ (Since P=B)

    $\Rightarrow H^2=2P^2$

    $\Rightarrow$ H=P$\sqrt{2}$
- Teacher asks the students to
  - substitute all three sides in terms of P means AB=P, BC=P (As AB=BC) and AC= P$\sqrt{2}$
  - represent trigonometric ratios of 45°
  - find out Sin 45° from the above figure (all the sides must be represented in terms of 'P')



- Sin 45°= $\frac{P}{H} = \frac{P}{P\sqrt{2}} = \frac{1}{\sqrt{2}}$

- Find out the remaining ratios of 45°.

https://youtu.be/0mQewnCeXs4?si=SXY_YCRcm6GXS8H-

6 min. Tic TacLearn English video on Trigonometric ratios of angle 45^0

	• Similarly find for Cos 45° and Tan 45 ° - Cos 45°= $\frac{B}{H} = \frac{P}{P\sqrt{2}} = \frac{1}{\sqrt{2}}$ - Tan 45 °= $\frac{P}{B} = \frac{P}{P} = 1$ • The teacher concludes the class by saying reciprocal of Sin θ, Cos θ and tan θ are Cosec θ, Sec θ and Cot θ respectively		

Summative assessment plan- only where relevant

1. **Evaluate:** $\frac{1-tan^2 45°}{1+tan^2 45°}$**=?**

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

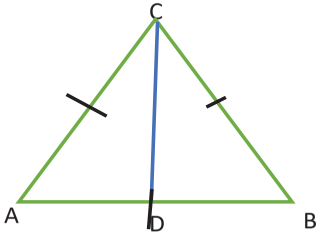
4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Introduction to Trigonometry
Total no. of periods for this chapter: 10
Period no: 3/10
Sub Topic: Trigonometric Ratios of 30^0 and 60^0

Learning Outcomes & Indicators/micro -competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences.	**Group Activity / Individual Activity: (30 min)** Teacher asks the students to construct an equilateral triangle.  • Name the ΔABC • Draw a perpendicular to the base of the Triangle as D • What do you observe? • Name the triangles formed		

Learning OutCome : determines all trigonometric ratios and identities with respect to a given acute angle (of aright triangle) and uses them in solving problems	▪ How many angles can you measure? • The teacher instructed to take each side as '2a' **Ask students to mention the other sides of ΔABC** • Now, consider ΔACD: - How will you find out AD? - Find CD. (Hint: Pythagoras theorem) - You already know the measure of ∠CAD • Teacher notes the relevant answers from the students (AD= a AC=2a CD=$\frac{a\sqrt{3}}{2}$) • Now students will find out Sin 60°, Cos 60°, $\tan 60°$ and their reciprocals • Teacher concludes the values for all the ratios of angle 60° • Teacher again goes back to the triangle and verifies which angle is 30° • When we take ∠ACD, mention the sides of base, Perpendicular and the hypotenuse • Teachers mentions the student to find • Sin 30°, Cos 30°, $\tan 30°$ and their reciprocals	Is CD is perpendicular bisector of AB justify? • Teacher asks the students to further find the formulas for Cosec60°, Sec 60° and cot 60° • Teacher asks the students to further find the formulas for Cosec30°, Sec 30° and cot 30°	 https://www.youtube.com/watch?v=l1X600nR1xA **6 min. Tic TacLearn English video on Trigonometric ratios of angle 30^0, 60^0**

- **Teacher concludes the values for all the ratios of angle 30°**

  Teacher gives a problem for clear understanding for applications of trigonometric values

  Evaluate $\frac{\sin 30+\tan 45-cosec\ 60}{sec30+\cos 60+\cot}$ 10min

- Teacher recapitulates all values of trigonometric ratios.
- Ask them to Substitute the values of the corresponding
- Teacher must guide to solve the problem
- Teacher will conclude by final solution

$=\frac{43-24\sqrt{3}}{11}$

$\therefore \frac{\sin 30+\tan 45-cos\quad 60}{sec30+\cos 60+\cot 45} = \frac{43-24\sqrt{3}}{11}$

Is it right to say
Cos (60° +30°)=cos60^0+sin60^0

State whether the following are true or false. Justify your answer.

(i) sin (A + B) = sin A + sin B.

(ii) The value of sin θ increases as θ increases.

(iii) The value of cos θ increases as θ increases.

(iv) sin θ = cos θ for all values of θ

(v) cot A is not defined for A = 0°

Summative assessment plan- only where relevant

Evaluate $\frac{5\cos^2 60° + 4\sec^2 30° - \tan^2 45°}{\sin^2 30° + \cos^2 30°}$

Teachers' reflections and experiences:

1. Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2. How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3. How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4. How effective were the Materials and resources used in the lesson?

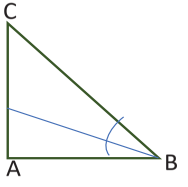
5. Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

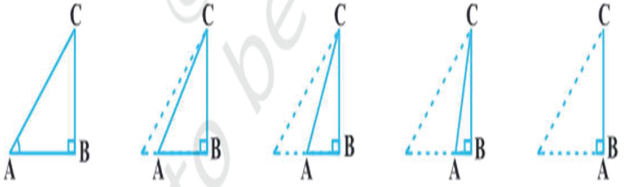
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Introduction to Trigonometry
Total no. of periods for this chapter: 10
Period no: 3/10
Sub Topic: Trigonometric Ratios of 0^0 and 90^0

Learning Outcomes & Indicators/micro -competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences.	Activity 1(10 MINTS): Trigonometric ratios for 0° : • Teacher instructs students to look at the image of the clock  		

Learning OutCome : determines all trigonometric ratios and identities with respect to a given acute angle (of aright triangle) and uses them in solving problems	• What angle is observed in the clock? • What will be the angle when both the hands of the clock overlaps each other? (Teacher note: Help the student to think that as the minutes hands come closer to the hour hand the angle decreases.) • Teacher takes a right-angled triangle ΔABC - What happens to $\angle B$, when BC leans on AB? - If BC leans on AB, then BC=AB. Justify  • Teacher explains (5 Mints): Sin B = $\frac{AC}{BC}$ We know $\angle B$ =0, BC= AB and AC becomes 0 (Teacher note: hypotenuse falls on the base) Then Sin 0°= $\frac{AC}{BC}$= $\frac{0}{BC}$= 0 ⇒ $\boxed{sin0° = 0}$ • Teacher instructs the student to find Cos 0^0, Tan 0^0 and their reciprocals in similar manner **Trigonometric values for 90°(15 Mints)** --- Teacher shows the figures and asks the students to observe and discuss with their peer groups to answer the following:		



- In the above figures can you notice whether all the angles remain same or changing?
- If AC leans on BC which side will diminish?

Teacher describes the above figures with a clear explanation:

Sin A = $\frac{BC}{AC}$ we know $\angle C$ =0°;$\angle A$=90°;AB=0 and AC=BC

(Teacher notes: In this case the hypotenuse falls on the Opposite Side)

⇒ sin 90° =$\frac{BC}{AC}$ =1 (AC = BC)

⇒sin 90° =1

Similarly, cos A= $\frac{AB}{AC}$ =$\frac{0}{BC}$ = 0

Teacher instructs students to find out the remaining ratios.

(15 Minutes

https://youtu.be/TyrM8G1MqiI?si=0zNCU-pKSIbgnNee

Simple mathematical Hand Trick for knowing trigonometric value of Specific values by Speed Math 6 min. video

Assertion:

In right angle triangle ABC and DEF ($\angle C$ =∠F =90°) $\angle B$ and $\angle E$ are acute angles such that sinB=sinE then ∠B =∠E

Reason:

$\Delta ABC \sim \Delta DEF$

Choices:

1. Both A and R are true and R is the correct explanation of A
2. Both A and R are true and R is not the correct explanation of A
3. A is true but R is false
4. A is false but R is true

Teacher puts tabular form and ask the students to fill the remaining:

A	0^0	30^0	45^0	60^0	90^0
Sin A					1
Cos A	1				0
Tan A				$\sqrt{3}$	
Cosec A		2			
Sec A				2	
Cot A	Not Defined				0

https://www.youtube.com/watch?v=hr8_hSIgmOg

6 min. Tic TacLearn English video on Trigonometric ratios of angle 0^0, 90^0

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10^{th}
Chapter: Introduction to Trigonometry
Total no. of periods for this chapter:10
Period no: 6 /10
Sub topic: Trigonometric Identities

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences. **Learning Outcome:** determines all trigonometric ratios and identities with respect to a given acute angle	**ACTIVITY:(10 MINS)** • Teacher writes an equation along with an identity on the board and ask about the differences between them. ○ $(a+b)^2 = a^2+b^2+2ab$ ○ $7a+29b+c=0$ ○ Mention when we will able to define an equation as an identity • Teacher wants some examples from the students on the statement: (10mins) • Teacher gives the statement on identity Every identity is an equation but every equation is not an identity ○ Mention 2 equations to justify the above statement ○ Is resultant of Pythagoras theorem an identity? • Teacher defines the identity equation as an equation that is true for all allowable values of variables involved.	What is an identity explain in your on your words?	

(of aright triangle) and uses them in solving problems	• Thus, when we involve trigonometric ratios of an angle then it is called trigonometric identity
	
	Activity(10mins)
	
	• Teacher asks students to construct a right angled triangle, name it as ABC, sides as p,b,h and ∠CAB as θ
	• Pick out the Pythagoras resultant from the triangle
	  ○ Here it is $h^2=p^2+b^2$.
	• Now teacher inquiries from students the value of Sin θ and Cos θ
	  ○ Sin $\theta=\frac{p}{h}$ -----(i); Cos $\theta=\frac{b}{h}$-----(ii)
	  ○ Now we squaring and adding both equation (i) and (ii):
	  ○ $\text{Sin}^2\,\theta+\text{Cos}^2\,\theta=\frac{p^2}{h^2}+\frac{b^2}{h^2}$
	  $=\frac{p^2+b^2}{h^2}$
	  $=\frac{h^2}{h^2}=1$
	  $\text{Sin}^2\,\theta+\text{Cos}^2\,\theta=1$
	
	• Express the ratio of Cos A, Tan A and Sec A in terms of Sin A. **(10mins)**
	(Teacher's Note: If the students are not able to recall the step-by-step process teacher needs to guide the students)
	- Can you use the above identity to solve the problem?
	- How will you use the identity?
	- Can you represent tan A in terms of Sin A and Cos A?
	- What is the relationship between Cos A and Sec A?
	• Teacher takes the above identity **(10mins)**
	$Sin^2A+Cos^2A=1$
	  - Ask students why is this an identity?
		$\text{Sin}^2\,81^0+\text{Cos}^2\,81^0$?
		
		Prove that $\frac{Sec\,\theta}{Cos\,\theta}-\frac{Tan\,\theta}{Cot\,\theta}=1$
			https://www.youtube.com/watch?v=lc_dC789bO0&t=12s
			
			4 min. Tic TacLearn English video Explaining Trigonometry Identities

	Cos^2A= 1- Sin^2A Cos A =$\sqrt{1 - Sin^2A}$ • Inquire from students why we are representing Cos A in this manner (Teacher's Note: If students are not able to find the connection Teacher will explain Since we are asked to represent the ratios in terms of Sin A, so we need to convert all the values of the ratios in terms of Sin A) • Let us represent Tan A in terms of Sin A and Cos A -We know Sin A = $\frac{P}{H}$ Cos A= $\frac{B}{H}$ -Dividing Sin A by Cos A $\frac{Sin\ A}{Cos\ A} = \frac{P}{H} \Big/ \frac{B}{H} = \frac{P}{H} X \frac{H}{B} = \frac{P}{B}$ = Tan A $\therefore Tan\ A = \frac{Sin\ A}{Cos\ A}$ $Tan\ A = \frac{Sin\ A}{\sqrt{1 - Sin^2A}}$ • Similarly represent Sec A in terms of Sin A • Teacher concludes by summarizing the identity proved in the class	Draw a right triangle right-angled at B. and verify the result Tan A=sin A/Cos A Tanke A=30^0 verify the following. $Tan\ A = \frac{Sin\ A}{\sqrt{1 - Sin^2A}}$	

Summative assessment plan- only where relevant

- Prove the identity where angles involved are acute angles for which the expression is defined:
  $(\text{Cosec}\ \theta - Cot\ \theta\ )^2 = \frac{1-Cos\theta}{1+Cos\ \theta}$

Teachers' reflections and experiences:

1. Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2. How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3. How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

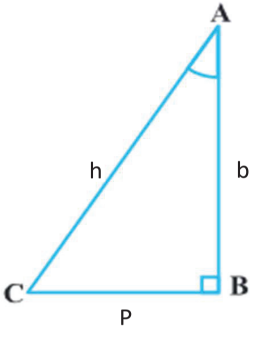
4. How effective were the Materials and resources used in the lesson?

5. Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Introduction to Trigonometry
Total no. of periods for this chapter: 10
Period no: 07/10
Sub Topic: Trigonometric Identities

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences. **Learning Outcome:** determines all trigonometric ratios and identities with respect to a given acute angle	**Activity 1(10 Mints)** Teacher reiterates students to construct a right-angled triangle name it as ABC with sides p, b, h and ∠CAB = θ  1) Pick out the Pythagoras resultant from the triangle. • Here it is $h^2 = p^2 + b^2$ 2) Now teacher inquiries from students the value of sin= θ		https://www.youtube.com/watch?v=lc_dC789bO0&t=12s **4 min. Tic TacLearn English**

(of aright triangle) and uses them in solving problems	and cos= θ sin $\theta = \frac{p}{h}$ --------- (i) ; cos $\theta = \frac{b}{h}$ --------- (ii) 3) Now teacher recapitulates the identities of sin θ and cos θ Let them to write in their note books. **4) Teacher instructs (10 Mints)** • to divide each and every term of the identity by $\cos^2\theta$. • asks the students which term remains? • concludes by explaining as follows: $\Rightarrow \quad Sin^2\theta + Cos^2\theta = 1$ $\frac{sin^2\theta}{\cos^2\theta} + \frac{cos^2\theta}{\cos^2\theta} = \frac{1}{\cos^2\theta}$ $\Rightarrow \quad tan^2\theta + 1 = sec^2\theta$ Teacher emphasizes an example (Teachers Note: If the students are not able to find the connection how to apply the identity) (10 **Min.)** • Prove $\tan^4\theta + \tan^2\theta = \text{Sec}^4\theta + \text{Sec}^2\theta$ • Can you identify the LHS of the Problem? • Which term has to take as common? • How we will use the identity? • How can we express tan θ in terms of sec θ Teacher should ensure the student • to take once again the trigonometric identity of sinθ and cosθ • ask them to divide every term by $sin^2\theta$ • verifies whether all gets same answer • concludes by summarizing the identity of $1+cot^2\theta=cosec^2\theta$ Teacher explains the identity usage to solve the problem)**10 Mints)**		**Video Explaining Trigonometry Identities**

	Prove (v) $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \text{cosec } A + \cot A$, using the identity $\text{cosec}^2 A = 1 + \cot^2 A$. Teacher inquires students to take the left-hand side of the proof tell them to divide each and every term by sin A ask them which term has obtained after doing this convert them in terms of cot A and cosec A (Hint: $\frac{cotA-1+cosecA}{cotA+1-cosecA}$) can we use the above identity in place of 1? ask them $cosec^2\theta$-$cot^2\theta$ is in which form? then from numerator can we take anything as common? After doing this what was the resultant	Can we prove this question in any other way?	

Summative assessment plan-only where relevant

- **Evaluate $\frac{tanA+sacA-1}{tanA-sacA-1}$ using related trigonometric identity**

1. Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?
2. How well did the pedagogical Strategies engage students and promote active participation in the learning process?
3. How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?
4. How effective were the Materials and resources used in the lesson?
5. Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10^{th}
Chapter: Introduction to Trigonometry
Total no. of periods for this chapter:10
Period no: 8 /10
Sub topic: Trigonometric Identities

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences. **Learning Outcome:** determines all trigonometric ratios and identities with respect to a given acute angle	Teacher makes the students recall the concept of trigonometric identity by solving the exercise problems. **(10 Mints)** 1.write trigonometric identities? 2.Express all trigonometric ratios in terms of Sec A Teacher puts a question on the Board. **(15 minutes)** Prove the following identity where the angle involved are acute angles for which the expression is defined. $\frac{\tan\theta}{1-cot\theta}+\frac{\text{Cot}\,\theta}{1-tan\theta}$ = 1+ secθ cosecθ • Teacher asks students to check the ways the two sides may be equated. • Teacher may ask the students to refer the list of all the formulae relevant to identities.	Choose the correct option. justify your choice (i) $9sec^2$A-$9tan^2$A= (A) 1 (B) 2 (C) 8 (D) 0 (II) (1+tanA+secA) (1+cotA-cosecA) = (A) 0 (B) 1 (C) 2 (D) -1 (III) (sec A+ tan A) (1-sin A)= (A)sec A (B) sin A (C) cosec A (D) cos A	https://byjus.com/maths/trigonometric-identities/ **Notes for proof of trigonometric identities**

(of aright triangle) and uses them in solving problems	(Teacher Note: Teacher should ensure that the student identifies multiple ways to start with but specific way makes the task easy) • Teacher may advise few ways at a later stage. One of the ways may be advised as follows: To convert all the given trigonometric ratios in terms of Sine and Cosine and use algebraic computations. • Teacher involves with the students and facilitates students in making the left-hand side simplifies to get: LHS = $\frac{sin^2\theta+sin\theta cos\theta+cos^2\theta)(sin\theta-cos\theta)}{(sin\theta-cos\theta)(sin\theta cos\theta)}$ Teacher guides students to proceed ahead just think how you can reduce this by applying some identity or tricks = $\frac{1+\sin\theta cos\theta}{sin\theta cos\theta}$ = $\frac{1}{sin\theta cos\theta}$ + $\frac{\sin\theta cos\theta}{sin\theta cos\theta}$ = RHS Teacher can also test the understanding of students in the classroom with the help of some such examples. Teacher concludes the class by giving practice problems as homework. (**15 minutes)**		https://www.youtube.com/watch?v=lc_dC789bO0&t=12s **4 min. Tic TacLearn English Video Explaining Trigonometry Identities**

Summative assessment plan- only where relevant

Prove the following identities, where the angles involved are acute angles for which the expressions are defined.

1. (Cosec A – Sin A)(Sec A – Cos A) = $\frac{1}{\tan A+\cot A}$
2. (cosec θ– cot θ)2 = $\frac{1-co}{1+co}$
3. $\frac{Cos\ A}{1+Sin\ A}$ +$\frac{1+Sin\ A}{\cos A}$ = 2 Sec A

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

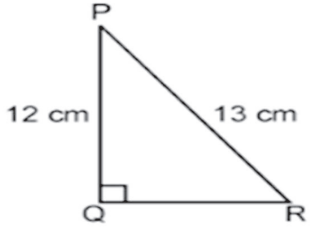
4.How effective were the Materials and resources used in the lesson? **5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Trigonometry
Total no. of periods for this chapter: 10
Period no :9/10
Sub Topic: Case Study Problems

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/self-assessment checklists/etc.**	**Material required**
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences. **Learning Outcome:** determines all trigonometric ratios and identities with respect to a given acute angle	Testing previous knowledge: 5min 1. Express all trigonometric ratios in terms of cosec θ 2. Reciprocal of Cosec θ? 3. Reciprocal of Tan θ? 4. Write all trigonometric identities? Teacher make the students into groups and ask them to solve following questions and present in front of the class 1. Prove that $1+\frac{\cot^2\theta}{1+\operatorname{cosec}\theta}=\frac{1}{\sin\theta}$. 3. Sec θ +tan θ = p *then show that*		

(of aright triangle) and uses them in solving problems	$sin\theta = \frac{p^2 - 1}{p^2 + 1}$ 3. In figure, find tan P − cot R.  4. In a right triangle ABC, right angled at C, if tan θ = 1, then verify that 2 sinθ.cos θ = 1. 5. In ABC, $ABC = 90°$, $AB = 5$ cm and $ACB = 30°$, find BC and AC.		

Summative assessment plan- only where relevant

1. What is the ratio of the length of the sides of a 30-60-90 triangle?
   A. 1:2:3
   B. 1:1:1
   C. 2:3:4
   D. 3:4:5
2. Which of the following is NOT a trigonometric identity?
   A. sin(2x) = 2cos(x)sin(x)
   B. cos2(x) + sin2(x) = 1
   C. tan2(x) + cot2(x) = 1
   D. sin2(x) + cos2(x) = 2

3. What is the relationship between sin(x) and cos(90 – x)?
   A. sin(x) = cos(90 – x)
   B. sin(x) = 1/cos(90 – x)
   C. cos(90 – x) = 1/sin(x)
   D. cos(90 – x) = 1 – sin(x)

4. How many degrees are in a quadrant?
   A. 90
   B. 180
   C. 270
   D. 360
5. If $\sin\theta - \cos\theta = 0$ then the value of is θ
   A. 30^0 B.45^0 C. 90^0 D.0^0

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

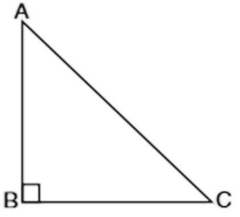
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Introduction to Trigonometry
Total no. of periods for this chapter:10
Period no :10/10

Sub Topic: Competency Based Questions

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/ assignments/self-assessment checklists/etc.**	**Material required**
C: 4.6 Understands the definitions of the basic trigonometric functions and their history and motivation (including the introduction of sin and cos functions by Aryabhatta using chords) and their utility across the sciences. **Learning OutCome :** determines all trigonometric ratios and identities with respect to a given acute angle	Teacher given some higher order thinking-based questions. And also ask the students form into pairs solve the following and present Infront of the class 1. If $\frac{\cos\alpha}{\cos\beta}=m$ and $\frac{\sin\alpha}{\sin\beta}=n$, prove that $(n^2-m^2)\sin^2\beta=1-m^2$ 2. Prove that : $\frac{\tan\theta+1+\sec\theta}{\tan\theta+1-\sec\theta}=\frac{1}{\sec\theta-\tan\theta}$.	1. recall the identity (a^2-b^2) 2. recall identity of $\text{Sin}^2\theta$ + $\text{Cos}^2\theta$=1 3. recall the identity $\text{Tan}^2\theta$ - $\text{Sec}^2\theta$=1 4. recall identity of (a^2-b^2) =(a +b) (a-b)	

(of aright triangle) and uses them in solving problems	3. In the figure, ΔABC is right angled at B, BC = 7 cm and $AC - AB$ = 1 cm. Find the value of $\cos A - \sin A$.  4. Evaluate : $\frac{\tan^2 60^\circ + 4\sin^2 45^\circ + 3\sec^2 30^\circ + 5\cos^2 90^\circ}{\text{cosec}\, 30^\circ + \sec 60^\circ - \cot^2 30^\circ}$ 5. If $\cot\theta = \frac{3}{4}$, prove that $\sqrt{\frac{\sec\theta - \text{cosec}\,\theta}{\sec\theta + \text{cosec}\,\theta}} = \frac{1}{\sqrt{7}}$.	5. What is the angle at ∠B? 6. Ratio of Cos A = $\frac{Adj\ Side}{Hyp}$ 7. Remember the Trigonometric Specific ratios 8. Ratio of Cotθ	

Summative assessment plan- only where relevant

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

WORK SHEET 1

1. If $\sin A + \sin^2 A = 1$, then the value of the expression $(\cos^2 A + \cos^4 A)$ is
   (A) 1 (B) 1/ 2 (C) 2 (D) 3

2. Given that $\sin\alpha = 1/2$ and $\cos\beta = 1/2$, then the value of $(\alpha + \beta)$ is
   (A) 0° (B) 30° (C) 60° (D) 90°

3. The value of $(\tan 1° \tan 2° \tan 3° \ldots \tan 89°)$ is
   (A) 0 (B) 1 (C) 2 (D) 1 /2

4. A pole 6 m high casts a shadow $2\sqrt{3}$ m long on the ground, then the Sun's elevation is
   (A\) 60° (B) 45° (C) 30° (D) 90°

5. $\sin(45° + \theta) - \cos(45° - \theta)$ is equal to (A) $2\cos\theta$ (B) 0 (C) $2\sin\theta$ (D) 1

WORK SHEET 2

Write 'True' or 'False' and justify your answer in each of the following:

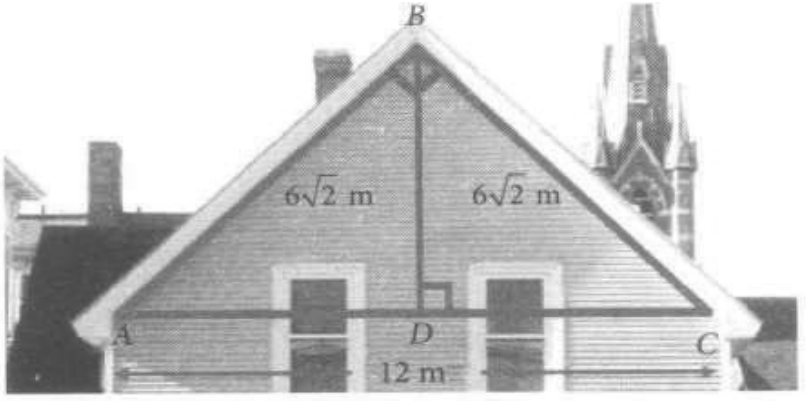
6. $(\tan\theta + 2)(2\tan\theta + 1) = 5\tan\theta + \sec^2\theta$.

7. If the length of the shadow of a tower is increasing, then the angle of elevation of the sun is also increasing.

8. If a man standing on a platform 3 metres above the surface of a lake observes a cloud and its reflection in the lake, then the angle of elevation of the cloud is equal to the angle of depression of its reflection.

WORK SHEET 3

Aanya and her father go to meet her friend Juhi for a party. When they reached to Juhi's place, Aanya saw the roof of the house, which is triangular in shape. If she imagined the dimensions of the roof as given in the figure, then answer the following questions.



(i) If D is the midpoint of AC, then BD =

(a) 2m	(b) 3m	(c) 4m	(d) 6m

(ii) Measure of ∠A =

(a) 30°	(b) 60°	(c) 45°	(d) None of these

(iii) Measure of ∠C =

(a) 30°	(b) 60°	(c) 45°	(d) None of these

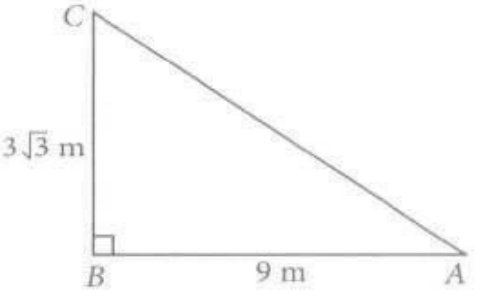
(iv) Find the value of sinA + cosC.

(a) 0	(b) 1	(c) 1/2	(d) $2\sqrt{2}$

(v) Find the value of $\tan^2 C + \tan^2 A$.

(a) 0	(b) 1	(c) 2	(d) 1/2

Three friends – Anshu, Vijay, and Vishal are playing hide and seek in a park. Anshu and Vijay hide in the shrubs and Vishal have to find both of them. If the positions of the three friends are at A, and Band C respectively as shown in the figure, and form a right-angled triangle such that AB = 9 m, BC = 33√3 m, and ∠∠B = 90°, then answer the following questions.



(i) The measure of ∠A is

(a) 30°	(b) 45°	(c) 60°	(d) None of these

(ii) The measure of ∠C is

(a) 30°	(b) 45°	(c) 60°	(d) None of these

(iii) The length of AC is

(a)2√3 m	(b)√3m	(c)4√3m	(d)6√3m

(iv) cos2A =

(a) 0	(b)1/2	(c)1/√2	(d)√3/2

For more reference scan QR code

Q2W7N7

INTRODUCTION

[Go to http://epathshala.nic.in/QR/?id=1062CH09]

[Type or Scan QR Code]

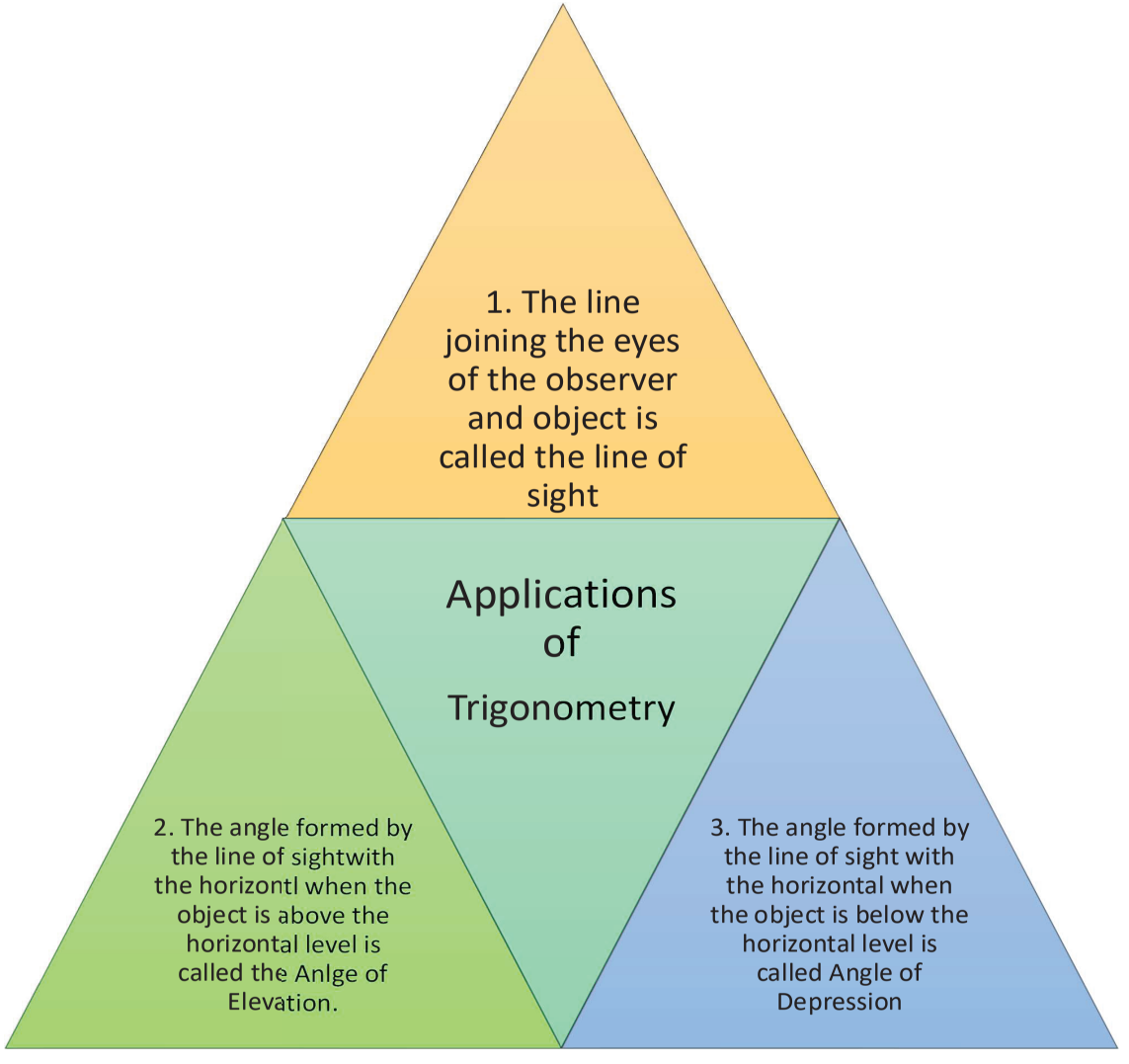
9. SOME APPLICATIONS OF TRIGONOMETRY

Chapter Plan (Unit plan/ lesson plan)

The following curricular goals (CG) and competencies (c) will be developed through this chapter

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-4: Analyses characteristics and properties of two-dimensional geometric shapes and develops mathematical arguments to explain geometric relationships	**C-4.6: Understands the definition of the basic trigonometric functions their history and motivation and their utility across the sciences.**

MIND MAP


1. The line joining the eyes of the observer and object is called the line of sight
Applications of Trigonometry
2. The angle formed by the line of sightwith the horizontl when the object is above the horizontal level is called the Anlge of Elevation.
3. The angle formed by the line of sight with the horizontal when the object is below the horizontal level is called Angle of Depression

PERIOD WISE PLAN

Period No	Teaching Topic	Learning Outcomes
1	Introduction through real life situations to angle of elevation	Develops strategies to apply the concept of elevation to daily life situations
2	Problem solving on angle of Elevation (distances)	Determines all trigonometric ratios with respect to acute angles and uses them in solving problems in daily life contexts like distance from them.
3	Problem solving on angle of Elevation (Heights)	Determines all trigonometric ratios w.r.t acute angles and uses them in solving problems in daily life contexts like heights of different structures from them.
4	Introduction through real life situations to angle of depression	Develops strategies to apply the concept of Angle of Depression to daily life situations
5	Problem solving on angle of Depression	Identifies and classifies to measure lengths and use measurements to determine angle measures
6	Questions on competency Based	Be able to calculate distances and angles using trigonometric ratios
7	Questions on Case Study Based	To apply the knowledge of trigonometric ratios for solving different types of problems.

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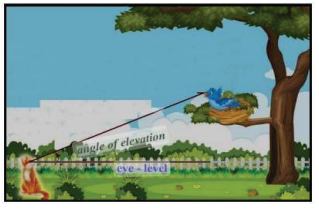
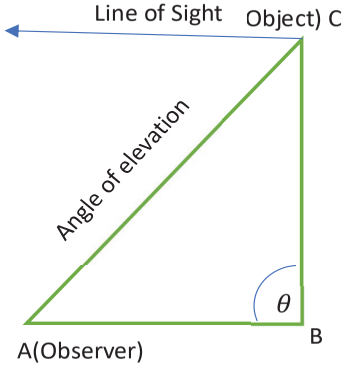
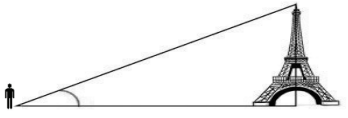
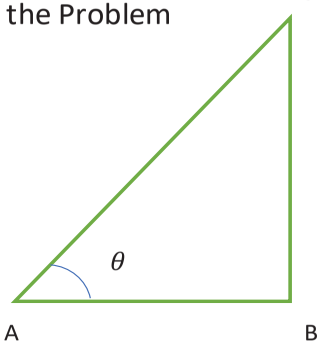
Period Plan (40 min Class)

Class: 10th
Chapter: Some Applications of Trigonometry
Total no. of periods for this chapter:7
Period no :1/7
Sub topic: Angle of Elevation

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.**	**Material required**
C- 4.6: Understands the definition of the basic trigonometric functions their history and motivation and their utility across the sciences **Learning outcomes:** • Derives proofs of mathematical statements particularly	ACTIVITY:1 (10mins) Image 1  • A hungry fox is looking at a bird's nest on a tree at some distance. Look at the picture and try to answer the following questions: • can you imagine a line from fox eyesight to the bird? • At which angle the fox is looking at the bird? Justify		https://www.youtube.com/watch?v=Pp6h4GMMXI4 Video from (H1IWH42LqV) on Intro of Angle of Elevation & Depression

related to geometrical concepts like parallel lines, triangles by applying axiomatic approach and solve problem using them. • Determine all trigonometric ratios with respect to given acute angle and users solving problems in daily life contexts like finding heights of different structures or distances from them	ACTIVITY:2(20mins) • Teacher introduces the concept angle of elevation • Teacher instructs students to construct a right-angled tringle  Image 2 • Teacher inquires students to compare the two images and mark the following in Image 1: 1. Observer 2. Object 3. Angle of elevation 4. Line of sight (Students can write the answers in their notebook) • Teacher introduces that AB can be viewed as the distance between the observer and the vertical line of the object.		

	• This can also be called as the horizontal axis • Teacher defines **angle of elevation** as the angle formed between the horizontal axis and the line of sight (Teacher Note: Explain when an observer is looking upward at an object then it is always an elevation. Elevation exists above the horizontal axis) • Teacher inquiries about the following question showing the below picture  -Can you see the line of sight starting from the foot of the observer? -What happens to the angle of elevation when the line of sight starts from the eye of the observer? -What happens to the horizontal axis? (Hint: Measure of the horizontal axis will not change) -What will happen to the angle of elevation when the person starts to move towards the tower?	**1.If a ladder is at a distance $10\sqrt{3}$ m from the foot of the wall of height 10m makes an angle θ with ground.** **a) Draw the suitable diagram of above data.** **b) Find the angle of elevation**	

	• Teacher gives a problem to the student(10MINS) **The distance between an observer and a building is 480 m and the angle of elevation is 60°. Find the height of the building.** -Teacher inquires the students to mark all the data given in the Problem -Teacher explains and solve the Problem  Given AB =480 m , θ= 60° Let BC =P (Teacher's note: Try to bring from the students the trigonometric ratio that is applicable here) Since we are finding P and we know AB=480 We can write	Shadow of 10 m long pole is $10\sqrt{3}$m. Find the angle of elevation of the sun	

	Tan 60°= $\frac{BC}{AB} = \frac{P}{480}$ $\Rightarrow \sqrt{3} = \frac{P}{480}$ $\Rightarrow P = 480\sqrt{3}$ (Hint: $\sqrt{3} = 1.732$) $\Rightarrow P = 480 \times 1.732$ $\Rightarrow P = 831.86$ m https://youtu.be/RxsdDkgJRAY?feature=shared The above link is related to history of Trigonometry from The Procrastinator Notes Teacher can use video to explain history and contribution of mathematicians in solving Heights and Distances. Teacher could mention about how maths evolved based on the needs of man.		

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

1. Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2. How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3. How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

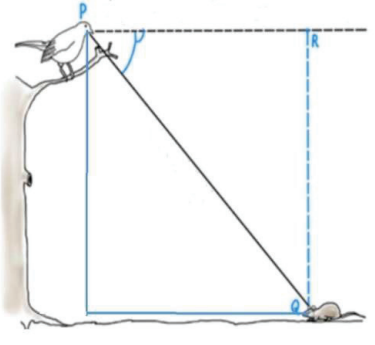
4. How effective were the Materials and resources used in the lesson?

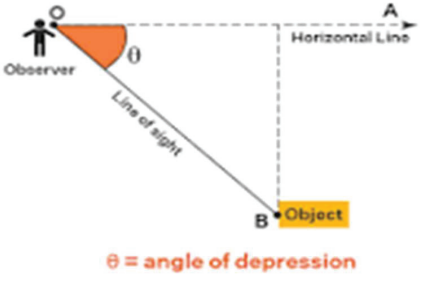
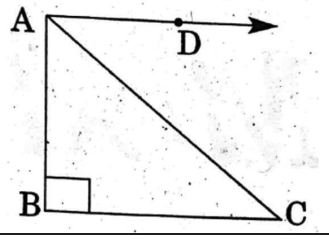
5. Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

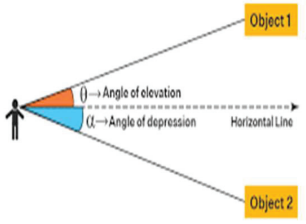
Period plan (40 mins class)

Class: 10th
Chapter: Some Applications of Trigonometry
Total no. of periods for this chapter:7
Period no :2/7
Sub topic: Angle of Depression

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-4.6: Understands the definition of the basic trigonometric functions their history and motivation and their utility across the sciences **Learning outcome:** Develops strategies to apply the concept of	• Teacher displays an image and promotes discussions, among the peers. ACTIVITY-1: (15MINS) A mouse was walking past a tree. When it saw a bird sitting on the trunk of the tree  		https://youtu.be/Pp6h4GMMXI4?si=YK3rOIEthA6pFlHC

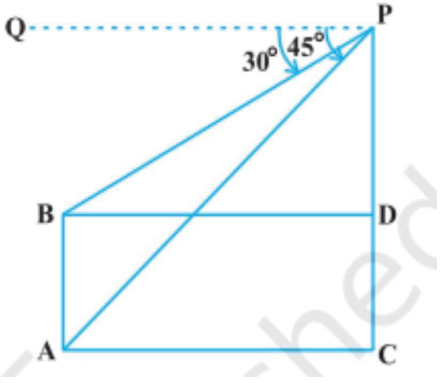
Angle of Depression to daily life situations	From the picture identify angle of depression? • Asks them what do you call to the line PQ? • At which angle the bird observes the mouse? • What do you call for that angle? Teacher introduces the concept of angle of depression. (10MINS) Teacher instructs students to construct an inverse right angle on their note books as shown in the figure. Angle of Depression  Figure 2 Teacher inquires students to compare the two figures and mark the following in figure 1. 1. Observer 2. Object 3. Angle of depression 4. Line of sight	Describe angle of elevation in y 5.**Name the 'angle of depression' from the figure given below in which** $\angle B = 90°$  	Explanation to the Introduction of Angle of Elevation and depression https://www.slideshare.net/debditapan/ebook-on-elementary-trigonometry-by-debdita-pan-45837517 SCAN ME

	(Students can write the answers in their note books) ➢ Teacher introduces that **PR** (Horizontal Line) can be viewed as the distance between the observer and vertical line of the object. ➢ Teacher defines angle of depression as the angle formed between the horizontal line and the line of sight. ➢ (Teachers Note: when an observer is looking downwards to the object then it is always a depression. Depression exists below the horizontal line.) Teacher inquiries about the following questions showing the below picture. (5MINS)		



1. Can you differentiate angle of elevation and angle depression?
2. When will angle of depression changes?
   (Teachers Hint: When the observer looks top of the object with an angle with 30^0,
   Foot of the object angle with 60^0)

Teacher gives an example to the students for clear understanding of the concept. (10MINS)



The angle of depression of the top and bottom of 8m tall building from the top of a multistoried building are 30^0 and45^0 respectively.

Teacher explains the diagram as follows:

- From where the observer watching?
- Name multistoried building and the tall building from figure.
- What are the alternate angles of ∠QPB and ∠QPA

From the top of a light house angles of depressions of ships A and ship B are found to be 45^0 and 60^0 respectively. Which ship is closer to the light house?

Summative assessment plan- only where relevant

- **A player sitting on the top of tower of height 20m observes angle of the depression of ball lying on the ground as 60^0. Find the distance between the foot of the tower and ball.**

Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

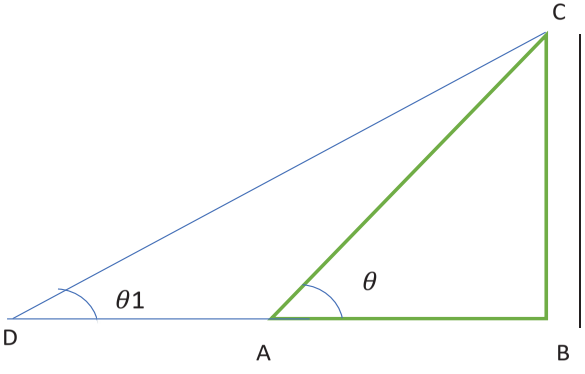
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

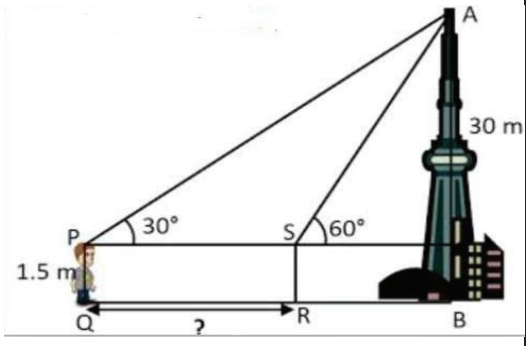
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Some Applications of Trigonometry
Total no. of periods for this chapter:7
Period no :3/7
Sub topic: Angle of Elevation & Angle of depression

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-4.6: Understands the definition of the basic trigonometric functions their history and motivation and their utility across the sciences **Learning outcome:** Determines all trigonometric ratios with respect to acute angles and	• Teacher gives a recap of the previous class (5mins) ACTIVITY:1 • Teacher asks the following questions and testing of previous knowledge happens (10mins) (Teacher Note: This is the individual work followed by peer sharing and whole group sharing) - What is the angle of elevation? - What happens if the person standing at point A moves to - point D		

uses them in solving problems in daily life contexts like distance from them.	 • Teacher gives a problem to the class (20MINS) **A 1.5m tall boy is standing at some distance from a 30 m tall building. The angle of elevation from his eyes to the top of the building increases from 30° to 60° as he walks towards the building. Find the distance he walked towards the building.** • Teacher inquires the first step for solving the problem		https://youtu.be/xn6_d8a_ATs?si=KZfWeqWyldDWBLki **Video from Better than School and College relating to solution of the above question**



- The first step must be to draw a figure with the given data

(Teacher Note: Try to bring from the discussion among students that PT=QB . Why AB-PQ is required?)

- Teacher explains in the ΔAPT we have,

  AT= AB—TB=30-1.5=28.5

$\therefore AT$
$= 28.5\ m$
$\angle APT$
$= 30°$

We have to find PT

Now, from ΔAPT

Tan$30°=\frac{AT}{PT}$

$\frac{1}{\sqrt{3}}=\frac{28.5}{PT}$

PT=$28.5\sqrt{3}$m

Similarly, teacher will explain to find for ST

How can you mention the angles in figure?

Why we are excluding the person height from building height?

Why we use the trigonometric ratio of tanθ?

	Teacher concludes ST=$\frac{28.5\sqrt{3}}{3}$ m, PS= $19\sqrt{3}$m	1. Shadow of 10 m long pole is $10\sqrt{3}$m. Find the angle of elevation of the sun	

Summative assessment plan- only where relevant

- Shadow of 10 m long pole is $10\sqrt{3}$m. Find the angle of elevation of the sun.

Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

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Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Some Applications of Trigonometry
Total no. of periods for this chapter:7
Period no :4/7
Sub topic: Angle of Elevation

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-4.6: Understands the definition of the basic trigonometric functions their history and motivation and their utility across the sciences **Learning outcome:** Determines all trigonometric ratios w.r.t acute angles and uses them in solving problems in daily	• Teacher gives a recap of the previous class (5 mins) • Teacher promotes a discussion among peers by showing a picture and asks the following:(15mins) **14.Match the following** **Column I** — **column II** **a) the length of a shadow of a tower is√3times the height of the tower The angle of the elevation of the sun is** — **i) 40m** **b) The angle of depression of the top of a tower at a point 40m from its base is** $45°$**.the Height of the tower is…..** — **ii)** $60°$ **C) The angle of elevation of the top of a tower from a point 15m away from its base is** $30°$**. The height of the tower is** — **iii)** $30°$		https://youtu.be/FSxF5TETXpE?si=5Lr1Res8El-jf8df

life contexts like heights of different structures from them.	**a) At a point 14m away from the Base of a $14\sqrt{3}$ m high pillar, The angle of elevation of its top Is...** **iv) $5\sqrt{3}m$** • In a playground, children like to slide on slider and slider is on a defined angle from ground.  1. What will happen to the slider if we change the angle? 2. Will children still be able to play on it? • Teacher explains the concept with clear explanation on the concept(20mins) • Teacher gives a problem to the class related to the topic **A contractor plans to install two slides for the children to play in a park.For the children below the age of 5yrs ,she prefers to have a**		https://www.youtube.com/watch?v=plXZyOZNLM8 Some Applications of Trigonometry (Tic TacLearn English)

slide whose top is at a height of 1.5m, and is inclined at an angle 30 to the ground,whereas for elder children,she wants to have a steep slide at a height of 3m, and inclined at an angle of 60 to the ground. What should be the length of the slide in each case?

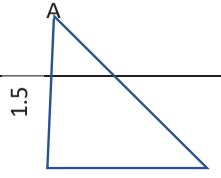
(20 min)

Teacher inquires the first step for solving the problem.

- The first step must be to ask them to take a tabular form

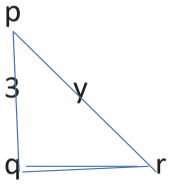
Ages	Heights of Slide	Incline angle	hypotenuses
Below 5 yrs	1.5 mts	30^0	AC =x (say)
Above 5 yrs	3 mts	60^0	PR = y (say)

Ask them to construct two triangles using the above data



Assertion:
An observer 1.5 m tall is 20.5 m away from the tower 22m height.
The angle of elevation of the top of tower from the eye of the
observer is 450.
Reason:
Tan θ= $\frac{Perpendicular}{base}$

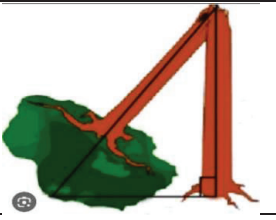
a) Both A and R are true and R is the correct explanation of A
b) Both A and R are true and R is not the correct explanation of A
c) A is true but R is false

	x  (Teacher Note: Try to bring from the discussion among the students) Observe from the figure, 1. how can we find AC and PR using these measurements? 2.Which trigonometric ratio is applicable here? Teacher explains by asking the following From the ⊿ABC ⇒ Sin 30^0 = ? ⇒ Then x =? From the ⊿PQR ⇒ Sin 60^0 =? ⇒ Then y = ? Teacher asks what is the length of the slider for below 5 yrs. and for the above 5 yrs.	**1. At some time of the day, the length of the Shadow of a tower is equal to its height. What is the Sun's altitude at that time.**	

	Teacher concludes: for below 5 yrs. AC(x) =? for above 5 yrs. PR(y) =?		

Summative assessment plan- only where relevant

A tree breaks due to storm and the broken part bends so that the top of the tree touches the ground making an angle 30° with it. The distance between the foot of the tree to the point where the top touches the ground is 8 m. Find the height of the tree



Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

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3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

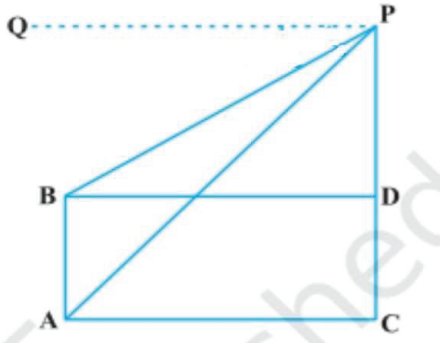
5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

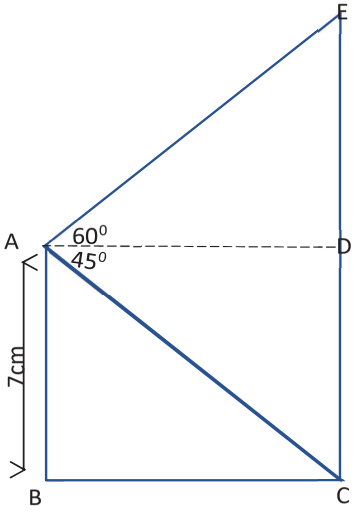
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Some Applications of Trigonometry
Total no. of periods for this chapter:7
Period no :5/7
Sub topic: Angle of Depression

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-4.6: Understands the definition of the basic trigonometric functions their history and motivation and their utility across the sciences **Learning outcome:** Identifies and classifies to measure lengths and use measurements to	• Teacher gives a recap of the previous class(5mins) • Teacher asks the following questions and testing of previous knowledge happens (15mins) (Teacher Note: This is the individual work followed by peer sharing and whole group sharing	Draw a diagram to find a kite at an angle of elevation 'θ' and the length of thread from his hand to kite is 'l' which trigonometric ratio is used for finding length of ladder? If BC= d m	

determine angle measures	 - Where does the angle of Depression formed ? - What do you call PQ? - What happens if the person from P looking to different positions of A, B? - What is the line of sight for ΔPAC? Teacher gives a problem to the class(20mins) • **From the top of a 7m building, the angle of elevation of the top of a cable tower is 60^0** **And the angle of the depression of its foot is 45^0. Determine height of the Tower. (20 min)** Teacher inquires the first step must be to draw figure with given data.		https://youtu.be/qa9LaCYnnoQ?si=Q0CAHJFNuJf--Y51 4 min Garg Tutorials video for solution of the problem



(Teacher Note: Try to bring from the discussion among students that BC = A

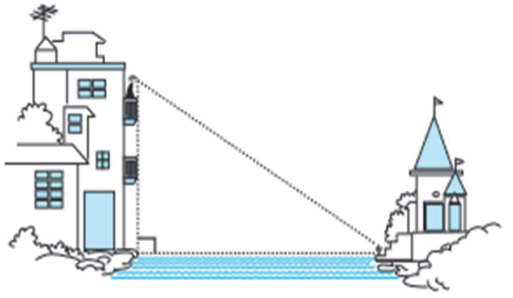
From the figure, what is EC? (EC = CD +DE)

- At what elevations the building top to the cable tower.

- In the same manner, at what depression from the top of building to the tower. (Teachers Note: as AC is transversal, alternative angles are equal.)

- Teacher explains in right angle ΔABC
  We have $\tan 45^0 = \frac{AB}{BC}$

  $\Rightarrow 1 = \frac{7}{BC}$



Suppose a girl is sitting on the balcony of her house located on the bank of a river. She is looking down at a flower pot placed on a stair of a temple situated nearby on the other bank of the river. A right triangle is imagined to be made in this situation as shown figure .

Analyze the above figure and give answers of the following questions:

1. Horizontal line is above of the line of sight? State True of False.

a) True b) False

2. Angle of depression is from between ---------- and ----------
   a) Horizontal level, vertical line
   b) Horizontal line, line of sight.

3. Angle of depression can be negative or positive. It depends on the direction of measurement?
   a) Yes b) No

	$\Rightarrow$BC = 7 $\therefore$ AD = 7 (Since BC = AD) Again from Δ ADE, tan $60^0 = \frac{DE}{AD}$ $\Rightarrow \sqrt{3} = \frac{DE}{7}$ DE = $7\sqrt{3}$ m. $\therefore$ the height of the cable tower (EC) =DE +CD = $7\sqrt{3}$ +7 =7(1 +$\sqrt{3}$) m. Teacher concludes the topic by explaining some more problems		

Summative assessment plan- only where relevant

- **From the top of a 7m high building, the angle of elevation of the top of a cable tower is 60^0 and the angle of depression of its foot is 45^0. Determine the height of the tower.**

Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Some Applications of Trigonometry
Total no. of periods for this chapter: 7
Period no: 6/7
Sub topic: Competency Based Questions

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/ self-assessment checklists/etc.	Material required
C-4.6: Understands the definition of the basic trigonometric functions their history and motivation and their utility across the sciences **Learning outcome:** Be able to calculate distances and angles using trigonometric ratios	1. The shadow of tower, standing on level ground is found to be 45m longer when sun's altitude is 30^0, then when it was 60^0, find the height of the tower. 2. A tree 50 m high is broken in two parts by the action of the wind. Top of the tree struck the ground and makes an angle of 60^0 with level ground. At what Height from the ground did the tree break? 3. By the time the driver collected seaweed, the boat shifted 20m on the opposite side. The driver now has to rise at an angle of 60° to reach the boat. What is the distance the driver travels to reach the boat?		

	4. A 9m high street-light pole is broken during a storm. The top end of the pole touches the ground at 30°.At what height did the pole break? 5. The angle of elevation of the top of a tower from a point on the ground, which is 30m away from the foot of the tower, is 30^0. Find the height of the tower. 6. If the angle of the elevation of the top of the tower from 2 points at the distance of 9m and 4m from the base of the tower and in the same straight line with it are complimentary then find the height of the tower. 7. The shadow of a flag staff is 3 times as long as the shadow of the flag staff, when the Sun rays meet the ground at an angle of 60^0. Find the angle between the sun rays and the ground at the time of longer shadow.		

Summative assessment plan- only where relevant

- **From the top of a 7m high building, the angle of elevation of the top of a cable tower is 60^0 and the angle of depression of its foot is 45^0. Determine the height of the tower.**

Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

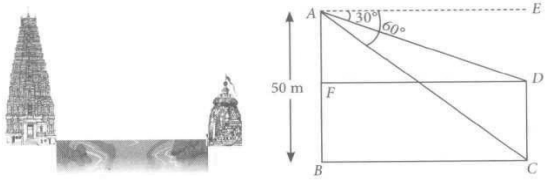
4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Some Applications of Trigonometry
Total no. of periods for this chapter:7
Period no :7/7
Sub topic: Real life situation-based questions

Learning Outcomes & Indicators/micro-competencies	Teaching-Learning Process This should include activities to facilitate learning along with broad time duration	Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments /assignments/ self-assessment checklists/etc.	Material required
C-4.6: Understands the definition of the basic trigonometric functions their history and motivation and their utility across the sciences **Learning outcome:** To apply the knowledge of trigonometric ratios for solving different types of problems.	Teacher makes the students into groups and ask them to solve the following problems and present Infront of the class (Teacher will guide the students wherever necessary) 1. There are two temples on each bank of a river. One temple is 50 m high. A man, who is standing on the top of 50 m high temple, observed from the top that angle of depression of the top and foot of another temple are 30° and 60° respectively. (Take $\sqrt{3} = 1.73$)  Based on the above information, answer the following questions. (i) Measure of angle of ADF is equal to	Identify the below figure and mention the Angle of elevation and Angle of depression 1. $\angle BAC$ 2. $\angle DCA$ D C	

(a) 45°	**(b) 60°**	**(c) 30°**	**(d) 90°**

(ii) Measure of angle of ACB is equal to

(a) 45°	**(b) 60°**	**(c) 30°**	**(d) 90°**

(iii) Width of the river is

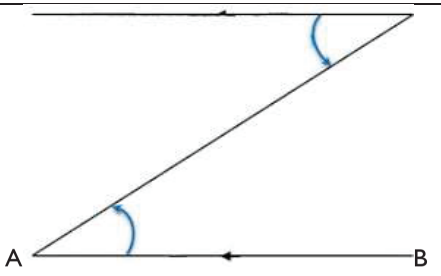
(a) 28.90 m	**(b) 26.75 m**	**(c) 25 m**	**(d) 27 m**

(iv) Height of the other temple is

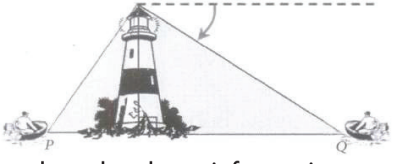
(a) 32.5 m	**(b) 35 m**	**(c) 33.33 m**	**(d) 40 m**

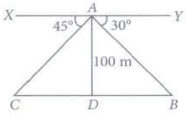
(v) Angle of depression is always

(a) reflex angle	**(b) straight**
(c) an obtuse angle	**(d) an acute angle**



2. A boy is standing on the top of light house. He observed that boat P and boat Q are approaching to light house from opposite directions. He finds that angle of depression of boat P is 45° and angle of depression of boat Q is 30°. He also knows that height of the light house is 100 m.





Based on the above information, answer the following questions.

(i) Measure of angle of ACD is equal to

(a) 30°	**(b) 45°**	**(c) 60°**	**(d) 90°**

(ii) If angle of YAB = 30°, then \(\angle\) ABD is also 30°, Why?

(a) vertically opposite angles	**(b) alternate interior angles**
(c) alternate exterior angles	**(d) corresponding angles**

	(iii) Length of CD is equal to **(a) 90 m** **(b) 60 m** **(c) 100 m** **(d) 80 m**		

Summative assessment questions

1.The angle of elevation of the top of building from the foot of the tower is 30^0 and the angle of elevation of the top of the tower from the foot of the building is 60^0. If the tower is 50m high, find the height of the building.

2.A player sitting on the top of a tower of height 20m observes the angle of depression of a ball lying on the ground as 600. Find the distance between the foot of the tower and the ball.

Teachers' reflections and experiences:

Teachers' reflections and experiences:

1.Did the lesson plan align with the curricular goals and competencies? If not How could be adjusted for better alignment?

2.How well did the pedagogical Strategies engage students and promote active participation in the learning process?

3.How well Did the assessment strategies measure student understanding and achievement of the learning outcomes?

4.How effective were the Materials and resources used in the lesson?

5.Did the lesson incorporate formative assessment Strategies to guide pedagogy and provide timely feedback to students?

WORK SHEET 1

From NCERT Exemplar

WORK SHEET 2

From NCERT Exemplar

WORK SHEET 3

From NCERT Exemplar

10 CIRCLES

https://epathshala.nic.in/topic-d.php?id=1062CH10

THE FOLLOWING CURRICULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPTER

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-4 Analyses characteristics and properties of two-dimensional geometric shapes and develops mathematical arguments to explain geometric relationships	• C-4.3 Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π
CG-7 *Begins to perceive and appreciate the axiomatic and deductive structure of Mathematics*	• **C-7.1** Proves mathematical statements and carries out geometric constructions using stated assumptions, axioms, postulates, definitions, and mathematics vocabulary • C-7.3 Proves theorems using Euclid's axioms and postulates – for angles, triangles, quadrilaterals, circles, area-related theorems for triangles and parallelograms.

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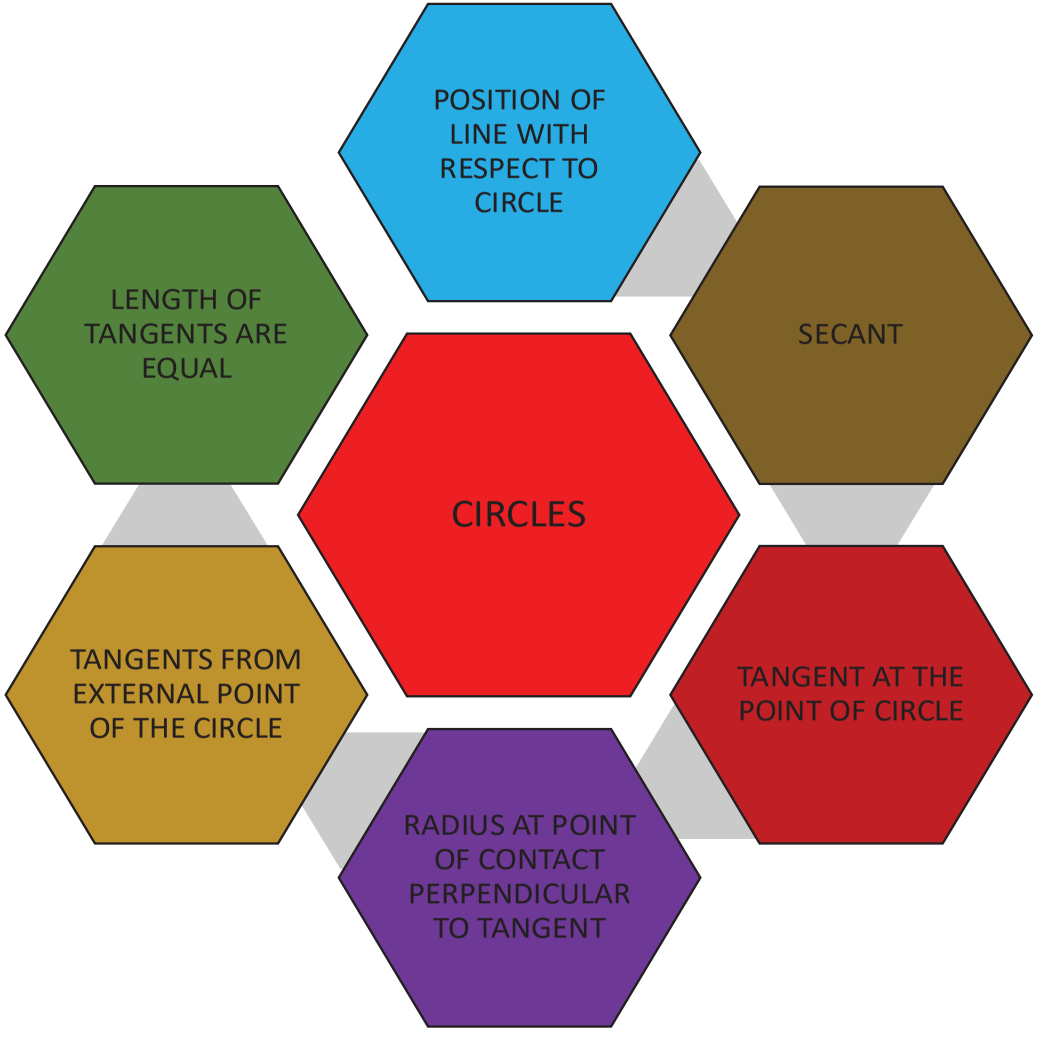
MINDMAP


POSITION OF LINE WITH RESPECT TO CIRCLE
LENGTH OF TANGENTS ARE EQUAL
SECANT
CIRCLES
TANGENTS FROM EXTERNAL POINT OF THE CIRCLE
TANGENT AT THE POINT OF CIRCLE
RADIUS AT POINT OF CONTACT PERPENDICULAR TO TANGENT

PERIOD WISE PLAN

TEACHING TOPICS	LEARNING OUTCOMES
LP 1 INTRODUCTION OF TANGENT TO A CIRCLE	➢ Recall the previous knowledge of circle and its component ➢ Identifies position of line with respect to circle.
LP 2 TANGENT TO A CIRCLE	➢ Recall the knowledge of secant and tangent to the circle.
LP 3 TANGENT AT ANY POINT OF A CIRCLE IS PERPENDICULAR TO THE RADIUS THROUGH THE POINT OF CONTACT	➢ Derives proofs of theorems related to the tangents of Circle. ➢ Identifies the angle made by the radius and the tangent. ➢ Proofs the tangent at any point of a circle is perpendicular the radius through the point of contact. ➢ Recall RHS congruency.
LP 4 NO.OF TANGENTS FROM A POINT TO THE CIRCLE	➢ Recall no. of tangents that can be drawn different points through any given circle.
LP 5 THE LENGTH OF TANGENTS DRAWN FROM EXTERNAL POINT TO A CIRCLE ARE EQUAL	➢ Proofs the length of tangents drawn from an external point to a circle are equal. ➢ Recall RHS congruency.
LP 6 PROBLEMS RELATED TO LENGTH OF TANGENTS	➢ Proofs the results related to tangents to a circle to solve problems.
LP 7 PROBLEMS RELATED TO LENGTH OF TANGENTS	➢ Proofs the results related to tangents to a circle to solve problems.
LP 8 PROBLEMS RELATED TO LENGTH OF TANGENTS	➢ Proofs the results related to tangents to a circle to solve problems.

Chapter Plan (Unit plan/ lesson plan)

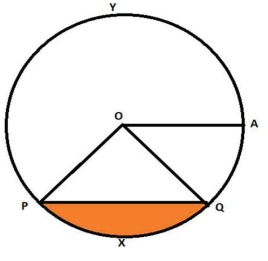
Class: **10**

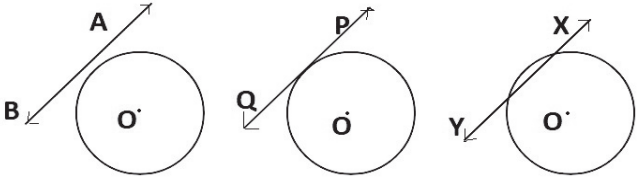
Chapter: **10. CIRCLES**

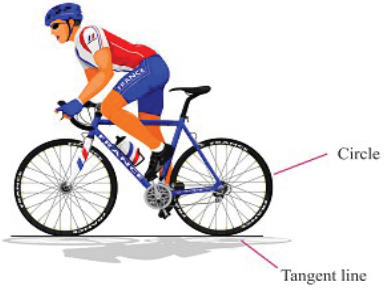
Total no. of periods for this chapter: **08**

Period No: **01 / 08**

Sub Topic: Introduction of Tangent to a circles

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-4.3 *Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π* **C-7.3** *Proves theorems using Euclid's axioms and postulates – for angles, triangles, quadrilaterals, circles, area-related theorems for triangles and parallelograms.*	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing): *(20 Minutes)* 1. Identify the circular objects in your class? 2. Define a circle. Give examples of circular objects 3. How to draw a circle with given radius. 4. Draw a circle and label its parts. **Teacher draws this figure and initiates discussion.** 	Find the objects that are circle-shaped 	https://youtu.be/QSpZtW6DNYo?si=MXx4_kqizFsaLHlg

	1. Identify Centre and radius in the circle. 2. Identify the chord. 3. Name the shaded region part 4. Identify the one sector 5. Name one minor arc and one Major arc. **Demonstration:** (20 minutes) **Whole group activity:** **Teacher draws figures and starts discussion.**  1. Which line is not intersecting the circle? 2. Identify the line that intersects the circle? 3. Mark the points where the line intersects the circle in two points. 4. Which line touches the circle? 5. Mark the point where the line the touches the circle **Teacher shows some real-life pictures for better understanding of tangent and secant. Initiates discussion.**	1. Identify the largest chord in the circle? 2. If the radius of the circle is 5cm then what is the diameter? 3. Which of the following must passes through the center of the circle? A. chord B. diameter 1. Describe a secant to a circle in our words. 2. Write the difference between secant and tangent to a circle?	**Daily life shapes / objects** https://www.youtube.com/watch?v=n3trLeLY7Vw **Tangen to a Circle**

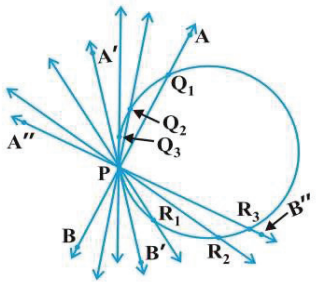


1. While cycling on the road show the point where the wheel touches the road.
2. What we conclude about the above picture.

1. How many intersecting points with green line of the bridge curve.

Whole group activity: Teacher draws this figure and initiates discussion*: (20 minutes)*

1. Give real life examples for tangent and secants.

	 Teacher asks the students take a circular wire and attach a straight wire AB at a point P of the circular wire so that it can rotate about the point P in a plane. Put the system on a table and gently rotate the wire AB about the point P to get different positions of the straight wire. Rotate the wire to one side of AB mark the points that intersects the circle at Q1, Q2, Q3,…. Again Rotate the wire to another side of AB mark the points that intersects the circle at R1, R2, R3,…. 1. Teacher ask the students to measure the length of chords PQ1, PQ2, PQ3,… and PR1, PR2, PR3,….. and record them. **2.** When will be the length of the chords become zero. **Conclusion: Teacher gives conclusion that, among all chords the chord with zero length is tangent at the point of contact P.**	1. Identify the point where all the points coincide with that point when wire rotated. 2. Identify the line that touches the circle at one point P 3. When two end points of the chord coincide with each other then it becomes Tangent or Secant.	

Summative Assessment Plan

(Only… where relevant)

1. Describe the difference between secant and Tangent to a circle.
2. Write some real-life examples where you identify circular objects, secants and tangents.

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

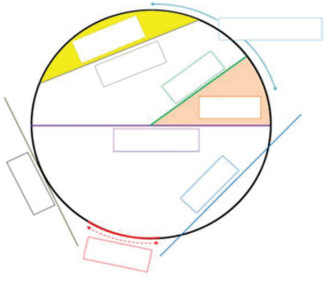
Class: **10**

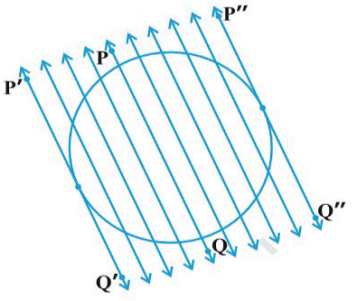
Chapter: **10. CIRCLES**

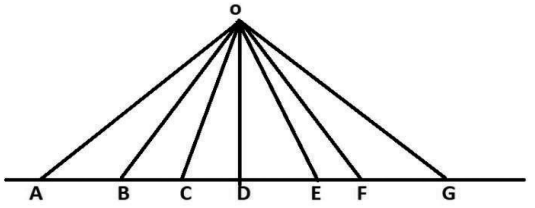
Total no. of periods for this chapter: **08**

Period No: **02 / 08**

Sub Topic: Tangent - point of contact – radius - normal

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-4.3 Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π **C-7.3** Proves theorems using Euclid's axioms and postulates – for angles, triangles, quadrilaterals, circles, area-related theorems for triangles and parallelograms.	**The teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing) 5 min ○ What is secant of a circle? ○ When secant becomes tangent of a circle. 2.Draw circle and draw a chord, and tangent and a secant 3. write the name of par in each empty box?  **Activity:** (15 minutes) In small groups, students do the following activity and record their observations:		Paper, geometrical instrument, Tracing/butter paper activity tic-tac

	 Teacher makes the students into groups and ask them to do the activity by following instructions. draw a circle on a sheet of paper. draw a secant PQ to the circle. Now, trace PQ on a tracing sheet (label it XY, such that X coincides with P and Y coincides with Q). Next, move the sheet gently on either side of PQ, such that the traced line XY is parallel to PQ. What do you notice? When does the secant become a tangent? Activity: [Students work individually and share their observation with their friends and whole group presentation.] 10min 1. Draw a line and mark a point O outside the line. 2. Mark points say A, B, C, D, ….L, M, G 3. Now draw line segments joining O and points A, B, C, D, ….L, M, G 4. Measure each of the line segments drawn.	Express shortest distance in your own words?	



Questions:

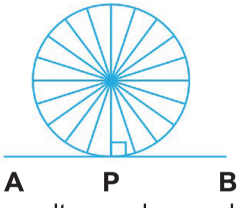
1. Identify the shortest distance.
2. Guess what is the angle measure of the angle formed by the shortest line segment to the given line.
3. Measure and check.
4. Share and check with your friends.

What can we conclude from this?

"When we draw lines from a point which is not on the line then, the shortest line is _____."

Whole group activity: 10min

Teacher draws this figure and initiates discussion.



1. Identify the result you observed from the wheel of the spokes.
2. Identify the radius in the figure.
3. How many radii do you see?
4. Identify tangent in the figure and label it AB.

	5. Mark the point of contact of this tangent and label it P. 6. Identify the radius through this point of contact and name it as PQ. 7. What can you infer about tangent AB and radius PQ?		

Summative Assessment Plan

(Only… where relevant)

1. If radius of a circle is 5 cm then find the distance two parallel tangents?
2. How many tangents can a circle have.
3. Fill in the blanks:
    1. A tangent to a circle intersects it in _____point (s).
    2. A line intersecting a circle in two points is called a_____ .
    3. A circle can have _____ parallel tangents at the most.
    4. The common point of a tangent to a circle and the circle is called_____ .

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

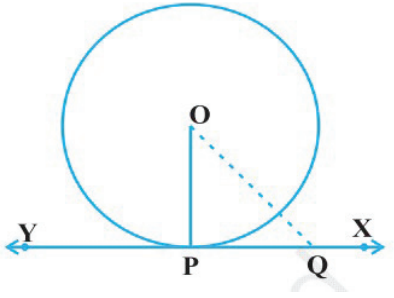
Chapter: **10. CIRCLES**

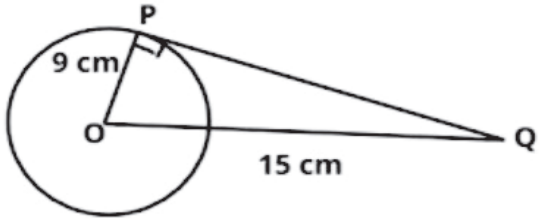
Total no. of periods for this chapter: 0**8**

Period No: **03 / 08**

Sub Topic: Tangent at any point of a circle is perpendicular to the radius through the point of contact

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
➢ Derives proofs of theorems related to the tangents of Circle. ➢ Identifies the angle made by the radius and the tangent. ➢ Proofs the tangent at any point of a circle is perpendicular to the radius through the point of contact. ➢ Recall RHS congruency.	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing) 10min 1. Draw a circle and a tangent. Join center and the point of contact 2. What can you observe about the angle between the line and radius. 3.what we call this perpendicular radius through the point of contact? 4.Recall Pythagoras theorem **Demonstration of proof:** *(20 minutes)* **Statement: The tangent at any point of a circle is perpendicular to the radius through the point of contact.**	1.write any 3 pairs of Pythagorean triplets? Where does the line touch the circle? When asked to draw a secant to a given circle, Joy draws a line to circle intersecting at 1 point. Is he right? Explain why?	Perpendicular Tangent Theorem

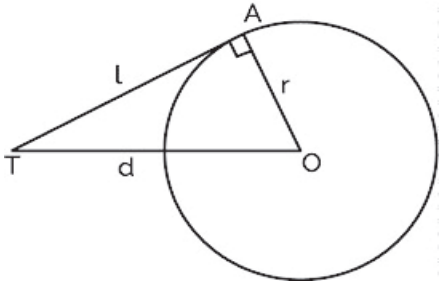
	 From the statement, students to write what is given data. From the statement, students to write what is require to be proved. Teacher leads to marking a point Q on XY and join OQ. Now, compare OP and OQ. Which is the shortest? Any other point on XY except for P, the line segment OP would be the shortest. And of all the lines drawn from a point outside the given line, the shortest line is the perpendicular to the given line. Hence OP the radius is perpendicular to the tangent XY. **Problem related to above theorem:** **What is the length of tangent drawn from a point 15cm away from the center of a circle of radius 9 cm.** **10min** 1.Teacher guide to the student s to draw the picture related to given problem	How many tangents can be drawn parallel to the given secant? What kind of triangle is △ OPQ? Why? Is $OQ^2 = OP^2 + PQ^2$? Why? 1. Why triangle OPQ is right Triangle? 2. What is the hypotenuse in triangle OPQ 3. Identify the other sides. What is the length of PQ?	length of tangent Tic-Taclearnenglish



What type of triangle OPQ.

The teacher asks the students to recall Pythagoras Theorem and find the unknown PQ.

2.Find the length of AT?

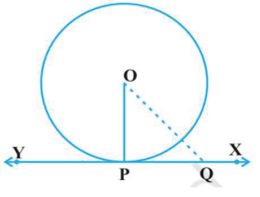


Teacher asks the students solve individually?

Follow the above process?

Express AT in terms of d and r.

Formative assessment:



1.In the above figure OP=4cm OQ=5cm find PQ.

2. A tangent PQ at a point P of a circle of radius 5 cm meets a line through the Centre O at a point Q so that OQ = 13 cm. Find length of PQ.

3. Draw a circle and two lines parallel to a given line such that one is a tangent and the other, a secant to the circle.

Summative Assessment Plan

(Only… where relevant)

1. A tangent PQ at a point P of a circle of radius 5 cm meets a line through the center O at a point Q so that OQ = 12 cm. Length PQ is :

   (A) 12 cm (B) 13 cm (C) 8.5 cm (D) 119 cm.

2. Draw a circle and two lines parallel to a given line such that one is a tangent and the other, a secant to the circle.

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

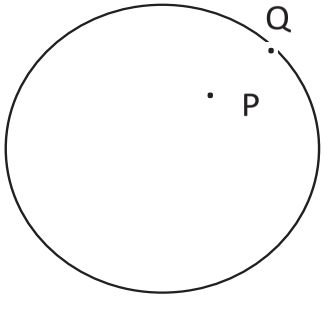
Class: **10**

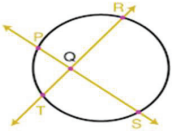
Chapter: **10. CIRCLES**

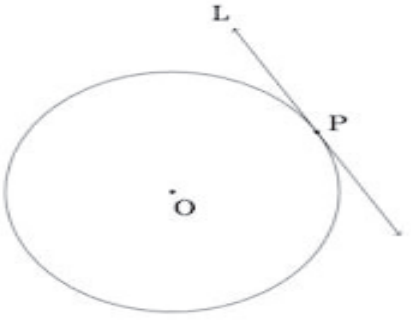
Total no. of periods for this chapter: 0**8**

Period No : **04 / 08**

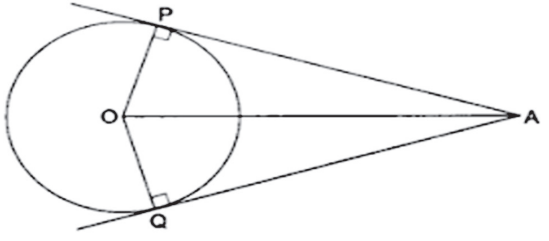
Sub Topic: No. of Tangents to a Circle

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-4.3 Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π **C-7.3** Proves theorems using Euclid's axioms and postulates – for angles, triangles, quadrilaterals, circles, area-related theorems for triangles and parallelograms.	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing) (5min) Teacher asks the students to draw a circle and mark points P,Q, at different positions and initiate discussions.  ○ How many tangents can a circle have?		

	○ How many tangents can be draw at a Point on the circle? ○ Can you draw a tangent from point P? **Demonstration of proof:** (20 minutes) **Activity: Teacher makes the students into small groups and initiate the following activity.** 1. Teacher asks the students to draw a circle on paper sheet and take a point Q inside it and draw lines through that point and initiate to write the observations.  2.The teacher asks the students to draw a circle on paper sheet and take a point P on the circle and draw tangents at that point and initiate to write the observations.	1. If the line is drawn from Q, how many intersecting points that line makes with circle? 2. Whether the line intersect the circle is Secant or Tangent? 3. Is it possible to draw Tangent from Q?	**Paper Sheet** **Geometrical Instruments** Number of Tangents to a Circle from any Point, Class 10 Maths Digital Teacher



2. The teacher asks student draw a circle on paper sheet draw tangents from external point. What are your observations?



Conclusion:

Teacher asks the students for better understanding

How many tangents can you draw to a circle from a) internal point

b) point on the circle

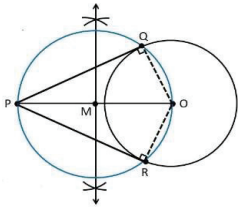
c)external point.

4.Is it possible to draw another tangent at P?

5.Is it possible to draw another tangent parallel to tangent L?

6.Is it possible to draw more than two tangents from external point A to the circle?

7. Draw a tangent to a circle of radius 4cm.

	Group Activity: (15 min) **Teacher explains how to draw a tangent from an external point by using geometry box. Also play video for more understanding.** **Construction of Pair of Tangents from external point to a Circle:** Teacher divides the students into groups and give the instructions how to draw a pair of tangents from an external point to the circle. [Teacher Note: 1.Draw a circle with suitable radius? 2.Take a point P external to the circle. 3.join O, P 4.draw a perpendicular bisector XY of OP. 5.Mark intersection point of OP and XY as M. 6. Take M as centre and OM=MP=r and draw circle. 7. identifies intersection points of two circles A and B. 8. Join P, A and P, B. Through playing video teacher explains how to construct the tangent form an external point.  1. Identify the tangent from P	8.How can we draw perpendicular of line segment OP. 9.Whether the lines are drawn from point p are tangents to the given circle? 10.Two tangents are drawn from an external point PL and PT to the circle. If PL=7cm find PT.	**constructio n of tangents** construction of tangents

	2. Measure the lengths of PA, PB 3. Are length of tangents PA, PB equal.		

Summative Assessment Plan

(Only… where relevant)

3. Draw a circle of diameter 6 cm from a point *P,* which is 8 cm away from its Centre. Draw the two tangents *PA* and *PB* to the circle and measure their lengths.

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

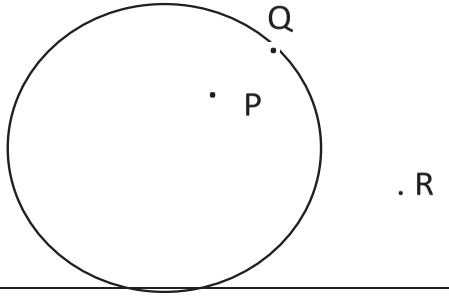
Chapter: **10. CIRCLES**

Total no. of periods for this chapter: 0**8**

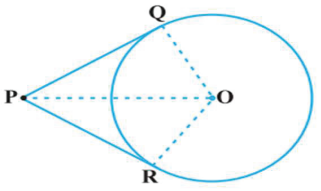
Period No : **05 / 08**

Topic: CIRCLES

Sub Topic: Length of Tangents to a Circle from external point

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-4.3 *Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π*	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing) (5min) 		Proving lengths of tangents drawn from external point to a circle are equal

	○ Is it possible to draw tangent from point P? ○ How many tangents we can draw at point Q? ○ Is it possible to draw three tangents from point R? **Demonstrate: (20 min)** Teacher demonstrates to prove the theorem Teacher shows video for the above statement for better understanding. https://www.youtube.com/watch?v=9nZK2edryuo **Statement:** Length of tangents from external point to the circle are equal	Explain about RHS congruency in your own words? 1. Why OQ = OR? 2. What is RHS Congruence Rule? 3. Explain CPCT Rule?	**Paper Sheet** **Geometrical Instruments** **theorems**



Proof:

Teacher draws a circle with center O, mark a point P lying out side of the circle.

Are PQ and PR be the tangents.?

Teacher asks the students what we need to prove?

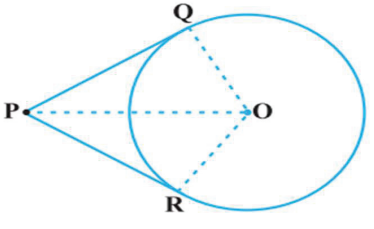
Teacher gives instructions, how the two triangles OQP, ORP are congruent?

Teacher asks the students why PQ = PR ?

Group Activity: (15 min)

Teacher divides the students into groups and give guidance to prove the length of pair of tangents are equal by using Pythagoras theorem.

The teacher asks the students the following questions.



1. If OQ=r and OP=d units.

DIGITAL GURUJII

Circle Theorem Proof - Length of Tangents Proof

Equal Tangents from an External Point using

	2. What is Pythagoras theorem? 3. How apply Pythagoras theorem to triangle OQP? 4. Find PQ. Find OR 5. Compare and write your conclusion?		Pythagoras theorem

Summative Assessment Plan

(Only… where relevant)

1. From a point Q, the length of the tangent to a circle is 24 cm and the distance of Q from the centre is 25cm. The radius of the circle is

   A) 7 cm B) 12cm C) 15 cm D) 24.5 cm

2. The length of a tangent from point A at distance 5cm from the centre of the circle is 4 cm . Find the radius of the circle.

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

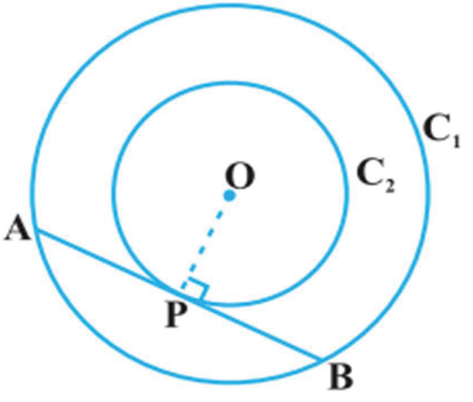
Chapter: **10. CIRCLES**

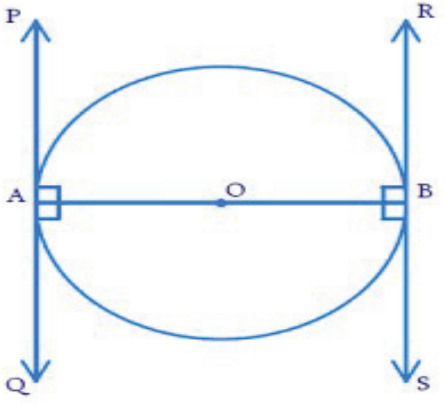
Total no. of periods for this chapter: 0**8**

Period No: **06/ 08**

Sub Topic: **Problems related to Exercise: 10.2**

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
➢ Proofs the results related to tangents to a circle to solve problems. **C-4.3** *Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π*	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing)(5min) o Is it perpendicular drawn from center to the chord bisect the Chord? o Are the lengths of tangents from external are equal? o Recall Pythagoras theorem? **Teacher explains how to solve the problems (20 min)**		

	1. Prove that in Two concentric circles the chord of the larger circle which touches the smaller circle is bisected at the point of contact. Teacher prove the statement by discussion .  Teacher asks the students what we have to prove? Teacher gives the instructions to join OA, OB. By what congruence rule OAP is congruent to OBP How can we conclude AP = BP? 2. Prove that the tangents drawn at the end points of circle are parallel.	1. Define concentric circles. 2. Why OA = OB? 3. Explain RHS congruence rule. 4. How we apply CPCT in this problem? If OP=3cm AP=4cm find the radius of the larger circle.	

	 Teacher proves the statement by discussion method 1. Why OA perpendicular to PQ and OB perpendicular to RS? 2. Identify the alternate angles? 3. How can we conclude these two lines are parallel? **Teacher gives some model questions and ask them to solve**, and present Infront of the class. (15 min) 1. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle. 2. Prove that the perpendicular at the point of contact to the tangent to a circle passes through the center.	Draw different circles and draw diameter, draw tangents at endpoints of each diameter and write your observation? Find the length of tangent to a smaller circle whose radius is r and radius of larger circle id R units.	GeoGebra demonstration https://www.youtube.com/watch?v=O8WnVlN1MyY Model problem

Summative Assessment Plan

(Only… where relevant)

1. If tangents PA and PB from a point P to a circle with center O are inclined to each other at angle of 80^0 then ∠POA =

   A)50^0 B)60^0 C)70^0 D) 80^0

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

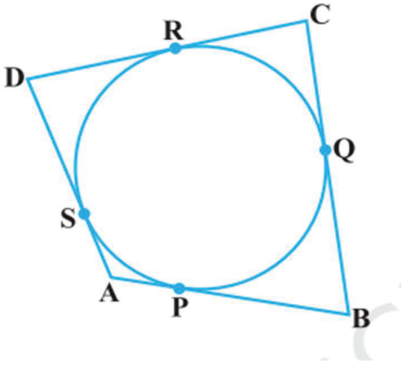
Class: **10**

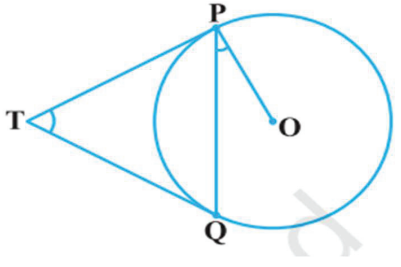
Chapter: **10. CIRCLES**

Total no. of periods for this chapter: 0**8**

Period No: **07/ 08**

Sub Topic: **Problems related to Exercise: 10.2**

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
➢ Proofs the results related to tangents to a circle to solve problems. **C-4.3** *Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π*	**Techer makes the students into groups and ask them to solve** **30 min** 1.Prove that a quadrilateral ABCD is drawn to circumscribe a circle prove that AB + CD = AD + BC. Teacher prove the statement by discussion  		A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB+CD=AD+BC

	1. Why AP = AS BP = BQ CR = CQ DR = DS ? 3. What we get when adding all the above equations? 4. How can be get AB, BC, CD, DA? **Problem 2:** **Two tangents TP and TQ are drawn to a circle with center O from an external point T. Prove that ∠PTQ = 2 ∠OPQ.**  Teacher prove the statement by discussion method 4. Teacher informs to the student to take **∠PTQ = θ and ∠OPQ= x** 5. Why TP = TQ ?	1. Identify the length of tangents from A. 2. Identify the length of tangents from B. 3. Identify the length of tangents from C. 4. Identify the length of tangents from D.	**Theorem**

	6. Is △TPQ is an isosceles triangle? 7. Is ∠TPQ = ∠TQP? 8. Why ∠TPQ = $(90^0 - x)$ 9. What is sum of angles in a triangle TPQ? 10. Teacher informs to students to substitute the above values in ∠PTQ + ∠TQP + ∠TPQ = 180^0 11. Ask the students to verify the result. **Teacher give some model questions and ask them to solve**.(10 min) 3. Prove that the parallelogram circumscribing circle is a Rhombus.	1. Identify the length of tangents from T? Are they equal? 2. Is △TPQ is an isosceles triangle? 3. What are the supplementary angles? 1. Write any two properties of a parallelogram? 2. Differentiate parallelogram and rhombus?	

Summative Assessment Plan

(Only… where relevant)

1. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line segment joining the points of contact at the Center.

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **10. CIRCLES**

Total no. of periods for this chapter: 0**8**

Period No : **08 / 08**

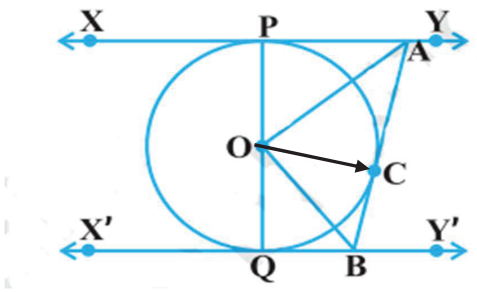
Sub Topic: **Problems related to Exercise: 10.2**

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
➢ Proofs the results related to tangents to a circle to solve problems. **C-4.3** *Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π*	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing)(10 min) o Is perpendicular drawn from center to the chord, bisects the Chord? o Are the lengths of tangents from external are equal? o Recall Pythagoras theorem? o Recall the RHS congruency Rule? o Recall Heron's formula for finding area of triangle? **Teacher explains how to solve the problems(30 min)** 1. XY and X^{l} Y^{l} are two parallel tangents to circle with center O and another tangent AB with point		

of contact C intersecting XY at A and X^{l} Y^{l} at B.

Prove that $\angle AOB = 90^0$

Teacher prove the statement by discussion



2. Teacher asks to students join O, C.
3. Are $\triangle OPA$, $\triangle OCA$ congruent? Give reasons.
4. Why $\angle POA = \angle COA$?
5. Why $\angle QOB = \angle COB$?
6. Why $\angle POA + \angle COA + \angle QOB + \angle COB = 180^0$?
7. Substitute 3, 4 in 5

   $2\angle COA + 2\angle COB = 180^0$

   find $\angle AOB$.

Problem 2:

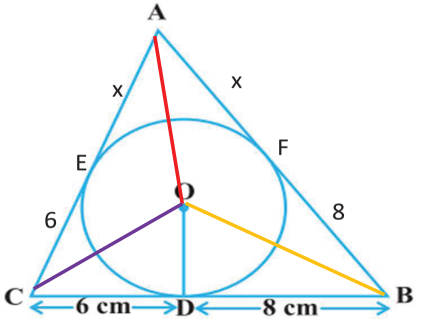
A triangle ABC is drawn to circumscribe a circle of radius 4cm such that the segments BD and BC into which BC is divided by the point of contact D

5. Identify the length of tangents from A.
6. Identify the length of tangents from B.
7. Identify the length of tangents from C.
8. Identify the length of tangents from D.

1. Which congruency rule is used?
2. $\angle COA + \angle COB$ = ?

https://www.youtube.com/watch?v=x6vfUEnlz1g

are of lengths 8 cm and 6 cm respectively. Find the Sides AB and AC.



Teacher find the values of AB and AC by discussion method

1. Teacher inform to students to take AE = AF = x
2. S = $\frac{AB+BC+CA}{2}$
3. Find the value of S.
4. Using the Heron's formula find the Area of triangle ABC.
5. Verify area of ABC = $\sqrt{(14+x)48x}$ ------- (i)
6. Verify the Area △ABC = Ar(△OBC) + Ar(△0AC)+ar (△0AB)

   = 56 + 4x ----------(ii)
7. Equating (i) & (ii) find x.
8. Find AB and AC

1. Why AE = AF?

2.Write Heron's Formula.

2. What are a, b, c?
3. Area of Triangle = $\frac{1}{2}$bh

   b, h stands for?

Write the lengths of the sides AB and AC?

https://www.youtube.com/watch?v=ZkGx-3_fQ58&t=660s

Summative Assessment Plan

(Only… where relevant)

2. PQ is a chord of length 8 cm of a circle of radius 5cm. The tangents at P& Q intersects at a point T. Find the length TP.
3. Prove that the opposite sides of a Quadrilateral circumscribing a circle subtend supplementary angles at the center of the circle

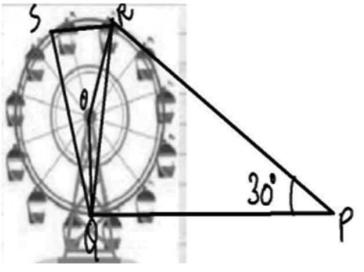
Teachers' reflections and experiences:

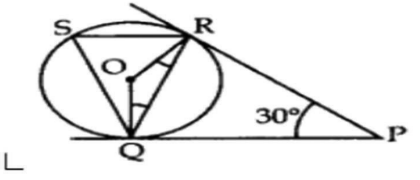
- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Case based Questions

CASE STUDY 1:

A Ferris wheel (or a big wheel in the United Kingdom) is an amusement ride consisting of a rotating upright wheel with multiple passenger-carrying components (commonly referred to as passenger cars, cabins, tubs, capsules, gondolas, or pods) attached to the rim in such a way that as the wheel turns, they are kept upright, usually by gravity. After taking a ride in Ferris wheel, Aarti came out from the crowd and was observing her friends who were enjoying the ride. She was curious about the different angles and measures that the wheel will form. She forms the figure as given below.



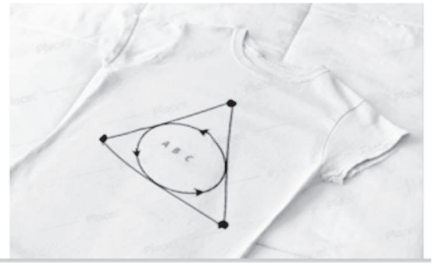


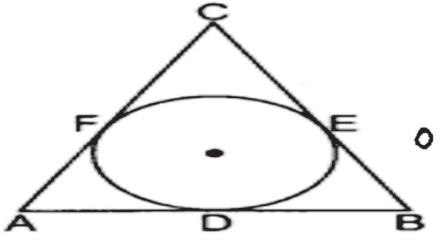
1. In the given figure find ∠ROQ
   a) 60
   b) 100
   c) 150
   d) 90
2. Find ∠RQP
   a) 75
   b) 60
   c) 30
   d) 90
3. Find ∠RSQ
   a) 60
   b) 75
   c) 100
   d) 30
4. Find ∠ORP

a) 90
b) 70
c) 100
d) 60

CASE STUDY 2:

Varun has been selected by his School to design logo for Sports Day T-shirts for students and staff . The logo design is as given in the figure and he is working on the fonts and different colours according to the theme. In given figure, a circle with centre O is inscribed in a ΔABC, such that it touches the sides AB, BC and CA at points D, E and F respectively. The lengths of sides AB, BC and CA are 12 cm, 8 cm and 10 cm respectively


A B C


C
F
E
O
A
D
B

1. Find the length of AD
   a) 7
   b) 8
   c) 5
   d) 9
2. Find the Length of BE
   a) 8
   b) 5
   c) 2
   d) 9
3. Find the length of CF
   a) 9
   b) 5
   c) 2
   d) 3
4. If radius of the circle is 4cm, Find the area of ΔOAB
   a) 20
   b) 36
   c) 24
   d) 48

5. Find area of ΔABC
   a) 50
   b) 60
   c) 100
   d) 90

Activities

http://epathshala.nic.in/QR/books/10Maths/labmanualclass10activity22.pdf

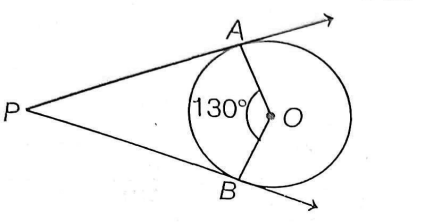
http://epathshala.nic.in/QR/books/10Maths/labmanualclass10activity23.pdf

For more practice / extended learning

WORKSHEET (Circles)

Level 1

1) Two concentric circles are of radii 10 cm and 8 cm then the length of the chord of the larger circle which touches the smaller circle is?
   a) 6 cm b) 12 cm c) 18 cm d) 9 cm
2) At which point a tangent is perpendicular to the radius?
3) Find the distance between two parallel tangents of a circle of radius 3 cm?
4) In the below figure PA and PB are tangents from P to a circle with center 'O'. If $\angle AOB = 130^0$, then find $\angle APB$?

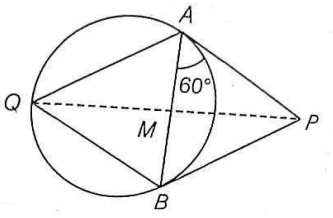


Level 2

1) The radii of two concentric circles are 13 cm and 8 cm. AB is diameter of the bigger circle. BD is a tangent to the smaller circle touching it at D. Find the length of AD?
2) Tangents AP and AQ are drawn to a circle with centre 'o' from an external point A. Prove that $\angle PAQ = 2\angle OPQ$

Level 3

1) PA and PB are the tangents to a circle which circumscribes an equilateral $\triangle$ ABQ. If $\angle PAB = 60^0$ as shown in the below figure. Prove that QP bisects AB at Right angled?



REMEDIAL WORK

1) Recall tangent and secant to a circle?
2) How many tangents can be draw at a point on a circle?
3) How tangents can we draw from external point to a circle? Are the lengths of tangents are equal?
4) If tangents PA and PB from a point P to a circle with centre O are inclined to each other at angle of 80^0 then $\angle POA$ =

   A)50^0 B)60^0 C)70^0 D) 80^0

5) PQ is a chord of length 8 cm of a circle of radius 5cm. The tangents at P& Q intersects at a point T. Find the length TP.

6) Prove that the opposite sides of a Quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

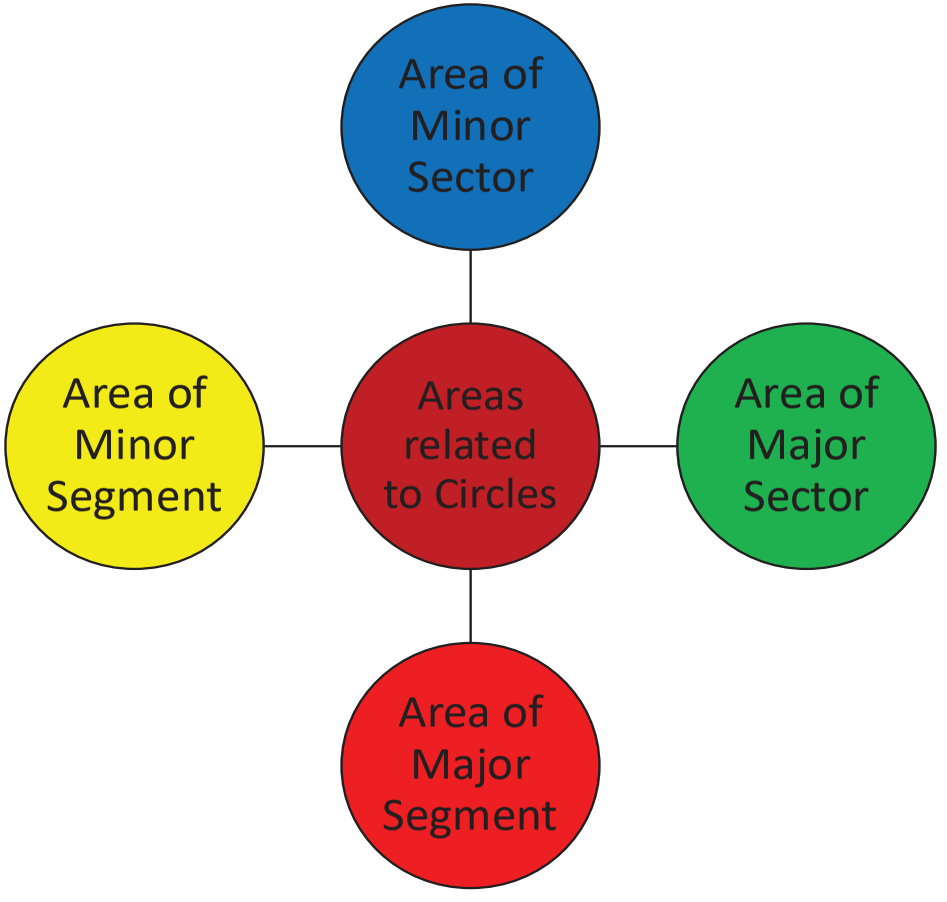
11. AREAS RELATED TO CIRCLES

https://ncert.nic.in/ncerts/l/jeep211.pdf

THE FOLLOWING CURRICULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPTER

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-4 Analyses characteristics and properties of two-dimensional geometric shapes and develops mathematical arguments to explain geometric relationships	• C-4.3 Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π
CG-7 *Begins to perceive and appreciate the axiomatic and deductive structure of Mathematics*	C-7.3 Proves theorems using Euclid's axioms and postulates – for angles, triangles, quadrilaterals, circles, area-related theorems for triangles and parallelograms

MIND MAP


Area of Minor Sector
Area of Minor Segment
Areas related to Circles
Area of Major Sector
Area of Major Segment

PERIOD WISE PLAN

PERIOD	LEARNING OUTCOMES
LP 1 **INTRODUCTION OF SECTOR AND SEGMENT**	➢ Derives formulas related to circumference and Area of circle, arc length. ➢ Applies formulas related to circumference and Area of circle, arc length. ➢ Solves problems on Areas related to Circles.
LP 2 **AREA OF SECTORS**	➢ Derives formulas related to Area of Minor sector and Area of Major sector. ➢ Applies formulas related to Area of Minor sector and Area of Major sector ➢ Solves problems on Areas related to Sectors.
LP 3 **AREA OF SEGMENTS**	➢ Derives formulas related to Area of Minor segment and Area of Major segment. ➢ Applies formulas related to Area of Minor segment and Area of Major segment. ➢ Solves problems on Areas related to segment.
LP 4 **PROBLEMS RELATED TO AREA OF SECTOR AND SEGMENT**	➢ Applies formulas on Areas and lengths related to Circles to solve problems. ➢ Uses formulas on Area and Lengths Related to Circles to find unknown measurements. ➢ Estimates and approximates measures of Areas.
LP 5 **PROBLEMS RELATED TO AREA OF SECTOR AND SEGMENT**	➢ Applies formulas on Areas and lengths related to Circles to solve problems. ➢ Uses formulas on Area and Lengths Related to Circles to find unknown measurements. ➢ Estimates and approximates measures of Areas.

Chapter Plan (Unit plan/ lesson plan)

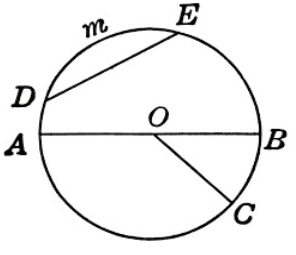
Class: **10**

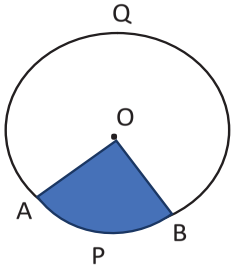
Chapter: **11. AREAS RELATED TO CIRCLES**

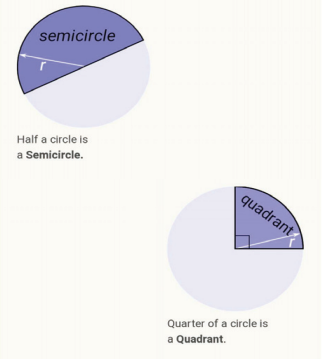
Total no. of periods for this chapter: **5**

Period No: **01 / 05**

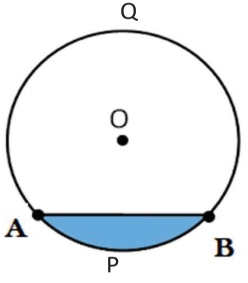
Sub Topic: Introduction of Sector and Segment

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-4.3 Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π C-7.3 Proves theorems using Euclid's axioms and postulates – for angles, triangles, quadrilaterals, circles, area-related theorems for triangles and parallelograms. Derives formulas related to circumference and Area of circle, arc length. Applies formulas related to circumference and Area of circle, arc length.	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing) (5 min) The teacher asks students to recall the parts of circle.  1. Identify radii in the circle? 2. What we call the line segment DE?	 Prepare a model for identifying parts of a circle. 1. What is radius?	 3 min.

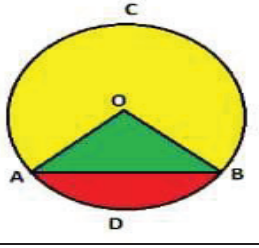
Solves problems on Areas related to Circles.	$\overset{\frown}{}$ 3. What we call DME? 4. What is diameter? Identify it? 5. Identify one sector? Demonstration (25 min) **Sector** :  Observe the shaded region and give the answers 1. Identify the parts of the circle/ 2. What are the boundaries of shaded region? 3. How the unshaded region is formed? 4. Compare the areas of shaded and unshaded regions? 5. What we call smaller shaded and unshaded regions? 6. How can we write major and minor sectors? **Common Sectors**: The Quadrant and Semi circle are two special types of sectors.	2. Define circumference of circle? 3.Write arc in your own words? Q1. Define Sector of the Circle? Q2. What is minor sector? Q3. What is major sector? Q4. Draw a circle with any radius .and draw a minor sector and major sector. Q5. If the are of circle 100cm^2 what is the area of semicircle and quadrant?	**BYJU'S video on parts of a cirle.** **Charts and models related circle and its parts**



Segment



1. Explain how the shaded region formed?
2. Explain how the unshaded region formed?
3. What you conclude when compare the regions?
4. What you call the shaded and unshaded regions?
5. How can we write major and minor segments?

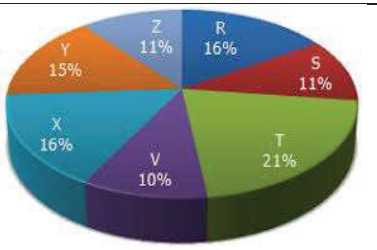


Sector and Segment in one Circle

Q1. Write about segment of circle in your own words?

Q2. what do you say about minor and major segments?

?

	1. Name the Yellow color regions? 2. Name the Red color regions? 3. Which colors represent minor sector? 4. Which colors represent major segment? Activity:  Take a Pizza ➢ Try to cut the Pizza in to Sectors. ➢ Try to cut the Circle (Pizza), bounded with chord. **Student Activity (Individual) (10 min)** Teacher asks the students to draw a circle and sectors and segments name them?	 How many sectors are in the above figures? Give some real-life examples where we can see segment and sectors ➢ How can we find Area of Sector and Segment?	

Summative Assessment Plan

(Only… where relevant)

1. Write the differences between segment and sector?

Teachers' reflections and experiences:

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

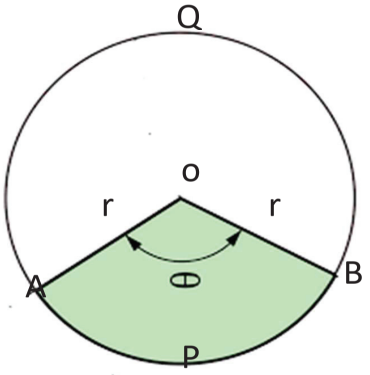
Chapter: **11. AREAS RELATED TO CIRCLES**

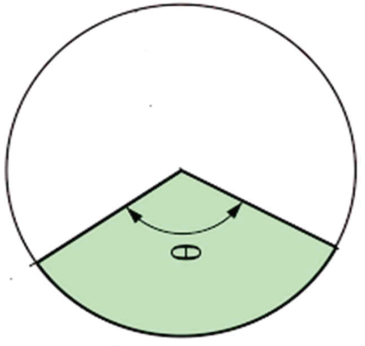
Total no. of periods for this chapter: **5**

Period No: **02 / 05**

Sub Topic AREA OF SECTORS

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-4.3 *Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of* π **C-7.3** *Proves theorems using Euclid's axioms and postulates – for angles, triangles, quadrilaterals, circles, area-related theorems for triangles and Parallelograms* • Derives formulas related to Area of Minor sector and Area of Major sector.	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing) (5 min) Teacher asks the students to recall sectors and segments in circle. 1. How can we make a sector from circle explain in your own words? 2. What is the area of a circle and explain the terms? 3. What is the ratio and approximate value of π? **Angle in a Sector (5 min)**	1.Is the ratio of circumference to the diameter of a circle $\frac{c}{d}$ is represented by π. But we say that π is an irrational number. Why?	**Circle. sector and segment models** 4 min. BIJU'S video Areas Related to Circles

• Applies formulas related to Area of Minor sector and Area of Major sector. • Solves problems on Areas related to Sectors.	 Teacher asks the students to 1. Identify the angle in the sector OAPB. 2. What is the angle at the center? 3. How can you find the angle in major sector, OAQB? **Area of Minor Sector (20 min)** Teacher draws the diagram and initiate discussions	1. What is the value of sum of angles in minor and major sectors? 2. How can we get the Angle in the major sector is $(360^0 - \theta)$? 1. Explain the variables in area of sector formula?	**Paper, geometrical instrument,**



- Area of a sector forming an angle of 360^0 at the center = $\pi\ r^2$

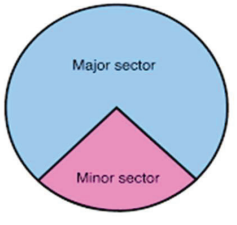
When the angle is 360° what will be the sector?

- Area of sector forming an angle of $1^0 = \frac{\pi\ r2}{360}$

Q: What is unitary method? How can we apply in this situation?

Area of sector forming an angel of $\theta = \theta\ X\ \frac{\pi\ r2}{360} = \frac{\theta}{360}\ X\ \pi\ r^2$

Area of Major Sector



Area of Major Sector = $\pi\ r^2 - \frac{\theta}{360}\ X\ \pi\ r^2$

Explain the terms of the above formula?

What is the circumference of a circle?

	Teacher asks the students 1. By adding the two areas sectors, what area we will get? 2. How do you find area of major sector? **Group Activity (10 min)** Teacher makes students into groups and give instructions to find Length of arc of sector of angle θ by using unitary method.	What is the length of arc in a sector?	

Summative Assessment Plan

(Only… where relevant)

2. Find the area of sector of a circle with radius 5 cm, if angle of sector is 30^0?
3. The length of minute hand of a clock is 7 cm, find the area swept by the minute hand in 5 min?

Teachers' reflections and experiences

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

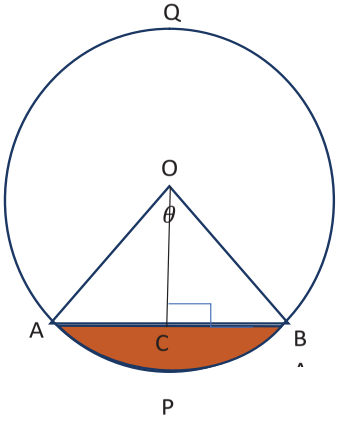
Chapter: **11. AREAS RELATED TO CIRCLES**

Total no. of periods for this chapter: **5**

Period No: **03 / 05**

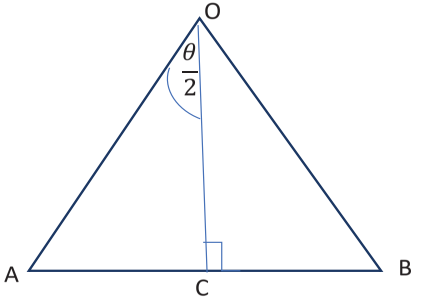
Sub Topic AREA OF SEGMENT

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-4.3 *Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π.* **C-7.3** *Proves theorems using Euclid's axioms and postulates – for angles, triangles, quadrilaterals, circles, area-related theorems for triangles and Parallelograms.* • Derives formulas related to Area of Minor segment and Area of Major	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing) (5 min) Teacher asks to recall segments in circle. 1. How the segments formed in circle? 2. What is the area of a circle and explain the terms? 3. What is the circumference of circle. 4. If area of circle is 154cm^2 and area of minor segment 54cm^2 . what is the area of major segment. **Area of Segment (15 min)** Teacher draws the diagram and explain how we get the formula for area of segment and lead to discussions.	1. Write the formula for area of triangle?	**34 min. video of Home School – 'Areas Related to Circles'**

segment. • Applies formulas related to Area of Minor segment and Area of Major segment. • Solves problems on Areas related to segment.	 Teacher asks the students to 1. Identify the minor segment name it. 2. What is the angle at the center? 3. Identify the triangle and segment in the sector OAPB? 4. what should be subtracted from area of sector to get area of minor segment.	1. What is the perpendicular bisector of AB? 2. Angle bisector of $\angle AOB$? 3. Identify base and height of ΔOAB? 4. In the figure area of triangle is $60cm^2$ and area of circle $100cm^2$ what is the area of minor segment?	**Paper, geometrical instrument,**

Area of ΔOAB: (10 min)

Teacher guides the students how to get the area of triangle ΔOAB



1. What we call OC, AB in ΔOAB?
2. Identify adjacent and opposite angles of $\frac{\theta}{2}$?
3. Which trigonometric ratio is used to find OC in ΔOAC?
4. Which trigonometric ratio is used to find AC in ΔOAC?
5. How can we get AB by using AC?
6. Write the formula for finding area of triangle OAB?

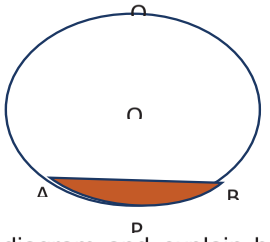
Conclusion:

Area of minor segment = Area of Sector – Area of ΔOAB

Area of major Segment (10 min)

Teacher initiative the students to derive area of major segment:

1. What ratio is for sin x?
2. What ratio is for cos x?

	 Teacher draws the diagram and explain how we get the formula for area of major segment. 1. Identify the major segment in circle? 2. What will get if minor and major segment areas are added? 3. What area we get when minor segment is removed from the circle? 4. What should be removed from area of circle to get area of major segment? Conclusion: **Area of major segment = Area of Circle– Area of ∆OAB**	1. Write the formula for area of circle? 2. Write the formula for area of minor segment?	

Summative Assessment Plan

(Only… where relevant)

1. A chord of a circle of radius 10 cm, subtends a right angle at the center find the area of corresponding (i) minor segment (ii) major segment

Teachers' reflections and experiences

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

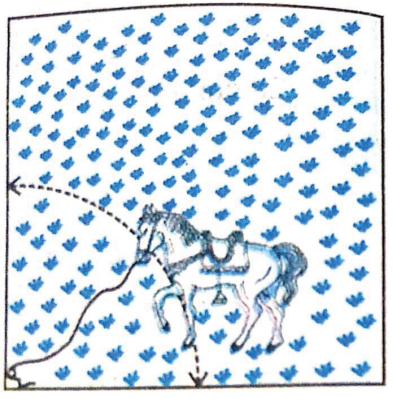
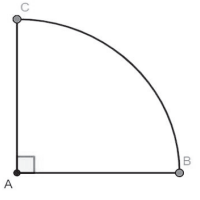
Chapter: **11. AREAS RELATED TO CIRCLES**

Total no. of periods for this chapter: **5**

Period No: **04 / 05**

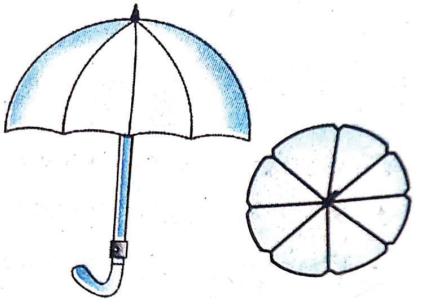
Sub Topic: Problems related to Areas of Segments and Sectors of a Circle

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-4.3 *Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π.* • Applies formulas on Areas and lengths related to Circles to solve problems. • Uses formulas on Area and Lengths Related to Circles to find unknown measurements. • Estimates and	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing) (10 min) Teacher asks to recall areas of segments and sectors in circle: 1. Identify the variables in the formula Area of sector = $\frac{\theta}{360}$ X π r^2 2. What is the formula for finding area of minor sector? 3. How can we find the area of segment? 4. How to find the area of major segment? **Problem 1 : (15 min)** A horse is tied to a peg at one corner of a square shaped grass field of side 15 meters by means of a 5 meters long rope. (See figure) Find (i) the area of that part of the field in which the horse		https://youtu.be/hlcUtoLB13U?si=0FvhupjsvBH6cP0U 9 min. CK-12 video relating to Calculating Areas of Sectors and Segments:

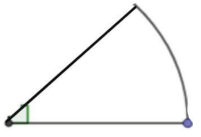
approximates measures of Areas. • Uses appropriate units to find the measure of Areas.	can graze, (ii) the increase in the grazing area if the rope were 10 meters long instead of 5 meters.  Teacher asks to identify the area part that the horse can graze and draw separate diagram.  Teacher asks the students to identify the values of θ and r. Teacher asks students to recall the formula useful to find the area of the region here. (Teacher Note : Teacher should ensure that students identify the shape as a sector and recollects the relevant formula) Teacher asks the students to calculate the area by replacing the values known and conclude the problem.	1. Why the region grazed by horse is a sector? 2. Can you find the area of the remaining field which the horse cannot graze? 3. What units are used to express the area grazed by the horse in this case?	https://www.youtube.com/watch?v=KtN_hdzGrts **Paper, geometrical instrument,**

Problem 2 : (15 min)

An umbrella has 8 ribs which are equally spaced (See the figure). Assuming the umbrella to be a flat circle of radius 45cm, find the area between the two consecutive ribs of the umbrella.



Teacher asks the students to draw 1 separate sector.



Teacher asks the students to find the angle of each sector. (Teacher Note: Teacher should assist students in getting the angle as 1/8 of 360^0. $\theta = 45^0$)

Teacher asks the students to use the available data and find the area between two consecutive ribs.

1. Find the area between two alternate ribs.
2. Find the perimeter of each sector.

Summative Assessment Plan

(Only… where relevant)

1.Find the area of the sector of the circle with radius 4 cm and of angle 30^0. Also find the area of the corresponding major sector.

Teachers' reflections and experiences

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

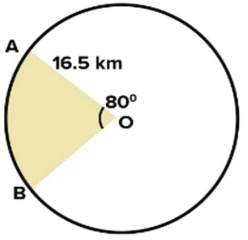
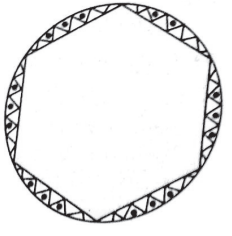
Chapter: **11. AREAS RELATED TO CIRCLES**

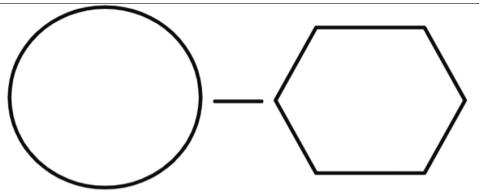
Total no. of periods for this chapter: **5**

Period No: **05 / 05**

Sub Topic: Problems related to Areas of Segments and Sectors of a Circle

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-4.3 *Proves theorems about the geometry of a circle, including its chords, subtended angles, inscribed polygons, and area in terms of π.* ➢ Applies formulas on Areas and lengths related to Circles to solve problems. ➢ Uses formulas on Area and Lengths Related to Circles to find unknown measurements.	**Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing) (10 min) Teacher asks to recall areas of segments and sectors in circle and formulas of areas. 1. Write the formula for finding area of sector and explain terms int? 2. If angle of a sector 60^0 and r=7cm what is the area of sector? 3. Area of major segment 100cm^2 area of minor segment is 54cm^2 what is the area of circle? **Problem 1: (15 min)** To warn ships for underwater rocks, a light house spreads light over a sector of angle 80^0 to a distance of 16.5KM. Find the area of the sea over which the ships are warned.		

➢ Estimates and approximates measures of Areas. ➢ Uses appropriate units to find the measure of Areas.	 Teacher asks the students to visualize and draw a relevant diagram depicting a circular sector with angle 80^0 and radius 16.5KM. Teacher makes the students realize that the result should be the area of such a sector. Teacher makes students recall the relevant formula and do the computational task. **Problem 2 : (15 min)** A round table cover has 6 equal designs, as shown in figure. If the radius of the cover is 28cm, find the cost of making the designs at the rate of rupees 0.35 / cm^2.  Teacher asks the students what should be removed from the circle to get the design.	1.The areas of two sectors of two different circles with equal corresponding arc lengths are equal. Is this statement true? Why? 2.Find the area of a sector of a circle of radius 28 cm and central angle 45°. 3. The wheel of a motor cycle is of radius 35 cm. How many revolutions per minute must the wheel make so as to keep a speed of 66 km/h? How to find the area of equilateral triangle? How to find the cost when rate is known?	12 min. Prof D video relating to Arc Length and Area of a Sector **Paper, geometrical instrument,**

	 Teacher makes the students to find the areas of circle and the hexagon, and take the difference as the required area. (Teacher Note: Teacher should enable students to find the area of hexagon with the use of 6 equilateral triangles with each side equal to the radius of circle) Teacher asks the students to find the cost of designing using this area and given rate of designing.		

Summative Assessment Plan

(Only… where relevant)

2. Find the area of the sector of the circle with radius 4 cm and of angle 30^0. Also find the area of the corresponding major sector.
3. A cow is tied with a rope of length 14 m, at the corner of a rectangular field of dimensions 20 m X 16 m. Find the area of the field in which the cow can graze?

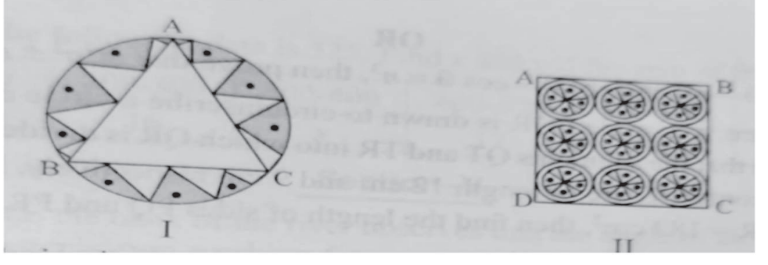
Teachers' reflections and experiences

- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**

For more practice/extended learning

Case based questions

1.Pookalam is the flower bed or flower pattern designed during Onam in Kerala. It is similar as Rangoli in North India and Kolam in Tamil Nadu. During the festival of Onam, your school is planning to conduct a Pookalam competition. Your friend who is a partner in competition, suggests two designs given below. Observe these carefully.



Design I: This design is made with a circle of radius 32cm leaving equilateral triangle ABC in the middle as shown in the given figure.

Design II: This Pookalam is made with 9 circular design each of radius 7cm.

Refer Design I:

1. The side of equilateral triangle is
   a) $12\sqrt{3}$ cm
   b) $32\sqrt{3}$ cm
   c) 48cm
   d) 64cm
2. The altitude of the equilateral triangle is
   a) 8 cm
   b) 12 cm
   c) 48cm
   d) 52cm

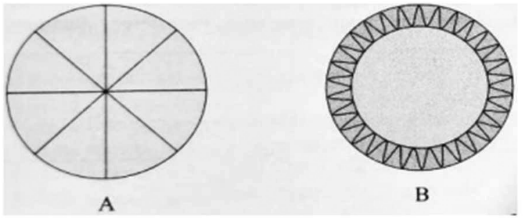
Refer Design II:

3. The area of square is

a) 1264 cm^2
b) 1764 cm^2
c) 1830 cm^2
d) 1944 cm^2

4. Area of each circular design is
   a) 124 cm^2
   b) 132 cm^2
   c) 144 cm^2
   d) 154 cm^2
5. Area of the remaining portion of the square ABCD is
   a) 378 cm^2
   b) 260 cm^2
   c) 340 cm^2
   d) 278 cm^2

2.A brooch is a small piece of jewellery which has a pin at the back so it can be fastened on a dress, blouse or coat. Designs of some brooch are shown below. Observe them carefully.



Design A: Brooch A is made with silver wire in the form of a circle with diameter 28mm. The wire used for making 4 diameters which divide the circle into 8 equal parts. Design B: Brooch b is made two colours_ Gold and silver. Outer part is made with Gold. The circumference of silver part is 44mm and the gold part is 3mm wide everywhere.

Refer to Design A

1. The total length of silver wire required is

a) 180 mm b) 200 mm c) 250 mm d) 280 mm

2. The area of each sector of the brooch is

a) 44 mm^2 b) 52 mm^2 c) 77 mm^2 d) 68 mm^2

Refer to Design B

3. The circumference of outer part (golden) is

a) 48.49 mm b) 82.2 mm c) 72.50 mm d) 62.86 mm

4. The difference of areas of golden and silver parts is

a) 18π b) $44\,\pi$ c) $51\,\pi$ d) $64\,5\,\pi$

A boy is playing with brooch B. He makes revolution with it along its edge. How many complete revolutions must it take to cover 80 mm?

a) 2 b) 3 c) 4 d) 5

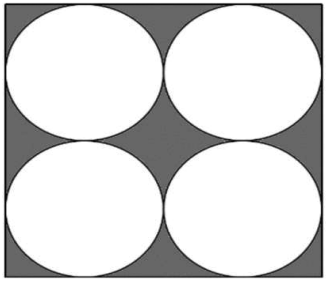
WORKSHEET (Areas related to circles)

Level 1

1) Find the area of circle whose circumference 3.5 cm?
2) If the perimeter of the circle is equal to that of a square then find the ratio of their Areas?
3) The radius of the wheel of a bus is 25 cm, if the speed of the bus is 33 km/h, then how many revolutions will the wheel make in one minute?

Level 2

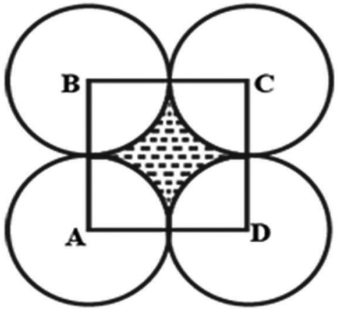
1) Find the area of the shaded region in figure as shown below where ABCD is a square of side 12 cm ?



2) A chord 10 cm long is drawn in a circle whose radius is $\sqrt{50}$ cm find the area of segment?

Level 3

1) In the given figure, ABCD is a square of side 7 cm and A, B, C and D are centers of equal circles touching externally in pairs find the area of the shaded region?



REMEDIAL WORK

1) Define Sector of the Circle?
2) What are minor and major sectors? and recall how to find the areas of sectors?
3) What are minor and major segments? and recall how to find the areas of segments?
4) Find the area of sector of a circle with radius 5 cm, if angle of sector is 30^0?
5) The length of minute hand of a clock is 7 cm, find the area swept by the minute hand in 5 min?

12.SURFACE AREAS AND VOLUMES

CHAPTER 12

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https://epathshala.nic.in/topic-d.php?id=1062CH13

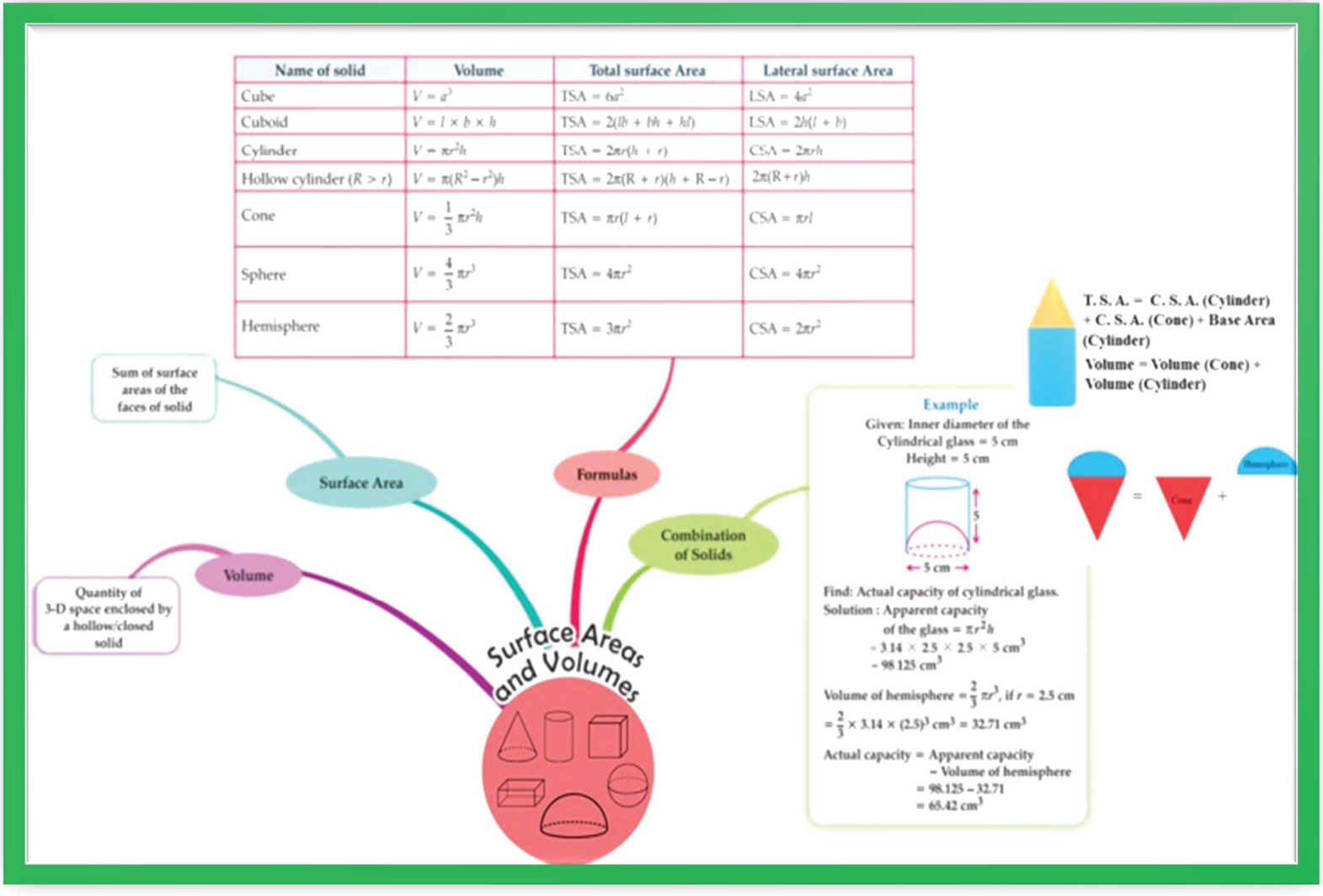
Introduction:

Chapter Plan (Unit plan/ lesson plan)

THE FOLLOWING CURRICULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPTER

CURRICULAR GOALS(CG)	COMPETENCIES (C)
CG-5: Derives and uses formulae to calculate areas of plane figures, and surface areas and volumes of solid objects	C-5.2: Visualizes and uses mathematical thinking to discover formulae to calculate surface areas and volumes of solid objects (cubes, cuboids, spheres, hemispheres, right circular cylinders/cones, and their combinations
CG-8: Builds skills such as visualization, optimization, representation, and mathematical modelling along with their application in daily life	C-8.3: Employs optimization strategies to maximize desired quantities (such as area, volume, or other output) under given constraints

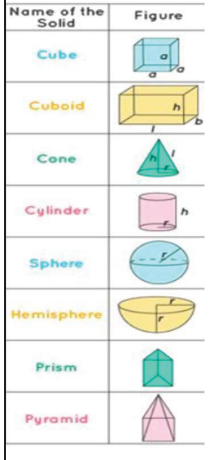
MIND MAP

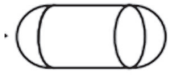
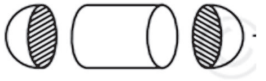
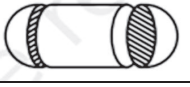

Name of solid | Volume | Total surface Area | Lateral surface Area
Cube | $V = a^3$ | TSA = $6a^2$ | LSA = $4a^2$
Cuboid | $V = l \times b \times h$ | TSA = $2(lb + bh + hl)$ | LSA = $2h(l + b)$
Cylinder | $V = \pi r^2 h$ | TSA = $2\pi r(h + r)$ | CSA = $2\pi rh$
Hollow cylinder ($R > r$) | $V = \pi(R^2 - r^2)h$ | TSA = $2\pi(R + r)(h + R - r)$ | $2\pi(R+r)h$
Cone | $V = \frac{1}{3}\pi r^2 h$ | TSA = $\pi r(l + r)$ | CSA = πrl
Sphere | $V = \frac{4}{3}\pi r^3$ | TSA = $4\pi r^2$ | CSA = $4\pi r^2$
Hemisphere | $V = \frac{2}{3}\pi r^3$ | TSA = $3\pi r^2$ | CSA = $2\pi r^2$
Sum of surface areas of the faces of solid
Surface Area
Formulas
Combination of Solids
Volume
Quantity of 3-D space enclosed by a hollow/closed solid
Surface Areas and Volumes
T. S. A. = C. S. A. (Cylinder) + C. S. A. (Cone) + Base Area (Cylinder)
Volume = Volume (Cone) + Volume (Cylinder)
Example
Given: Inner diameter of the Cylindrical glass = 5 cm
Height = 5 cm
5
5 cm
Find: Actual capacity of cylindrical glass.
Solution : Apparent capacity of the glass = $\pi r^2 h$
= 3.14 × 2.5 × 2.5 × 5 cm^3
= 98.125 cm^3
Volume of hemisphere = $\frac{2}{3}\pi r^3$, if r = 2.5 cm
= $\frac{2}{3}$ × 3.14 × (2.5)^3 cm^3 = 32.71 cm^3
Actual capacity = Apparent capacity − Volume of hemisphere
= 98.125 − 32.71
= 65.42 cm^3
Cone
Hemisphere

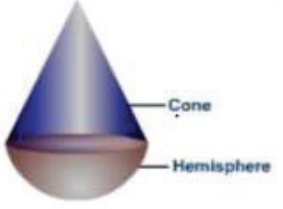
PERIOD WISE PLAN

PERIOD NO.	TEACHING TOPIC	LEARNING OUTCOMES
1	Introduction to surface areas and volumes Combinatin of solids	Understand and apply the formulas for surface area to solve real world problems.
2	Problems related to surface area of combination of solids.	Calculates surface area of the basic three-dimensional shapes and apply the relation ship between surface areas of the combination of the solids.
3	Problems related to surface area of combination of solids	Calculates surface area of the basic three-dimensional shapes and apply the Relationship between surface area of the combination of the solids
4	Problems related to surface area of combination of solids	Calculates surface area of the basic three-dimensional shapes and apply the Relationship between surface area of the combination of the solids
5	Volume of combination of solids	Explore how composite or combined shapes can be formed by joining or cutting basic solid shapes and understand how to breakdown complex figures into simpler components for volume calculations
6	Problems related to volume of combination of solids	Apply volume formulas to find the total volume of combined or composite solid shapes
7	Problems related to volume of combinations of solids	Apply volume formulas to find the total volume of combined or composite solid shapes
8	Conclusion and worksheets	Investigate how changes in dimensions effect both surface area and volume

Period plan (40 mins class)

Class: 10th **Chapter: Surface areas and volumes** **Total no. of periods for this chapter: 08** **Period no :1** **Sub Topic: 1. To find the area of combination of cylinder and hemisphere.** **2. To find the area of Combination of cone and hemi sphere.**			
Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process** **This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C.5.2 Visualizes and uses mathematical thinking to discover formulae to calculate surface areas and volumes of solid objects (cubes, cuboids, spheres, hemispheres, right circular cylinders/ cones and their combinations) C-8.3: Employs optimization strategies to maximize desired quantities (such as area, volume, or other output) under given constraints **Learning outcome**	**Teacher recapitulates the previous knowledge of the students by asking the following questions. (5 min)** 1. Give some examples of some composite shapes. 2. If you want to cover your maths text book with a colour paper, how much length would I need? 3. If I want to paint a ball, how would you decide on buying the quantity of paint. (Teacher note: Accept the answers and ask for the reasons.) By asking such type of questions teacher should recall the previous knowledge of the students about the surface area. **Activity 1: (10 min)** Teacher conducts the following activity. Teacher motivates the children in the groups to collect all the types of solid objects (soap boxes, balls, conical caps, bottles, cups). 1. Teacher instructs the groups to come up with	Match the following  LSA/CSA volume	

Understand and apply the formulas for surface area to solve real world problems.	composite shapes by using different shapes (created by the objects they have collected). 2. Each group presents shapes formed by them and let the other groups to describe what represents the surface area of that object. 3. After completion of the activity children will come to know the L.S.A & T.S.A. of objects. **Teacher asks students,** 1. Can you identify the object shown in the figure.  (Students give multiple answers what they know) 2. Can you give a best example with the above figure (Ex: medicine capsule) Teachers note: Teacher should give clarity that it is not a single object but a combination of two types of objects i.e. 1 cylinder and 2 hemi spheres  Teacher also could use other combinations of objects and ask for real life objects resembling that. **Teacher gives Activity 2: (10 min)** Extending the previous activity, the teacher asks the students if we have to paint the object identify the region to be painted and what would be the attribute that needs to be measured to buy the paint required. Teacher elicits how to find surface areas of composite shapes as below: The surface area of the new object is equal to the CSA of first hemi sphere + CSA of cylinder + CSA of second hemi sphere. 	1. Look for the objects or things in your surroundings that are combination of different solid objects. Draw the objects and colour them. 2. For the objects identified above what would be the formulae for finding the surface areas.	**https://youtu.be/I_XPkNBQZPI?si=sDNaI_OF6iAcnehE** **9 min. Suresh Aggarwal video on problems relating to Surface areas of Solids of Combination**

	Total surface area of the object = curved surface area of cylinder + 2× Curved surface area of hemi sphere. **Activity 3: (15 min)** The teacher asks the students in the groups 1. To prepare a toy by placing a cone on the hemisphere. Now decorate this toy with a colour paper. How much length of the paper you need. 2. Students will decorate the toy with colour paper and gives the conclusion that they need the colour paper which is equal to the CA of Hemisphere + CSA of Cone.  Teacher concludes that to find the TSA of the combination of solids. Need to find CSA of individual objects and add up to them. Teacher also recollects the formulae of LSA and TSA of (i) Sphere (ii) Hemi sphere (iii) Cylinder (iv) Cone.		**Solid shapes of the objects that we use in our daily life. (Ex: Ball, Duster, Book, Bottle, etc)** CSA of combination of solids

Summative assessment plan- only where relevant

Teachers' reflections and experiences:

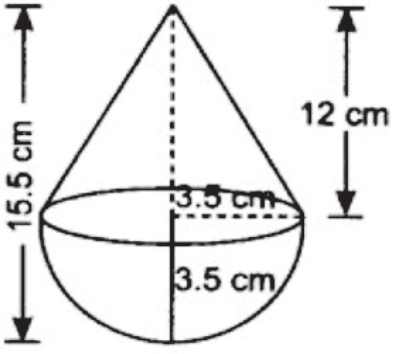
- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

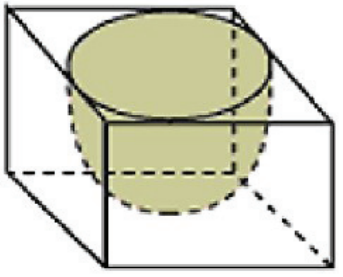
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Surface areas and volumes
Total no. of periods for this chapter: 08
Period no :2
Sub Topic: 1. Problems related to the concept

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C.5.2 Visualizes and uses mathematical thinking to discover formulae to calculate surface areas and volumes of solid objects (cubes, cuboids, spheres, hemispheres, right circular cylinders/ cones and their combinations) C-8.3: Employs optimization strategies to maximize desired quantities (such as area, volume, or other output) under given constraints **Learning outcome:** **Understand and apply the formulas for surface area to solve real world problems.**	Match the following (10 min) Solid Formula (LSA) 1 Cone a. $4\pi r^2$ 2 sphere b. $2\pi r^2$ 3 Cylinder c πrl 4 Hemisphere d. $2\pi rh$ 5.Describe the LSA/CSA of prism in your own words? 6. Describe the LSA/CSA of Pyramid in your own words? Problem: A toy in the form of a cone of radius 3.5 cm mounted on hemisphere of same radius. The total height of the toy is15.5 cm. Find the total surface area of the given figure (15 min)	1. A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 4 cm and the diameter of the base is 8 cm. Find the total surface area of the toy.	https://youtu.be/dgiE52DBJFA?si=qh4OqtLFQ_J4XgX8 **9 min.**

	 Teacher asks the students to read and understand the problem, draw the figure and recognize the given information. (Teachers note: teacher has to ensure that the student should identify to find the total surface area of the toy, we need to find lateral surface areas of both cone and hemisphere.) LSA of cone. : Teacher asks the students what we need 1 Find height of the cone. 2 find slant height of cone by Pythagoras theorem 3 Find LSA of cone by replacing r and l. LSA of hemisphere What we need? Write radius? Substitute in formula Now add both lateral surface areas to get total surface area Problem: A hemispherical depression is cut out from one face of a cubical wooden block such that the diameter l of the hemisphere is equal to the edge of the cube. Determine the surface area of the remaining solid Figure (15 min) • TEACHER asks the students to read and understand	2. Two cones with same base radius 8 cm and height 15cm are joined together along their bases. Find the surface area of the shape so formed. .	**Suresh Aggarwal video on problems relating to Surface areas of Solids of Combination** Model problem Video from TicTacLearn English

	the problem and draw the figure (Teachers note: Teacher should give proper instructions to understand the problem and draw the figure)  Write the given information. How can you find surface area of the given object (Teachers note: teacher should ensure that the student should understand to find surface area of given object 1.Find total surface area of the cube. 2.Find circular area on one of the faces of the cube. 3.Find curved surface area of hemisphere.) The teacher concludes that Total surface area of the object is equal to TSA of cube – Area of circle + CSA of hemisphere.		

Summative assessment plan- only where relevant

1. **Solve Exercise 12.1 question no 1,2**

2. **A sphere is inscribed in a cylinder. Is the surface of the sphere equal to the curved surface of the cylinder? If yes, explain how**

Teachers' reflections and experiences:

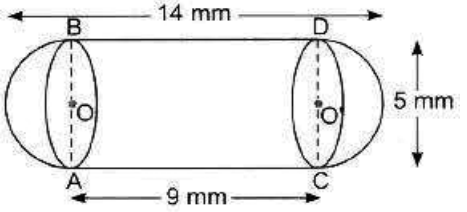
- Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?
- How well did the pedagogical strategies engage students and promote active participation in the learning process?
- How effective were the materials and resources used in this lesson?
- How well did the assessment strategies measure student understanding and achievement of the learning outcomes?

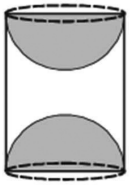
Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Surface areas and volumes
Total no. of periods for this chapter: 08
Period no :3
Sub Topic: 1. Problems related to the concept

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C.5.2 Visualizes and uses mathematical thinking to discover formulae to calculate surface areas and volumes of solid objects (cubes, cuboids, spheres, hemispheres, right circular cylinders/ cones and their combinations) C-8.3: Employs optimization strategies to maximize desired quantities (such as area, volume, or other output) under given constraints	Recapitulation of formulae based on total surface areas. Match the following (10 min) 1. cube a.$2\pi rh + 2\pi r^2$ 2.cu**boid** **b.**$6a^2$ **3.cone c.2(lb+bh+lh)** **4. cylinder d.**$\pi rl + \pi r^2$ **Write what are the shapes involved in the following combination of solids.**   Hut	1. Three cubes of volume 27 cubic cm each are joined end-to-end to form a solid. Find the surface area of the cuboid so formed. 2. From a solid cube of side 7 cm ,a conical cavity of height 7 cm and radius 3cm is hollowed out. Find the volume of the remaining solid. .	**https://youtu.be/Wu-IjIte61M?si=mOQaDLIy3QO_Omsj** **3 min. 'MathsInmyway' video on medicine capsule**

Learning outcome: Understand and apply the formula for surface area to solve real world problems.	Problem: A medicine capsule is in the shape of a cylinder with two hemispheres struck to each its ends. The length of the entire capsule is 14mm and the diameter of the capsule is 5mm. Find its surface. (30 min)  • The teacher asks the students 1. what solids can you observe in the figure? can you describe it. 2. list the given values. 3. How to find the surface area of medicine capsule. (Teacher Note: The teacher should ensure that the student understands the figure is the combination of two types of solids cylinder and hemisphere of the same radius of base.). 4.Find CSA of the cylinder and CSA of the hemisphere. 5. Add CSA of cylinder with two times of CSA of the hemisphere that concludes total surface area of the capsule. The teacher can help in substitution and in the calculation if need. Problem: A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in the figure. If the height of the cylinder is 10 cm. and its base radius is of 3.5 cm, find the total surface area of the article	Write the TSA? Write the TSA of article?	**Model solids.**

	 Teacher makes the students into pairs and ask them to solve by using following instructions From the figure, is radius of the hemispheres scooped out is the same as the radius of the base of the cylinder? Then which parts of the article includes for finding total surface area of the article? Compute TSA using formulas?		

Summative assessment plan- only where relevant

3. **Solve Exercise 12.1 question no 7**

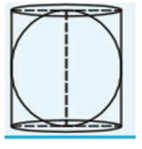
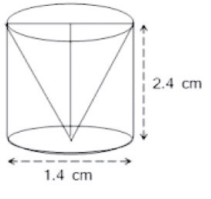
Teachers' reflections and experiences:

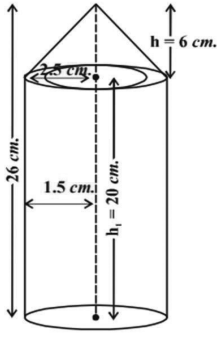
- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Surface areas and volumes
Total no. of periods for this chapter: 08
Period no :4
Sub Topic: 1. Problems related to the concept (continued previous class)

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
Calculates surface area of the basic three-dimensional shapes and apply the Relationship between surface area of the combination of the solids C.5.2 Visualizes and uses mathematical thinking to discover formulae to calculate surface areas and volumes of solid objects (cubes, cuboids, spheres, hemispheres, right circular cylinders/ cones and their combinations) C-8.3: Employs optimization strategies to maximize desired quantities (such as area, volume, or other output)	Teacher assigned different model problems and asks the students to solve in groups and present Infront of the class 40 min Problem: A sphere is inscribed in a cylinder. Is the surface of the sphere equal to the curved surface of the cylinder? If yes, explain how?  Problem: From a solid cylinder whose height is 2.4 cm and diameter 1.4 cm. A conical cavity of the same diameter is hollowed out. Find the total surface area of the remaining solid to the nearest sq cm. Figure  	. 1.Two solid hemispheres of same base of radius r joined together along their bases then find curved surface area of this new solid.	https://youtu.be/I_XPkNBQZPI?si=JfxDpqeMUgLRV9jL **9 min. Suresh Aggarwal video on problems relating to Surface areas of Solids of Combination**

under given constraints	Teacher asks the students to read and understand the question and draw the related figure. 1.Can you describe the figure? 2.how to find total surface area of the given solid. (Teachers Note: Teacher should ensure that the total surface area is the sum of CSA of cylinder, area of circular base and CSA of cone.) **1.Find CSA cylinder.** **2 Find area of circular base** **3.Find CSA of cone.** **Adding all to get total surface area.** **Problem:** A wooden toy rocket is in the shape of a cone mounted on a cylinder as shown in the adjacent figure. The height of the entire rocket is 26 cm, while the height of the conical part is 6cm. The base of the conical position has a diameter of 5cm, while the base diameter of the cylindrical portion is 3cm. If the conical portion is to be painted orange and the cylindrical portion is to be painted yellow, find the area of the rocket painted with each of these colour (Take π = 3.14)  1.Find slant height of cone. 2.find the area of conical portion. 3.Find the area of cylindrical portion.	Identify the measurements from the figure. What is slant height. How much area is painted orange? How much area is painted yellow?	**Model solids.**

Summative assessment plan- only where relevant
Teachers' reflections and experiences: ➢ **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?** ➢ **How well did the pedagogical strategies engage students and promote active participation in the learning process?** ➢ **How effective were the materials and resources used in this lesson?** ➢ **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Surface areas and volumes
Total no. of periods for this chapter: 08
Period no :5
Sub Topic: volumes of solids

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
Calculates surface area of the basic three-dimensional shapes and apply the Relationship between surface area of the combination of the solids C.5.2 Visualizes and uses mathematical thinking to discover formulae to calculate surface areas and volumes of solid objects (cubes, cuboids, spheres, hemispheres, right circular cylinders/ cones and their combinations) C-8.3: Employs optimization strategies to maximize desired quantities (such as area, volume, or other output) under given constraints	Teaching learning process: (5 min) ➢ Teacher test previous knowledge of the students by conducting the following activity. ➢ Teacher asks the students to bring the birthday cap, match box, empty lunch box of circular base or a square base and also some water bottle filled with a water and big beaker from the science lab. ➢ Teacher asks the students to keep the objects that they bought on the teacher's table. Activity 1: (10 min) ➢ Pour water in the circular lunchbox and square lunch box. ➢ Measure the volume of water in both the individual boxes and listed out the volumes. ➢ Now pour the water at a time in the beaker, and measure the volume. ➢ What do you observe from the activity?	A soli d consisting of a right circular cone of height 120 cm and radius 60cm. standing on hemisphere of a radius 60 cm is placed upright in a right circular cylinder full of water such that it touches the bottom. Find the volume of water left in the cylinder.	https://youtu.be/9KL4i6IxepY?si=SOj4G-Pp98gtJYCF

Activity 2: (10 min)

- Take a birthday cap or any lunch box, pour a sand to fill up. Now measure a volume individually and list out the volumes.
- Now once again pour a sand at a time and find the volume.

What do you observe from both the activities?

- Teacher concludes: We can find the volume of a combined solids just by adding the volumes.

(Teacher Note: teacher should ensure that the students should understand that we have not added the surface area of the two constituents, because some part of the surface area disappeared in the process of joining them. However, this will not be the case when we calculate the volume. The volume of the solid form by joining two basic solids will actually be the some of the volumes of the constituents.)

- Teacher recalls the formulas for volume by match the following:

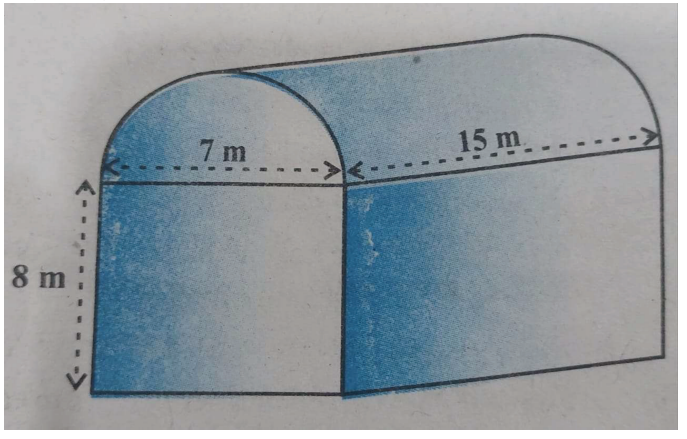
Solid	Volume (Cubic Units)
1) Cone	a) (4/3) π r^3
2) Cube	b) $l \times b \times h$
3) Cylinder	c) $\pi r^2 h$
4) Cuboid	d) a^3
5) Sphere	e) (1/3) $\pi r^2 h$

Let us see the following example to understand:

Example No. 1 (15 min)

Shanta runs an industry in a shed which is in the shape of a cuboid surmounted by a half cylinder (See figure). If the base of the shed is of dimension 7m x 15m and the

Birthday Cap, Empty Tiffin box of shapes circulate and square, Water and Sand.

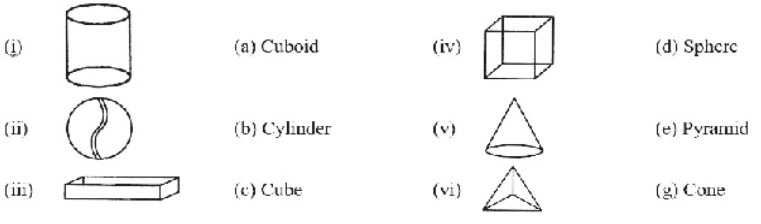
	height of the cuboidal portion is 8m. Find the volume of the shed can hold. Further, suppose the missionary in the shed occupies the total space of 300 m^3 ad there are 20 workers each of whom occupies about 0.08 m^3 space on an average then how much air is in the shed. {Take π = (22/7)}.  ➢ Students recall their previous knowledge from the above activities and should come to know that the volume of air inside the shed (when there are no people and missionary) is given by the volume of air inside the cuboid and inside the half cylinder taken together. ➢ Teacher asks the students to list out all the given values. ➢ How to find out the required volume? (Teachers Note: teacher should ensure that the students should understand the required volume is will get by subtracting the volume of missionary and volume of 20 workers.)		Volumes of solids
Summative assessment plan- only where relevant			

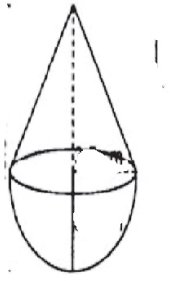
Solve example number 6 which is given in the textbook as well as students have to solve 5 and 6 questions from exercise number 12.2.
Teachers' reflections and experiences: ➢ **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?** ➢ **How well did the pedagogical strategies engage students and promote active participation in the learning process?** ➢ **How effective were the materials and resources used in this lesson?** ➢ **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan(Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Surface areas and volumes
Total no. of periods for this chapter: 08
Period no :6
Sub Topic: 1. Problems related to the concept

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C.5.2 Visualizes and uses mathematical thinking to discover formulae to calculate surface areas and volumes of solid objects (cubes, cuboids, spheres, hemispheres, right circular cylinders/ cones and their combinations) C-8.3: Employs optimization strategies to maximize desired quantities (such as area, volume, or other output) under given constraints Learning out comes: **Apply volume formulas to find the total volume of combined or composite solid shapes**	Activity (Matching) (10 min)  Write formula to find volume of the above solids and explain the terms. **Problem: A** **(30 min)** **solid in the** shape **of a cone** standing on a hemisphere with both radii equal to 1 cm and the height of the cone is equal to 1 its radius. find the volume of the solid in terms of π (Teachers Note: the teacher can ask to draw the solid and to label the parts. Ensure that volume of this solid is the sum of volume of cone and hemisphere)		**https://youtu.be/9KL4i6IxepY?si=SOj4G-Pp98gtJYCF** **5 min. PrepOnGo video on Volume of combination of solids (Eg1)**

	 1. Find volume of cone 2 Find volume of hemisphere 3 Add both volumes to get volume of the given solid Problem: B A conical vessel of radius 6cm and height 8cm is completely filled with water. A ball is thrown into the vessel which touches it and some water spills out the vessel. Find out the volume of the water left in the vessel. Teacher plays the video of the above problem and ask them to observe. After watching video asks the students solve the problem and present in the class	1.A solid toy is in the form of a hemisphere surmounted by a right circular cone. The height of the cone is 4cm and the diameter of the base is 8cm. a. Find volume of the toy. b. If cube circumscribes the toy, then find the difference of the volumes the cube and toy.	**Maths text book.** **Model solids.** Model Problem

Summative assessment plan- only where relevant

4. **Solve Exercise 12.2 question no 3,4**

Teachers' reflections and experiences:

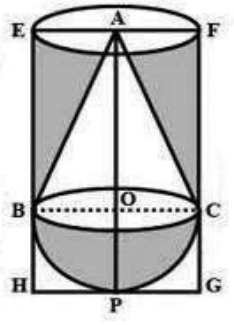
- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 mins class)

Class: 10th
Chapter: Surface areas and volumes
Total no. of periods for this chapter: 08
Period no :7
Sub Topic: 1. Problems related to the concept

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C.5.2 Visualizes and uses mathematical thinking to discover formulae to calculate surface areas and volumes of solid objects (cubes, cuboids, spheres, hemispheres, right circular cylinders/ cones and their combinations) C-8.3: Employs optimization strategies to maximise desired quantities (such as area, volume, or other output) under given constraints	Teacher explains different model problems . Problem. (40 min) A solid toy is in the form of a hemisphere surmounted by aright circular cone. The height of the cone is 2cm and diameter of the base is 4 cm. Determine the volume of the toy. If the right circular cylinder circumscribes the toy, find difference of the volumes of the cylinder and the toy. Given that $\pi = 3.14$ Teacher asks the students to read the problem and understand and draw the related figure. ➢ What are the solids you observing from the figure. ➢ List out the measures of cone, Hemisphere and cylinder. ➢ Find the volume of the cone and Hemisphere and add the volumes (it is the volume of toy). ➢ Find the volume of the cylinder. ➢ Subtract the toy volume from the cylinder.	. 1) A cylindrical bucket 32 cm height and with radius of base 18 cm is filled with sand. This bucket is emptied on the ground and a conical heap of sand is	https://youtu.be/9KL4i6IxepY?si=eM4PNOEKJs7IP6OJ **5 min. PrepOnGo video on Volume of combination of solids**

	 (Teachers note: Teacher should help the students, if they feel difficult in solving the problems.) Problem: A cylindrical pencil is sharpened to produce a perfect cone at one end with no overall loss of its length. The diameter of the pencil is 1cm and the length of the conical portion is 2cm. Calculate the volume of the shavings. Give your answer correct to two places if it is in decima use $use\ \pi = \frac{355}{113}$  How to find volume of showings? Whare the solids combined in given solid?	formed. If the height of the conical heap is 24 cm, then find the radius and slant height of heap?	**Model solids.**

	[Teacher note: **Volume of showings = Volume of cylinder of length 2 cm and base radius 0.5 cm. – volume of the cone formed by this cylinder**] Use the relevant formulas and simplify.		

Summative assessment plan- only where relevant

5. **Solve Exercise 12.2 question no 3,4**

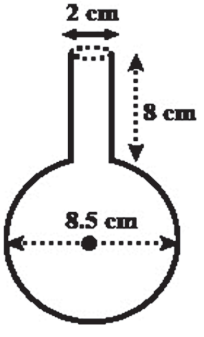
Teachers' reflections and experiences:

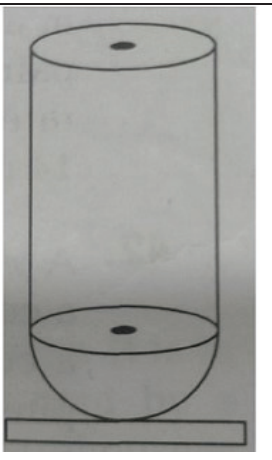
- **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?**
- **How well did the pedagogical strategies engage students and promote active participation in the learning process?**
- **How effective were the materials and resources used in this lesson?**
- **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

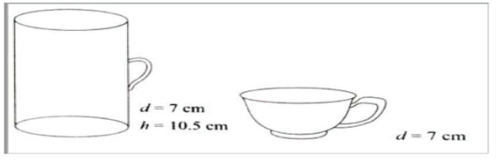
Chapter Plan (Unit plan/ lesson plan)

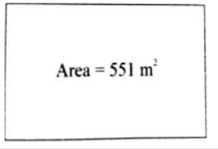
Period plan (40 mins class)

Class: 10th
Chapter: Surface areas and volumes
Total no. of periods for this chapter: 08
Period no :8
Sub Topic: 1. To find the area of combination of cylinder and hemisphere.
2. To find the area of Combination of cone and hemi sphere.

Learning Outcomes & Indicators/micro-competencies	**Teaching-Learning Process This should include activities to facilitate learning along with broad time duration**	**Pointers for formative assessment- this should include strategies that will be used to Check for Understanding - e.g., questions/worksheets/experiments/assignments/self-assessment checklists/etc.**	**Material required**
C.5.2 Visualizes and uses mathematical thinking to discover formulae to calculate surface areas and volumes of solid objects (cubes, cuboids, spheres, hemispheres, right circular cylinders/ cones and their combinations) C-8.3: Employs optimisation strategies to maximise desired quantities (such as area, volume, or other output) under given constraints	Problem. 15min A spherical glass vessel has cylindrical neck 8cm long ,2 cm in diameter; the diameter of the spherical part is 8.5 cm. By measuring the amount of water, it holds, a child finds its volume to be 345 cubic cm. Check whether she is correct, taking the above as inside measurements and $\pi = 3.14$  Teacher asks the students to read and understand the problem and the related figure.		https://youtu.be/9KL4i6IxepY?si=eM4PNOEKJs7IP6OJ **5 min. PrepOnGo video on Volume of combination of solids**

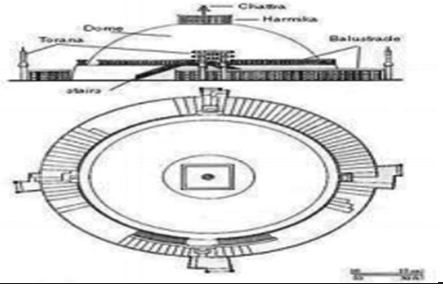
	List out all the given values. (10 min) To find the volume of the object, how to proceed? (Teachers note: Teachers should ensure that the students understand the measures they are taking as internal measures.) 1. Find the volume of a spherical ball with radius r = 8.5/2 2. Find the volume of the cylinder with height h=15 cm and radius r= 2cm. 3. Add the two volumes. 4. What do you observe? It is equal to the volume calculated by the girl? **CASE STUDY 1: 15min** **[Teacher makes the students into groups and assign a case study question and ask them to solve. Techer helps the students wherever necessary].** Adventure camps are the perfect place for the children to practice decision making for themselves without parents and teachers guiding their every move. Some students of a school reached for adventure at Sakleshpur. At the camp, the waiters served some students with a welcome drink in a cylindrical glass and some students in a hemispherical cup whose dimensions are shown below. After that they went for a jungle trek. The jungle trek was enjoyable but tiring. As dusk fell, it was time to take shelter. Each group of four students was given a canvas of area $551m^2$. Each group had to make a conical tent to accommodate all the four students. Assuming that all the stitching and wasting incurred while cutting, would amount to $1m^2$, the students put the tents. The radius of the tent is 7m.	1  3. A trophy awarded to the best student in the class is in the form of the solid cylinder mounted on solid hemi sphere with same radius and is made from some metal. This trophy is mounted on a wooden cuboid as shown in the figure. The diameter of hemisphere is 21 cm and total height of the trophy is 24.5 cm. find the weight of the metal used in making the trophy. If the weight of 1 cubic cm of metal is 1.2 g (Take $\pi = 22/7$)	**Live objects present in the class room.** **Paper and other stationary.** **Pens and Pencils etc.**





1. The volume of cylindrical cup is
2. The volume of hemispherical cup is
3. Which container had more juice and by how much?
4. The height of the conical tent prepared to accommodate four students is
5. How much space on the ground is occupied by each student in the conical tent

CASE STUDY 2: 10min



The Great Stupa at Sanchi is one of the oldest stone structures in India, and an important monument of Indian Architecture. It was originally commissioned by the emperor Ashoka in the 3rd century BCE. Its nucleus was a simple hemispherical brick structure built over the relics of the Buddha. It is a perfect example of combination of solid figures. A big hemispherical dome with a cuboidal structure mounted on it. (Take =22/7)

1. Calculate the volume of the hemispherical dome if the height of the dome is
2. 2 The formula to find the Volume of Sphere is
3. The cloth requires to cover the hemispherical dome if the radius of its base is
4. The total surface area of the combined figure i.e. hemispherical dome with radius 14m and cuboidal shaped top with dimensions 8m 6m 4m is
5. The volume of the cuboidal shaped top is with dimensions mentioned in question 4

Summative assessment plan- only where relevant
Teachers' reflections and experiences: ➢ **Did the lesson plan align with the curricular goals and competencies? if not how could be adjusted for better alignment?** ➢ **How well did the pedagogical strategies engage students and promote active participation in the learning process?** ➢ **How effective were the materials and resources used in this lesson?** ➢ **How well did the assessment strategies measure student understanding and achievement of the learning outcomes?**

For more Practice/extended learning

Chapter 12: Surface areas and volumes.

Work sheet 1

Multiple choice questions:

1.A funnel is the combination of

A). cone and a cylinder B). Frustrum of a cone and a cylinder

C). a hemisphere and a cylinder D). a hemisphere and a cone

2.During conversion of a solid from one shape to another the volume of new shape will be

A) increase B) decrease

C)remains same D) doubled

3.Volume of two spheres of same in the ratio 64:27. The ratio of surface areas is

A) 3:4 B) 4:3

C)9:16 D) 16:9

4.A mason constructs a wall of dimensions 270cm$\times$ $300cm \times 350cm$ with the bricks of each of size 22.5 cm $\times$ $11.25cm \times$
$8.75cm\ and\ it\ is\ assumed\ that\ \frac{1}{8}\ space\ is\ covered\ by\ the\ morta$Then the number of bricks used to construct the wall is?

A)11100 B)11200

C)1100 D)11300

5)If two solid hemispheres of same base radius r are joined together along their bases, then curved surface area of this new solid is

A)$4\pi r^2$ B)$6\pi^2$

C)$3\pi^2$ D)$8\pi^2$

Answer the following questions

1)IF two cubes of edge 5cm each are joined end-to-end, then find the surface area of the resulting cuboid.

2)An iron pole consists of a cylinder of height 240cm and a base diameter 26cm, which is surmounted by another cylinder of height 66cm and radius 10cm. Find The mass of the pole given that $1cm^3 0f$ iron has approximately 8g mass. (Takeπ=3.14)

3)A solid is composed of a cylinder with hemispherical ends. If the whole length of solid is 104 cm and the radius each hemispherical end is 7cm, then find the cost of polishing its surface at the rate of Rs 2 per cm^2.

4) A heap of rice is in the form of a cone of base diameter 24m and height 3.5m. Find the volume of the rice. How much canvas is required to just cover the heap.

5)A wooden article as shown in the figure was made from a cylinder by scooping out a hemisphere from one end and a cone from the other end. Find the total surface area of the article.

Work sheet 2

Chose the correct answer.

1. A cylindrical pencil sharpened at one edge is the combination of
   A). a cone and a cylinder B). frustrum of cone and a cylinder.

C). a hemisphere and a cylinder). two cylinders.

2. A surahi is the combination of

A). a sphere and a cylinder B) a hemisphere and a cylinder

c) two hemispheres D) a cylinder and a cone

3.A plumbline is the combination of

A).a cone and a cylinder B) a hemisphere and a cone.

C)frustrum of a cone and a cylinder D) sphere and a cylinder.

4.From a solid cylinder with a height 10 cm and radius of the base 6 cm, a right circular cone of the same height and the same base is removed, then the volume of remaining solid is

A).$280\pi\ cm^3$B) $330\pi\ cm^3$) $240\pi\ cm^3$ $280\pi\ cm^3$

Solve the following.

5.The curved surface area of a right circular cone is 12320 sq. cm. If the radius of its base is 56 cm then find its height.

6.A circus tent is cylindrical up to a height of 4 m and conical above it. If the diameter of the base is 98m and slant height of the conical part is 33m then find total canvas used in making the tent.

CHAPTER: 13

STATISTICS

Chapter Plan (Unit plan/ lesson plan)

PERIODWISE LESSON PLANS

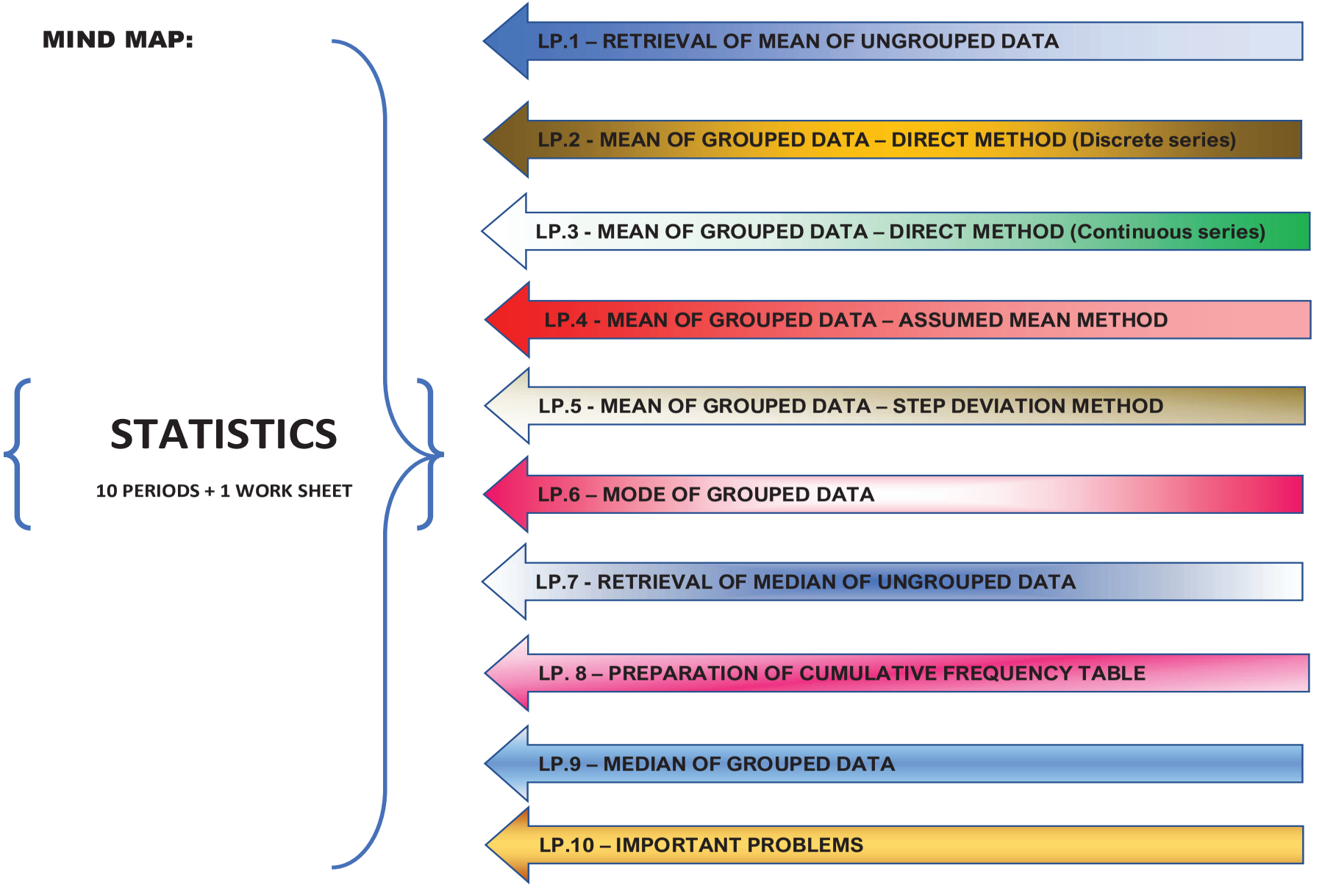
1062CH14

Chapter Plan (Unit Plan / Lesson Plans)

THE FOLLOWING CURRICULAR GOALS (CG) AND COMPETENCIES (C) WILL BE DEVELOPED THROUGH THIS CHAPTER

CURRICULAR GOALS(CG)	COMPETENCIES (C)
C.G. - 6: Analyses and interprets data using statistical concepts (such as measures of central tendency, standard deviations) and probability	**C - 6.1:** Applies measures of central tendencies such as mean, median, and mode
C.G. – 11 : Explores connections of Mathematics with other subjects.	**C - 11.1:** Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.

MIND MAP:


STATISTICS
10 PERIODS + 1 WORK SHEET
LP.1 – RETRIEVAL OF MEAN OF UNGROUPED DATA
LP.2 - MEAN OF GROUPED DATA – DIRECT METHOD (Discrete series)
LP.3 - MEAN OF GROUPED DATA – DIRECT METHOD (Continuous series)
LP.4 - MEAN OF GROUPED DATA – ASSUMED MEAN METHOD
LP.5 - MEAN OF GROUPED DATA – STEP DEVIATION METHOD
LP.6 – MODE OF GROUPED DATA
LP.7 - RETRIEVAL OF MEDIAN OF UNGROUPED DATA
LP. 8 – PREPARATION OF CUMULATIVE FREQUENCY TABLE
LP.9 – MEDIAN OF GROUPED DATA
LP.10 – IMPORTANT PROBLEMS

PERIOD WISE PLAN

PERIOD NO.	TEACHING TOPIC	LEARNING OUTCOMES/Objectives
1	**RETRIEVAL OF MEAN OF - UNGROUPED DATA**	1. Calculates mean for different sets of data related with real life contexts 2. Computes mean for ungrouped tabulated data. 3. Computes mean for grouped data. 4. Interprets the meaning of the computed mean of a given dataset
2	**MEAN OF GROUPED DATA** **– DIRECT METHOD (Discrete series)**	1. Calculates mean for different sets of data related with real life contexts. 2. Computes mean for grouped tabulated data. 3. Computes mean for grouped data. 4. Interprets the meaning of the computed mean of a given dataset 5. Computes mean for grouped data using the formula
3	**MEAN OF GROUPED DATA** **– DIRECT METHOD (Continuous series)**	1. Calculates mean for different sets of data related with real life contexts. 2. Computes mean for grouped tabulated data. 3. Computes mean for grouped data. 4. Interprets the meaning of the computed mean of a given dataset 5. Computes mean for grouped data using the formula
4	**MEAN OF GROUPED DATA** **– ASSUMED MEAN METHOD**	1. Calculates mean for different sets of data related with real life contexts. 2. Computes mean for grouped tabulated data. 3. Computes mean for grouped data. 4. Interprets the meaning of the computed mean of a given dataset 5. Computes mean for grouped data using the formula
5	**LP.5 - MEAN OF GROUPED DATA** **– STEP DEVIATION METHOD**	1. Calculates mean for different sets of data related with real life contexts. 2. Computes mean for grouped tabulated data. 3. Computes mean for grouped data. 4. Interprets the meaning of the computed mean of a given dataset - 5. Computes mean for grouped data using the formula
6	**MODE OF GROUPED DATA**	Calculates and interprets mode for grouped data. Recalls the mode formula and what each part represents. 2. Computes mode for grouped data - . 3. Interprets the meaning of the computed mode of a given dataset
7	**RETRIEVAL OF MEDIAN OF**	1. Determines and interprets median for tabulated data. 2. Determines cumulative frequencies of ungrouped tabulated data.

	UNGROUPED DATA	3. Determines median for ungrouped tabulated data. 4. Computes cumulative frequencies for grouped data. - 5. Recalls the median formula and what each part represents.
8	**PREPARATION OF CUMULATIVE FREQUENCY TABLE**	1. Computes median for grouped data using the formula. 2. 2. Interprets the meaning of the computed median of a given dataset. - 3. Determines and interprets median for tabulated data
9	**MEDIAN OF GROUPED DATA**	1. Determines and interprets median for tabulated data. 2. 2. Recalls the median formula and what each part represents. - Computes median for grouped data using the formula. 4. Interprets the meaning of the computed median of a given dataset.
10	**IMPORTANT PROBLEMS**	1. Calculates mean, median and mode for different sets of data related with real life contexts 2. Calculates and interprets mean, median and mode for tabulated data. 3. Computes mean, median and mode for grouped data. - . Interprets the meaning of the computed mean, median and mode of a given dataset

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

lass: **10**

hapter: **13. STATISTICS**

otal no. of periods for this chapter: **10**

eriod No: **01 / 10**

ubtopic: Retrieval knowledge - Mean of ungrouped data

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
urricular ompetencies: **-6.1** *Applies measures of entral tendencies such as ean, median, and mode* **-11.1** *Applies athematical knowledge nd tools to analyze roblems/ situations in ultiple subjects across cience, Social Science, isual Arts, Music,*	**Introduction:** *(10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). **The students ask for retrieval the previous knowledge by the following activity.** **Activity 1 :** Divide the students of class into four groups. Allot each group the work of collecting one of the following kinds of data: (i) Heights of 20 students of your class.	1. Did you recognize methods of data collection? 2. How do you name, the data of heights collected by you personally.?	**Data collection of various contexts of day-to-day life.** **Statistical formulas**

ocational Education, and ports.

EARNING OUTCOMES:

. Calculates mean for different sets of data related with real life contexts
. Computes mean for ungrouped tabulated data.
. Computes mean for rouped data.

. Interprets the meaning of he computed mean of a iven dataset

(ii) Number of absentees in each day in your class for last month of this year.

(iii) Number of members in the families of your classmates

(iv) Blood group of your class mates from health records

Demonstration: (25 minutes)

Whole Class activity: the learners ask to give the proper answers from the following daily life situations.:

Activity.2:

The student asks to find the average rain fall from the given data.

Day	Rain fall in (cms)
Sunday	1.5
Monday	2.5
Tuesday	3.0
Wednesday	1.0
Thursday	0.0
Friday	2.0
Saturday	1.0

How we can find the average of the above data.

Can you tell other names for average?

3. How do you collect the data of number of absentees of last month?
4. Classify the data above as Primary or Secondary data.
5. Give another example for primary data from your day-to-day life.
6. Give another example for secondary data from your day-to-day life.

https://youtu.be/H_jZvuub3hE?si=QBQYPJ1j6WzYzn8

Introduction to Statistics

	Activity.3: Teacher makes students into small groups and asks to find value of x in the following given data. And students should present their solutions in front of the class. 1. If the average of 5, 7, x, 11, 13 is 9. 2. If the average of 5, 7, x, 11, 13 is x. 3. **Mathematical representation of the Average/Mean:** **The teacher retrieval and will write the formula for Mean of ungrouped data on the black board by using Σ notation:** Mean $= \frac{sum\ of\ the\ marks\ obtained}{no\ of\ the\ students}$ $= \frac{\Sigma x_i}{\Sigma n}$ where $\Sigma x = \text{sum of the marks}$ $\Sigma n = \text{number of the students}$ **ASSIGNMENT:** 1. Students ask to collect FA.1 Mathematics marks and calculate mean mark in Mathematics. [Teacher note: teacher play video and asks the students to observe and also instructed to note points]	7.If the average of ½, 1/3, ¼, 1/5, 1/6 is ---	https://www.youtube.com/watch?v=ehxwGufdAiw (Tic tac learn English) https://youtu.be/QmBXGF7p1ds?si=jSZIHWuFkir0Xm8V

Summative Assessment Plan

(Only… where relevant)

1. Find Mean for the ungrouped data: 18 20 20 20 20 21 20 17 19 20 13 18 22 26 20
2. What is the k value if the mean of 9 8 10 k 12 is 15?

Teachers' reflections and experiences:

1. How can I improve the variety and effectiveness of my teaching methods to cater to different learning styles and needs?
2. How well did I manage the classroom during the lesson?
3. Were there any disruptions or behavioural issues that I need to address?
4. What strategies can I implement to improve classroom management?
5. Did the students actively participate and show interest in the lesson?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **13. STATISTICS**

Total no. of periods for this chapter: **10**

Period No : **02 / 10**

Subtopic: Mean of Grouped data – Direct Method for discrete series

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C - 6.1 *Applies measures of central tendencies such as mean, median, and mode* **C - 11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.*	**Introduction:** *(10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). 1. How many ways data be classified.? 2. What is formula for finding mean for ungrouped data? 3. Can we classify the data into groups? 4. Which letter is used for denoting the values in the given data.? 5. What is the symbol for number of times occur a particular value? 6. What is the symbol for summation?		**Data collection of various contexts of day-to-day life.** **Statistical formulae**

Learning Outcomes:

1. Calculates mean for different sets of data related with real life contexts.
2. Computes mean for grouped tabulated data.
3. Computes mean for grouped data.
4. Interprets the meaning of the computed mean of a given dataset
5. Computes mean for grouped data using the formula

Activity: (10min)

Teacher will discuss the following situations for introducing measures of central tendency:

(Teacher Note: The nature of the data and its purpose will be the criteria to go for average or median or mode among the measures of central tendency)

Case-1 : In a hostel 50 students usually eat 200 Idlies in their breakfast. How many more Idlies does the mess in charge make if 20 more students joined in the hostel.

Case-2 : Consider the wages of staff at a factory as given in the table. Which salary figure represents the whole staff

Staff	1	2	3	4	5	6	7	8	9	10
Salary ₹ (in thousands)	12	14	15	15	15	16	17	18	90	95

Case-3: The different forms of transport in a city are given below. Which is the popular means of transport?

1. Car 15%
2. Train 12%
3. Bus 60%
4. Two-wheeler 13%

Demonstration: (15 minutes)

Whole group activity:

Teacher introduces the formula for finding Arithmetic Mean for Grouped data.

Observe the following data. Note and write which value occurring more times.

4 5 6 3 4 5 6 5 6 1 4 5 2 3 4 3 4 2 1 2.

Fill the table using the above information

Value x_i	Frequency f_i

How can we find mean of the grouped frequency data?

Teacher introduces the method of finding mean to the given grouped data.

the mean $\overline{x}$ of the data is given by

$$\overline{x} = \frac{f_1x_1 + f_2x_2 + \cdots + f_nx_n}{f_1 + f_2 + \cdots + f_n}$$

which, more briefly, is written as

Where ***i*** varies from **1** to ***n***.

Teacher will give instructions to solve the given problem through Group activity.

The marks obtained by 30 students of Class X of a certain school in a Mathematics paper consisting of

1. Which symbol we use for denote value in data.
2. Which symbol we use for frequency of the value occurs in data.
3. How would you get the value f_1x_1?
4. How will you find the value $\Sigma f_i x_i$
5. How will you find the value Σf_i

1. Identify the values of $x_1, x_2, \ldots\ldots x_n$

	100 marks are presented in table below. Find the mean of the marks obtained by the students. **ACTIVITY.2:** *(5 minutes)* **Teacher makes the students into groups and ask them to solve the following question and present to the teacher.** **Find mean for the following problem:** 1. What are the salary packages? 2. What is the mean formula? 3. What is mean value of the salaries	2. How can we represent fourth row frequency? 3. What represents the value Σf_i? 4. Find the value of $\Sigma f_i x_i$? 5. Write the formula for finding mean and explain each term in the formula.	https://www.youtube.com/watch?v=Ht_3oegggsw PROBLEM RELATED VIDEO

Marks obtained (x_i)	10	20	36	40	50	56	60	70	72	80	88	92	95
Number of student (f_i)	1	1	3	4	3	2	4	4	1	1	2	3	1

SALARY PER DAY x	NO OF PERSONS f
500	8
800	14
1000	16
1200	7

Summative Assessment Plan

(Only… where relevant)

Solve the problem

1. The wickets taken by a bowler in 10 cricket matches are as follows: Find the mean.

Number of wickets	0	1	2	3	4	5	6
Number of matches	1	1	3	2	1	1	1

Teachers' reflections and experiences:

1. How well did I manage the classroom during the lesson?
2. Were there any disruptions or behavioural issues that I need to address?
3. What strategies can I implement to improve classroom management?
4. Did the students actively participate and show interest in the lesson?
5. How can I increase student engagement and create a more interactive learning environment?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **13. STATISTICS**

Total no. of periods for this chapter: **10**

Period No : **03 / 10**

Subtopic: ***Mean of Grouped data – Direct Method for continuous series***

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.1** *Applies measures of central tendencies such as mean, median, and mode* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.*	**Introduction:** *(10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). 1. In FA.2 examination how many students got marks in between 10 – 19. 2. How many students got marks in between 20 - 29, 30 - 39, 40 - 49, and 50 - 59. 3. How many students attended the FA.1 examination from your class. 4. How many achieved more than 80 marks and less than 90 marks. 5. Prepare for 5 more question using FA2		**Data collection of various contexts of day-to-day life.** **Statistical formulae**

Learning Outcomes:

1. Calculates mean for different sets of data related with real life contexts.

2. Computes mean for grouped tabulated data.

3. Computes mean for grouped data.

4. Interprets the meaning of the computed mean of a given dataset 5. Computes mean for grouped data using the formula

Demonstration: (25 minutes) **Whole group activity:**

Teacher asks the students the following questions to get the knowledge about the class intervals:

Activity:1 (Retrieval of basic concepts: In this context student has to retrieval the knowledge of Inclusive and exclusive classes, preparing frequency distribution table and class mark or mid value of the class.)

Observe the following data.

MARKS	Frequency f_i
10 - 19	2
20 - 29	3
30 - 39	3
40 - 49	5

MARKS	Frequency f_i
10 - 20	14
20 - 30	20
30 - 40	11
40 - 50	5

Activity:2 Arithmetic Mean for grouped data.

Teacher has to demonstrate the formula finding the mean using the formula:

$$\overline{x} = \frac{\Sigma f_i x_i}{\Sigma f_i}$$

Problem.1 : find the mean by direct method of the following data:

1. What are the limits of the class 20 – 29?
2. What are the class limits of 30 – 39.?
3. What are the class limits of the class 10 - 20?
4. What is the class mark/mid value of 20-30?
5. Differentiate inclusive and exclusive classes?

direct method video from Tic Tac

learn https://www.youtube.com/watch?v=EYe-5bl4MLE

Direct method (digital guruji)

Class Interval	Number of students
10 - 25	2
25 - 40	3
40 - 55	7
55 - 70	6
70 - 85	6
85 - 100	6

Teacher demonstrates the formula finding the Arithmetic Mean formula. The student asks to solve the problem.

Sol:

Class Interval	Number of students f_i	Class mark x_i (Mid vales)	$f_i x_i$
10 - 25	2	17.5	35.0
25 - 40	3	32.5	97.5
40 - 55	7	47.5	332.5
55 - 70	6	62.5	375.0
70 - 85	6	77.5	465.0
85 - 100	6	92.5	555.0
	$\Sigma f_i = 30$		$\Sigma f_i x_i = 1860.0$

Assignment: *(5 minutes)*

Find the mean percentage of female teachers.

Percentage of female teachers	15 - 25	25 - 35	35 - 45	45 - 55	55 - 65	65 - 75	75 - 85
Number of States/U.T.	6	11	7	4	4	2	1

1. Find the sum of the frequencies.
2. What is the value of Σf_i
3. Write the class marks for the given classes.
4. Find the products of x_i and f_i
5. Find the value of $\Sigma f_i x_i$
6. Which symbol we use for denote value of mean given in data.
7. Which symbol we use for frequency of the value occurs in data.
8. How would you get the value X_i?
9. How will you find the value $\Sigma f_i x_i$?
10. How will you obtain Mean for the given data?

Summative Assessment Plan

(Only… where relevant)

Solve the problem

2. Using the direct method, find the mean of the following data:

Class Interval	0-10	10-20	20-30	30-40	40-50
Frequency	7	8	12	13	10

Teachers' reflections and experiences:

1. Did I assess student understanding effectively during the lesson?
2. Did I provide timely and constructive feedback to guide their learning?
3. How can I improve my assessment and feedback practices?
4. Was the pacing of the lesson appropriate?
5. Did I cover all the planned content without rushing or leaving gaps?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **13. STATISTICS**

Total no. of periods for this chapter: **10**

Period No: **04 / 10**

Subtopic: Mean of Grouped data – Assumed Mean method

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.1** *Applies measures of central tendencies such as mean, median, and mode* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.* **Learning Outcomes:**	**Introduction:** *(10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). *(Teacher will introduce formula for Assumed Mean Method for finding the Mean for continuous series.)* 1. What is the mean of 1st 10 natural numbers. 2. Explain how to find deviation? 3. Sometimes when the numerical values of x i and f i are large, finding the product of xi and fi becomes tedious and time consuming. So, for such situations, is it suitable direct method. **Teacher has to demonstrate the formula finding the mean using the formula in deductive manner:**	1. The symbol d stands for what in assumed mean method? 2. How can you find the deviation value d_i? 3. For large values of frequencies and class marks which method is suitable? 4. Can you assume the mean for the scores 26 24 27 25 28?	**Data collection of various contexts of day-to-day life.** **Statistical formulae**

1. Calculates mean for different sets of data related with real life contexts.

2. Computes mean for grouped tabulated data.

3. Computes mean for grouped data.

4. Interprets the meaning of the computed mean of a given dataset

5. Computes mean for grouped data using the formula

$$\overline{x} = a + \frac{\Sigma f_i d_i}{\Sigma f_i}$$

Where $d_i = x_i - a$ where a is the assumed mean.

Demonstration: (25 minutes)

[Teacher Note: Sometimes when the numerical values of x i and f i are large, finding the product of xi and fi becomes tedious and time consuming. So, for such situations, let us think of a method of reducing these calculations.

We can do nothing with the f i 's, but we can change each x i to a smaller number so that our calculations become easy. How do we do this? What about subtracting a fixed number from each of these xi 's? Let us try this method.]

Activity:1 Arithmetic Mean for grouped data – assumed mean method.

Teacher divided the whole class into 4 groups and will do the following activities for finding mean:

Problem.1 : find the mean by using assumed mean method of the following:

Class Interval	Number of students
10 - 25	2
25 - 40	3
40 - 55	7
55 - 70	6
70 - 85	6
85 - 100	6

5. If assumed mean is 45 what is deviation value for the class 20 – 30.

1. Which value you will be assume as assumed mean.?
2. Fill up the table:
   with class marks and deviations.:

Class interval	Number of students f_i	class marks x_i	$d_i = x_i - a = x_i - 47.5$
10 - 25	2		
25 - 40	3		
40 - 55	7		
55 - 70	6		
70 - 85	6		
85 - 100	6		

3. Calculate the product value of fi d_i for each class.
4. Find **Σ fi di**
5. Find the mean by using assumed mean formula.

https://www.youtube.com/watch?v=zj_v9-7ebW4&t=72s

Mean of Grouped Data: Assumed Mean Method (Video from Tic Tac learn English)

36Y4Q5

https://www.youtu

	Sol: Teacher will observe the solving procedure and guide when needed in calculation work. **Assignment:** *(5 minutes)* **Problem.2 :** find the mean by assumed mean method of the following data: And also compare with direct metod.		be.com/watch?v=YZ0bPrRyVPM Diksha

X_i	Frequency
40 - 49	1
50 - 59	5
60 - 69	10
70 - 79	6
80 -89	3

Summative Assessment Plan

(Only… where relevant)

Solve the problem

3. Using the assume mean method, find the mean of the following data:

Class Interval	0-10	10-20	20-30	30-40	40-50
Frequency	7	8	12	13	10

Teachers' reflections and experiences:

1. In what areas can I improve as a teacher?
2. How can I continue to develop my teaching skills and practices?
3. Did I encourage self-reflection and metacognition among students?
4. How can I incorporate more opportunities for students to reflect on their learning and assess their own progress?
5. Did I critically examine student work to gain insights into their understanding and identify areas for improvement?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **13. STATISTICS**

Total no. of periods for this chapter: **10**

Period No : **05 / 10**

Subtopic: Mean of Grouped data – Step Deviation method

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.1** *Applies measures of central tendencies such as mean, median, and mode* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.*	**Introduction: (***10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). Write the formulas for finding mean i) Direct Method ii) Assumed mean method ACTIVITY: Consider the data given example and calculate the arithmetic mean by deviation method by taking successive values of xi i.e., 17.5, 32.5, ... as assumed means. Now discuss the following:	1. The symbol u_i stands for what? 2. How can you find the deviation value u_i? 3. Which value you will be assume as assumed mean.?	**Data collection of various contexts of day-to-day life.** **Statistical formulae**

Class interval	10-25	25-40	40-55	55-70	70-85	85-100
Number of students	2	3	7	6	6	6

Learning Outcomes:

1. Calculates mean for different sets of data related with real life contexts.

2. Computes mean for grouped tabulated data.

3. Computes mean for grouped data.

4. Interprets the meaning of the computed mean of a given dataset

5. Computes mean for grouped data using the formula

1. Are the values of arithmetic mean in all the above cases equal?

2. If we take the actual mean as the assumed mean, how much will $\sum F_i d_i$

3. Reason about taking any mid-value (class mark) as assumed mean

Demonstration: *(25 minutes)*

(Teacher will introduce and explain the terms in the formula for finding mean in Step Deviation Method)

Teacher has to demonstrate the formula finding the mean using the step deviation formula in deductive manner:

$$\overline{x} = a + \left(\frac{\Sigma f_i u_i}{\Sigma f_i} \right) \times h$$

$$\text{where } u_i = \frac{x_i - a}{h}.$$

Activity:1 Arithmetic Mean for grouped data – assumed mean method.

Teacher divided the whole class into 4 groups and will do the following activities for finding mean:

Problem.1 : find the mean by using Step Deviation method of the following:

377ZRS

Diksha

https://youtu.be/_U6GDm8A96s?si=0xaVFVII2evyj6WF

Step Deviation video from Tic-Tac learn English

Class Interval	Number of students
10 - 25	2
25 - 40	3
40 - 55	7
55 - 70	6
70 - 85	6
85 - 100	6

Sol: Teacher will observe the solving procedure and guide when needed in calculation work.

Assignment: (5 minutes)

Problem.2 : find the mean by step deviation method of the following data and present Infront of the class (in pairs or in groups)

X_i	Frequency
40 - 49	1
50 - 59	5
60 - 69	10
70 - 79	6
80 -89	3

4. Fill up the table:
   with class marks and deviations.:

Class interval	Number of students f_i	class marks x_i	$u_i = \frac{x_i - a}{h}$
10 - 25	2		
25 - 40	3		
40 - 55	7		
55 - 70	6		
70 - 85	6		
85 - 100	6		

6. Calculate the product values of fi u_i for each class.
7. Find **Σ fi ui**
8. Find the mean by -using step deviation formula.
9. Is there any change of mean finding in three methods?

Write the formula of step deviation for finding Mean and explain terms in it?

Find the mean using direct method and assumed mean method then compare with step deviation method?

Write your observations?

Summative Assessment Plan

(Only… where relevant)

Solve the problem

4. Using the step deviation method, find the mean of the following data:

Class Interval	0-10	10-20	20-30	30-40	40-50
Frequency	7	8	12	13	10

Teachers' reflections and experiences:

1. Did I provide timely and constructive feedback to guide their learning?
2. How can I improve my assessment and feedback practices?
3. Was the pacing of the lesson appropriate?
4. Did I cover all the planned content without rushing or leaving gaps?
5. How can I better manage the time allocated for each activity?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **13. STATISTICS**

Total no. of periods for this chapter: **10**

Subtopic: ***retrieval of Mode for Ungrouped data – Mode of grouped data***

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.1** *Applies measures of central tendencies such as mean, median, and mode* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.*	**Introduction:** *(10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). *(Teacher retrieval the definition of Mode form previous class by asking the following questions:)* Activity: Teacher makes the students into groups and assign the following activity and ask them to write their observations. Group 1: Classify your class mates according to their heights and find most frequented height. Group 2: The PET has to place an order for shoes, which number shoes should he order more? [The mode is that value of the observation which occurs most frequently, i.e., an observation with the maximum frequency is called the mode.]	1. In your FA.1 exam how many students have got equal marks? 2. What is the name for the value mostly occur *frequently* in a data. 3. The mode of 4, 4, 6, 6, 2, 3, 3, 3, 3, 3, 4, 5, 6, 5, 6, 6 is _____ 4. If the mode of the given data set 3, 4, 3, 5, 4, 6, 6 and x is 4. Find the value of x. 5. What are the class limits and boundaries for the classes 20-30; 30-40; 40-50. 6. Fill up the table:	**Data collection of various contexts of day-to-day life.** **Statistical formulae**

Learning Outcomes:

1. Calculates and interprets mode for grouped data. Recalls the mode formula and what each part represents.
2. Computes mode for grouped data.
3. Interprets the meaning of the computed mode of a given dataset

Students asks to retrieval the limits and boundaries for the classes. Differentiate the limits and boundaries.

Demonstration: *(25 minutes)*

Mode of the Grouped Data

Teacher has to demonstrate the formula finding the mode using the formula in deductive manner:

In a grouped frequency distribution, it is not possible to determine the mode by looking at the frequencies.

Here, we can only locate a class with the maximum frequency, called the **modal class.**

The mode is a value inside the modal class, and is given by the formula:

$$\text{Mode} = l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right) \times h$$

where

1. l = lower boundary of the modal class,
2. h = size of the class interval (assuming all class sizes to be equal),
3. f_1 = frequency of the modal class,
4. f_0 = frequency of the class preceding the modal class,
5. f_2 = frequency of the class succeeding the modal class.

Class intervals	Class limits		Class boundaries	
	lower limits	upper limits	lower boundaries	upper boundaries
10 - 19				
20 - 29				
30 - 39				
40 - 49				
50 - 59				
60 - 69				

Write

1. h stands for ….
2. l stands for ….
3. f_0 stands for ….
4. f_1 stands for ….
5. f_2 stands for ….

THINK - DISCUSS

1. It depends upon the demand of the situation whether we are interested in finding the average marks obtained by the students or the marks obtained by most of the students.
   a. What do we find in the first situation?
   b. What do we find in the second situation?

https://youtu.be/WVwUrPoXDlM?si=FKpl51_YCC91XU3Q

Mode of the data

Activity: Mode for grouped data – assumed mean method.

Teacher divided the whole class into 4 groups and will do the following activities for finding mean:

Problem.1 : find the mean by using assumed mean method of the following:

Family size	Number of families
1 - 3	7
3 - 5	8
5 - 7	2
7 - 9	2
9 - 11	1

Sol: Teacher will observe the solving procedure of the students and guide them when needed in calculation work.

1. what is the highest frequency?
2. Find the Modal class?
3. Write values for h, l, f_0, f_1, and f_2
4. Find the mode value by substituting the values of h, l, f_0, f_1, and f_2 in Mode formula.

Mode of the data

Assignment: ***(5 minutes)***

Teacher asks the stunts

Problem.2 : The following data gives the information on the observed lifetimes (in hours) of 225 electrical components

Life times (in hours)	Frequency
0 - 20	10
20 - 40	35
40 - 60	52
60 - 80	61
80 - 100	38
100 - 120	29

Determine the modal lifetimes of the components.

1. Identify the modal class?
2. Find the value of l (lower boundary of median class)
3. Note down the value of h
5. Write the values of f_0, f_1, and f_2
6. For the classes 10-20,21-30,31-40,41-50 What is the lower boundary of the class 31-40
7. Can mode be calculated for grouped data with unequal class sizes?

Summative Assessment Plan

(Only… where relevant)

Solve the problem

1. The following distribution gives the state-wise teacher-student ratio in higher secondary schools of India. Find the mean and mode of this data. Interpret the two measures.

No of students per Teacher	Number of the States/U.T.
0-10	3
11-20	8
21-30	9
31-40	10
41-50	3
51-60	0

Teachers' reflections and experiences:

1. Were there any disruptions or behavioural issues that I need to address?
2. What strategies can I implement to improve classroom management?
3. Did the students actively participate and show interest in the lesson?
4. How can I increase student engagement and create a more interactive learning environment?
5. Did I assess student understanding effectively during the lesson?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **13. STATISTICS**

Total no. of periods for this chapter: **10**

Period No: **07 / 10**

Subtopic: ***Retrieval Median of the Ungrouped data***

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.1** *Applies measures of central tendencies such as mean, median, and mode* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.* **Learning Outcomes:**	**Introduction:** *(10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). (Teacher retrieval the median for ungrouped data for even/odd number of values.) **Individual Activity:1 finding the Median for the given data:** Median is that value of the given number of observations, which divides it into exactly two parts. When the number of observations ***n is odd***, the median is the value of the $\left(\frac{n+1}{2}\right)^{th}$ Observation.	1. Write the ages of your family members in ascending or descending order. 2. Who is in center position when their ages are in order (ascending / descending). 3. Find middle most value of 1 3 5 7 9 11 13. 4. What we call the 7 for the above data?	**Data collection of various contexts of day-to-day life.** **Statistical formulae**

1. Determines and interprets median for tabulated data. 2. 2Determines cumulative frequencies of ungrouped tabulated data. 3. Determines median for ungrouped tabulated data. 4. Computes cumulative frequencies for grouped data. 5. Recalls the median formula and what each part represents.	When the number of observations ***n is even***, the median is the mean of the $\left(\frac{n}{2}\right)^{th}$ and $\left(\frac{n}{2}+1\right)^{th}$ Observations. **Demonstration:** *(25 minutes)* **Activity: 1** **(Student form in pair for solving the problems for finding Median for odd number of values and even number of values.)** Teacher will observe the solving procedure and guide when needed in calculation work. The heights (in cm) of 9 students of your class are as follows: 155 160 145 149 150 147 152 144 148 Find the median of this data. The points scored by a Kabaddi team in a series of matches are as follows: 17, 2, 7, 27, 15, 5, 14, 8, 10, 24, 48, 10, 8, 7, 18, 28 Find the median of the points scored by the team **Teacher asks the students arrange the data in ascending order and ask them to find median.** **Assignment:** *(5 minutes)*	5. Find the middle value of 14, 18, 22, 26, 30, 34 1. Number of observations is odd or even? 2. Write the observations in any order either ascending or descending. 3. What is the middle most value? 4. Verify the value by using the formula $\left(\frac{n+1}{2}\right)^{th}$ Observation 5. What is the median for the given data? 1. Write the points in ascending or descending order. 2. Write n value.	**Meadian for un grouped data** **Video from** TicTacLearn English

	Individual Activity: Teacher will observe the solving procedure of the individual of the students and guide when needed in calculation work. 1. Find the median of the following ungrouped data 1, 3, 9, 5, 3, 7, 9, 2, 6, 9, 5, 3 2. If the median of the scores 17, 12, 16, 11, 18, 19, 13, 14, x is 15 then find the value of x.	3. Find the median by using the formula when the even number of values are given.?	

Summative Assessment Plan

(Only… where relevant)

1. The following number of goals were scored by a team in a series of 10 matches:
   2, 3, 4, 5, 0, 1, 3, 3, 4, 3 Find the median of these scores.
2. Find the median of the first five odd integers. If the sixth odd integer is also included, find the difference of medians in the two cases.

Teachers' reflections and experiences:

1. Did I clearly communicate the lesson objectives to the students?
2. How can I ensure that students understand the objectives and can demonstrate their knowledge or skills related to them?
3. Did I use effective instructional strategies to engage students in the lesson?
4. How can I improve the variety and effectiveness of my teaching methods to cater to
5. different learning styles and needs?
6. How well did I manage the classroom during the lesson?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **13. STATISTICS**

Total no. of periods for this chapter: **10**

Period No : **08 / 10**

Subtopic: Preparation of cumulative frequency table

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.1** *Applies measures of central tendencies such as mean, median, and mode* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.*	**Introduction:** *(10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). **Activity:** Teacher has to give instructions to the students to get cumulative frequency. **Activity: Preparing cumulative frequency table**: Teacher has to demonstrate for finding the cumulative frequencies for the frequencies by asking the questions. Cumulative frequency of particular class is sum of the frequencies up to the particular class.	Teacher instructed to the students stand up and tell number 1st student number 1, 2nd student has to tell 1 + 1=2, 3rd student has to give answer like 2 + 1= 3, … In the similar way all the students are give their standing position number. 2. How many students are obtained less than 20 marks?	**Data collection of various contexts of day-to-day life.** **Statistical formulae**

Learning Outcomes:

1. Computes median for grouped data using the formula.
2. Interprets the meaning of the computed median of a given dataset.
3. Determines and interprets median for tabulated data

Marks obtained	No. of Students (cumulative Frequency)	No. of Students (cumulative Frequency)
15 - 20	3	3
20 - 25	7	3 + 7 = ?
25 - 30	9	10 + 9 = ?
30 - 35	10	19 + 10 = ?
35 - 40	6	29 + 6 = ?
40 - 45	4	35 + 4 = ?
45 - 50	1	39 + 1 = ?

Demonstration: *(25 minutes)*

Whole group activity: Prepare a cumulative Frequency Table for the following data:

Marks obtained	No. of students
0 -10	5
10 - 20	3
20 - 30	4
30 - 40	3
40 - 50	3
50 - 60	4
60 - 70	7
70 - 80	9
80 -90	7
90 - 100	8

Problem:
A life insurance agent found the following data for distribution of ages of 100 policy holders is given

3. How many students are obtained less than 25 marks? (by adding 3 + 7)
4. How many students are obtained less than 30 marks? (by adding 10 + 9)
5. How many students are obtained less than 35 marks? (by adding 19 + 10)
6. Find the cumulative frequencies and fill up the following table.

Finding cumulative frequency

cumulative frequency. Prepare frequency table with class intervals and frequency.

Age (in years)	Number of Policy holders
below 20	2
below 25	6
below 30	24
below 35	45
below 40	78
below 45	89
below 50	92
below 55	98
below 60	100

If any student has to face any problem in preparing teacher explains how to make class intervals with given data and frequencies from the cumulative frequencies. Guide the students for filling the table.

Age (in years)	**Number of Policy holders**
15 - 20	2
20 - 25	6 - 2 = ?
25 - 30	24 - 8 = ?
?	45 - 32 = ?
?	?
?	?
?	?
?	?
?	?

Fill up the he following table with cumulative frequencies.

Marks Obtained	**No. of students (Cumulative Frequency)**
up to 10	
up to20	
up to 30	
up to 40	
up to 50	
up to 60	
up to 70	
up to 80	
up to 90	
up to 100	

1. What if the common interval for preparing class?
2. Will you give first class by observing the following classes?
3. What is the frequency of the class?
4. How much will be the frequency of the second class?
5. Fill up the following table:

Assignment: *(5 minutes)*

1. Fill up the following table.

Marks obtained	No. of students	Cumulative frequency
15 - 20	3	
20 - 25	7	
25 - 30	9	
30 - 35	10	
35 - 40	6	
40 - 45	4	
45 - 50	1	

Summative Assessment Plan

(Only… where relevant)

Prepare cumulative frequency table for the following data:

Marks	0 - 10	10 - 30	30 - 60	60 - 80	80 - 90
Number of students	6	20	37	10	7

2.Construct greater than cumulative and less than cumulative frequency table

Class interval	frequency
0-10	5
10-20	7
20-30	9
30-40	4
40-50	8

Teachers' reflections and experiences:

1. How can I continue to develop my teaching skills and practices?
2. Did I encourage self-reflection and metacognition among students?
3. How can I incorporate more opportunities for students to reflect on their learning and assess their own progress?
4. How can I use student work as a valuable source of information for my teaching?
5. Did I effectively utilize formative assessments to monitor student progress and adjust instruction accordingly?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **13. STATISTICS**

Total no. of periods for this chapter: **10**

Period No : **09 / 10**

Subtopic: ***Median for the Grouped data***

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.1** *Applies measures of central tendencies such as mean, median, and mode* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.*	**Introduction: (**10 minutes) **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). 1. What we call the middle most value for a data? 2. What is the median for value for the scores 25, 30, 40, 15, 20, 35 3. Do you know how to calculate cumulative frequency? 4. What is lower boundary of the class 20-30 from the classes: 10-20, 20-30, 30-40…. 5. How will we decide Modal class or Median class? 6. In the mode formula letter "l" stands for what?	**Which average (median, mode, or mean) would be best used for** • **Test scores, grades** • **Favorite Ice Cream** • **Average price of home** • **Average worker salary** • **Most popular song of the year** • **The average of your scores from your favorite computer game**	**Data collection of various contexts of day-to-day life.** **Statistical formulae**

Learning Outcomes:

1. Determines and interprets median for tabulated data.
2. Recalls the median formula and what each part represents.
3. Computes median for grouped data using the formula.
4. Interprets the meaning of the computed median of a given dataset.

Demonstration: (25 minutes)

Whole group activity:

Teacher introduces the formula for finding Median for Grouped data.

(Teacher will introduce and explain the terms in the formula for finding Median for the Grouped data)

Teacher has to demonstrate the formula finding the Median:

Median Class: Where the value $\frac{n}{2}$ located in the cumulative frequency column, the class is called the Median class.

$$\text{Median} = l + \left(\frac{\frac{n}{2} - \text{cf}}{f} \right) \times h$$

where

l = lower limit of median class,
n = number of observations,
c.f.= cumulative frequency of class preceding the median class or sum of the frequencies up to median class
f = frequency of median class,
h = class size (assuming class size to be equal)

Teacher divided the whole class into 4 groups and will do the following activities for finding median:

Problem.1:

The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the median.

1. Identify the Median class
2. What is sum of frequencies?
3. Identify where n/2 it locates in cumulative frequency column?
4. How can you find the value l

Median for grouped data video from TIC-TAC Learnenglish

https://youtu.be/1b1Tnp79Emk?si=fmUiJb4cp2FYVgK9

Teacher explains the procedure and ask term to follow the students

1. Ask the students write the table vertically four convivence.
2. Find cumulative frequencies.
3. Identify median class
4. Write the values of l, c. f, f, h
5. simplify

Monthly Consumption	65 - 85	85 - 105	105 - 125	125 - 145	145 - 165	165 - 185	185 - 205
Number of Consumers	4	5	13	20	14	8	4

Teacher will observe the solving procedure and guide when needed in calculation work.

Assignment: *(5 minutes)*

Problem.2: find the Median of the following data:

X_i	Frequency
40 - 49	1
50 - 59	5
60 - 69	10
70 - 79	6
80 -89	3

1. How many classes are there?
2. Find $\frac{n}{2}$?
3. Identify the Median class where the value $\frac{n}{2}$ (just exceeds) located in the cumulative frequency column.
4. What is the frequency of the median class?
5. How much is class length.?
6. Find the l for the Median class?

Summative Assessment Plan

(Only… where relevant)

Solve the problem

The following table gives the distribution of the life time of 400 neon lamps:

Life time (in hours)	1500 - 2000	2000 - 2500	2500 - 3000	3000 - 3500	3500 - 4000	4000 - 4500	4500 - 5000
Number of lamps	14	56	60	86	74	62	48

Find the median life time of a lamp.

Teachers' reflections and experiences:

1. Did I assess student understanding effectively during the lesson?
2. Did I provide timely and constructive feedback to guide their learning?
3. How can I improve my assessment and feedback practices?
4. Was the pacing of the lesson appropriate?
5. Did I cover all the planned content without rushing or leaving gaps?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **13. STATISTICS**

Total no. of periods for this chapter: **10**

Period No: **10 / 10**

Subtopic: Important problems solving.

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.1** *Applies measures of central tendencies such as mean, median, and mode* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.* **Learning Outcomes:**	**Introduction:** *(10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). 1. Write the formula for Mean for grouped data 2. Write the formula for Mode for grouped data 3. Write the formula for Median for grouped data 4. Which is easy for calculation? 5. What are the measures of central tendency? **Demonstration:** *(25 minutes)* The student asks to solve the problems given by the teacher for solving. Teacher has to supervise and assist the solving procedure and assist the students if they felt difficult. **Problem.1:**		**Data collection of various contexts of day-to-day life.** **Statistical formulae**

1. Calculates mean, median and mode for different sets of data related with real life contexts.
2. Calculates and interprets mean, median and mode for tabulated data.
3. Computes mean, median and mode for grouped data.
4. Interprets the meaning of the computed mean, median and mode of a given dataset

100 surnames were randomly picked up from a local telephone directory and the frequency distribution of the number of letters in the English alphabets in the surnames was obtained as follows:

Number of letters	Number of Surnames
1 - 4	6
4 - 7	30
7 - 10	40
10 - 13	16
13 - 16	4
16 - 19	4

Determine the median number of letters in the surnames. Find the mean number of letters in the surnames? Also, find the modal size of the surnames

Problem 2:

If the median of the distribution given below is 28.5, find the values of x and y.

Class Interval	Frequency
0 - 10	5
10 - 20	x
20 - 30	20
30 - 40	15
40 - 50	y
50 - 60	5
Total	**60**

Assignment : (5 minutes)

1. In the given problem what we have to find?
2. What is assumed mean?
3. Find the values of $\Sigma f_i U_i$
4. Find "l" value
5. Write the values f_0, f_1 and f_2
6. What is the Median class?
7. What is the Mean class?

1. What is given?
2. Write the cumulative frequencies
3. Substitute the values in Median formula
4. Find the value of x.

Statistics - Mean, Median & Mode for a grouped frequency data

	1. Write the formula for finding Mean, Mode and Median for Grouped data. Explain the terms for each formula.		

Summative Assessment Plan

(Only… where relevant)

The following table shows the ages of the patients admitted in a hospital during a year:

Age in years	Number of patients
5 -15	6
15 - 25	11
25 - 35	21
35 - 45	23
45 - 55	14
55 - 65	5

Find the mean, mode and median of the data given above. Compare and interpret the three measures of central tendency.

Teachers' reflections and experiences:

1. How well did I manage the classroom during the lesson?
2. Were there any disruptions or behavioural issues that I need to address?
3. What strategies can I implement to improve classroom management?
4. Did the students actively participate and show interest in the lesson?
5. How can I increase student engagement and create a more interactive learning environment?

For more problems (NCERT) click here

Case based questions:

CASE STUDY 1: COVID-19 Pandemic The COVID-19 pandemic, also known as coronavirus pandemic, is an ongoing pandemic of coronavirus disease caused by the transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) among humans.

The following tables shows the age distribution of case admitted during a day in two different hospitals

Table 1

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of cases	6	11	21	23	14	5

Table 2

Age (in years)	5-15	15-25	25-35	35-45	45-55	55-65
No. of cases	8	16	10	42	24	12

Refer to table 1 1.

The average age for which maximum cases occurred is

a) 32.24 b) 34.36 c) 36.82 d) 42.24

2. The upper limit of modal class is

a) 15 b) 25 c) 35 d) 45

3. The mean of the given data is

a) 26.2 b) 32.4 c) 33.5 d) 35.4

Refer to table 2

4. The mode of the given data is

a) 41.4 b) 48.2 c) 55.3 d) 64.6 5.

The median of the given data is

a) 32.7 b) 40.2 c) 42.3 d) 48.6

CASE STUDY 2: Electricity energy consumption is the form of energy consumption that uses electric energy. Global electricity consumption continues to increase faster than world population, leading to an increase in the average amount of electricity consumed per person (per capita electricity consumption).

Tariff	: LT - Residential	Bill Number	: 384756
Type of Supply	: Single Phase	Connected Load	: 3 kW
Meter Reading Date	: 31-11-13	Meter Reading	: 65789
Previous Reading Date	: 31-10-13	Previous Meter Reading	: 65500
		Units Consumed	: 289

A survey is conducted for 56 families of a Colony A. The following tables gives the weekly consumption of electricity of these families.

Weekly consumption (in units)	0-10	10-20	20-30	30-40	40-50	50-60
No. of families	16	12	18	6	4	0

The similar survey is conducted for 80 families of Colony B and the data is recorded as below:

Weekly consumption (in units)	0-10	10-20	20-30	30-40	40-50	50-60
No. of families	0	5	10	20	40	5

Refer to data received from Colony A

1. The median weekly consumption is
   a) 12 units
   b) 16 units
   c) 20 units
   d) None of these
2. The mean weekly consumption is
   a) 19.64 units
   b) 22.5 units
   c) 26 units
   d) None of these

3. The modal class of the above data is I
   a) 0-10
   b) 10-20
   c) 20-30
   d) 30-40

Refer to data received from Colony B

4. The modal weekly consumption is
   a) 38.2 units
   b) 43.6 units
   c) 26 units
   d) 32 units
5. The mean weekly consumption is
   a) 15.65 units
   b) 32.8 units
   c) 38.75 units
   d) 48 units

WORKSHEET FOR STATISTICS:

Section - I

1. Write the short form of the expansion in symbolic form 1 + 2 + 3 + 4 + ……+ n
2. Mean of 1, 2, x, 3 is 0 then what is the value of ‘ x ’ ?
3. If Mode of the Data 5, 3, 4, -2, 3, p , 2, 2, 1, is 3 find the value of ‘ p ’
4. What is the Median of the first 8 prime numbers?
5. n In a Data ‘ n ’ scores are given and if ‘ n ’ is odd then what is the formula for finding Median from the following:

   ( )

   a) $\left(\frac{n+1}{2}\right)^{th}$ event b) $\left(\frac{n-1}{2}\right)^{th}$ event

   c) n^{th} event d) $(n-1)^{th}$ event

6. Choose the correct answer satisfying the following conditions:
   Statement (A) : Arithmetic Mean influences on the extreme values of the data.
   Statement (B) : Unimodal data may have many modes

   a) Both A and B are true b) A is true, B is false
   c) A is false, B is true d) Both A and B are false

7. Find the sum of lower limit of Median class and upper limit of modal class for the data

Calss Marks	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	1	3	5	9	7	3

8. What is the name of Measure of Central tendency for the formula

   $\left(\frac{\text{Sum of the Observations}}{\text{Number of Observations}}\right)$ ( )

   a) Mean b) Median c) Mode d) Range

9. Write the name of the Graph of cumulative frequency distribution.

Section - II

10. Find the Mean of $\frac{2}{9}, \frac{1}{9}, \frac{4}{9}, \text{ and } \frac{7}{9}$
11. Gopal says that the median of 3, 14, 19, 20, 11 is 19. Is it correct? Justify.
12. The following observations are arranged in ascending order :

    20, 23, 42, 53, x, x + 2, 70, 75, 82, 96. If the median is 63, find the value of x.
13. The mean of 7 numbers is 4. What will be the new Mean, if each score is increased by 3?
14. The Mean value can be calculated from both Ungrouped and Grouped data. Which one do you think is more accurate? Why?
15. Write the formula to find 'Median' for a Grouped data and explain each it's terms.
16. Find the Mean of 5, 6, 9, 10, 6, 12, 3, 6, 11, 10 ?
17. If Mode of the following data is 7, then find the value of ' k ' ?

    Data : 6, 3, 5, 6, 7, 5, 8, 7, 6, 2k + 1, 9, 7, 13
18. Find the mean of the following data:

x_i	5	8	10	15	18	20
f_i	2	3	5	4	4	2

19. The Median of the observations -2, 5, 3, -1, 4, 6 is 3.5. Is it correct? Justify.

Section - III

20. The Annual profits earned by 30 shops in Guntur locality give rise to the following distribution:

Profit (in Lakhs)	**More Than Equal to 5**	**More Than Equal to 5**	**More Than Equal to 5**	**More Than Equal to 5**	**More Than Equal to 5**	**More Than Equal to 5**	**More Than Equal to 5**
Number of shops	**30**	**28**	**16**	**14**	**10**	**7**	**3**

    Draw both Ogives for the Data above. Hence obtain the Median profit

21. The following table gives production yield per Hectare of wheat of 100 farmers of village:

Production Yield Qtl/Hec	**50 - 55**	**55 - 60**	**60 - 65**	**65 - 70**	**70 - 75**	**75 - 80**
Number of Farmers	**2**	**24**	**16**	**8**	**38**	**12**

Draw both Ogives for the above Data. Hence obtain the Median production yield.

22. Consider the following distribution of daily wages of 50workers of a factory:

Daily Wages	200 - 250	250 – 300	300 - 350	350 - 400	400 - 450
Number of Workers	6	8	14	10	12

Find the Mean daily wages of the workers in the factory by using Step-Deviation method.

23. The following table shows the daily expenditure on grocery of 25 households in a locality. Find the 'Mode' value of daily Expenditure on grocery.

Daily expenditure	100 – 150	150 – 200	200 – 250	250 - 300	300 - 350
Number of house holders	4	5	12	2	2

24. Find the Mean for the following the distribution table by Assumed Mean method:

Class Interval	**10 - 25**	**25 - 40**	**40- 55**	**55 -70**	**70 -85**	**85 - 100**
Frequency	**2**	**3**	**7**	**6**	**6**	**6**

25. The following data indicates marks of 53 students in a set.

Marks	00 - 10	10 - 20	20 - 30	30 - 40	40 - 50	50 - 60	60 - 70	70 - 80
Number of Students	5	3	4	3	4	7	9	7

Draw a " Less Than Ogive curve " for the data

36. 100 surnames were randomly picked up from a local telephone directory and the frequency distribution of the number of letters in the English alphabet in the surnames was obtained as follows:

Number of letters	1 - 4	4 - 7	7 - 10	10 - 13	13 - 16	16 - 19
Number of Surnames	6	30	40	16	4	4

Determine the median number of letters in the surnames. Find the mean number of letters in the surnames? Also The Modal size of the Surnames.

37. The Median of the following data is 525. Find the values of x and y, if the total frequency is100. Here C.I. stands for class interval and Fr for frequency.

CI	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
Fr	2	5	x	12	17	20	y	9	7	4

38 The following table gives the marks obtained by 100 students in SA-1 examination in Mathematics subject. Draw Ogive graph of less than and greater than:

Marks	50 - 55	55 - 60	60 - 65	65 - 70	70 - 75	75 - 80
Number of Students	2	8	12	24	38	16

4. In the formula $\bar{x} = a + \left(\frac{\sum f_i u_i}{\sum f_i} \times h \right)$, finding the mean of the grouped data, u_i =

(a) $\frac{x_i + a}{h}$ (b) $\frac{x_i - a}{h}$ (c) $\frac{a - x_i}{h}$ (d) $h(x_i - a)$

5. For the following distribution:

Class	0-5	5-10	10-15	15-20	20-25
Frequency	10	15	12	20	9

The sum of lower limits of the median class and the modal class is

(a) 15 (b) 25 (c) 30 (d) 35

6. Consider the following frequency distribution:

Class	0-9	10-19	20-29	30-39	40-49
Frequency	13	10	15	8	11

The upper limit of the median class is

(a) 29 (b) 29.5 (c) 30 (d) 19.5

7. The abscissa of the point of intersection of the less than type and of the more than type ogives gives its

(a) mean (b) median (c) mode (d) all three

8. For the following distribution: the modal class is

Marks	Below 10	Below 20	Below 30	Below 40	Below 50
No. of Students	8	17	32	62	80

(a) 10 – 20 (b) 20 – 30 (c) 30 – 40 (d) 40 – 50

Problems:

1. The mean of the following distribution is 18. The frequency f in the class interval 19-21 is missing. Determine f.

Class	11-13	13-15	15-17	17-19	19-21	21-23	23-25
Frequency	3	6	9	13	f	5	4

2. The mean of the following distribution is 24. Find the value of p.

Marks	0-10	10-20	20-30	30-40	40-50	50-60
No. of Students	15	20	35	P	10	42

3. Find the missing frequencies f_1 and f_2 in table given below; it is being given that the mean of the given frequency distribution is 50.

Class	0-20	20-40	40-60	60-80	80-100	Total
Frequency	17	f_1	32	f_2	19	120

4. Find the missing frequencies f_1 and f_2 in table given below; it is being given that the mean of the given frequency distribution is 145.

Class	100-120	120-140	140-160	160-180	180-200	**Total**
Frequency	10	f_1	f_2	15	5	**80**

CHAPTER: 14

PROBABILITY

PERIODWISE LESSON PLANS

1062CH15

http://epathshala.nic.in/QR/?id=1062CH15

apter Plan (Unit Plan / Lesson Plans)

The following **Curricular Goals (C.G.)** & **Competencies (C)** will be developed through teaching of this chapter.

Curricular Goals (C.G.)

C.G. - 6 *Analyses and interprets data using statistical concepts (such as measures of central tendency, standard deviations) and probability.*

C.G. - 11 *Explores connections of Mathematics with other subjects.*

Competencies (C)

C-6.2 *Applies concepts from probability to solve problems on the likelihood of everyday events*

C-11.1 *Applies mathematical knowledge and tools to analyse problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports.*

MIND MAP:

PROBABILITY

9 PERIODS + 1 WORK SHEET

- LP.1 – RETRIEVAL OF EMPIRICAL PROBABILITY FORMULA
- LP.2 - THEORITICAL PROBABILITY FORMULA
- LP.3 - SUM OF THE PROBABILITIES FOR SAME EXPERIMENT
- LP.4 - COMPLEMENTARY EVENTS
- LP.5 - SURE AND IMPOSSIBLE EVENTS - PROBABILITY VALUE
- LP.6 - DECK OF CARDS
- LP.7 - IMPORTANT PROBLEMS
- LP. 8 - GEOMETRY BASED QUESTIONS
- LP.9 - CASE BASED QUESTIONS

Also discuss Contextual Problems based on Probability related to day-to-day situations.

LP No:	TEACHING TOPIC	LEARNING OUTCOMES
1	LP.1 – RETRIEVAL OF EMPIRICAL PROBABILITY FORMULA	1. Determines the probability of an event and applies the concept in solving daily life problems. 2. Recognizes the elementary events in daily life context. 3, Determines the probabilities of the elementary events in daily life context.
2	LP.2 - THEORITICAL PROBABILITY FORMULA	1. Applies the concept of probability in solving daily life problems. 2. Computes the probability of an event in daily life context using count (discrete probability i.e., countable sample space). 3. Computes the probability of an event in daily life context using measurement for a continuous sample space.
3	LP.3 - SUM OF THE PROBABILITIES FOR SAME EXPERIMENT	1. Determines the probability of an event. 2. Recognizes the elementary events in daily life context. 3. Determines the probabilities of the elementary events in daily life context. 4. Computes the probability of an event in daily life context using measurement for a continuous sample space.
4	LP.4 - COMPLEMENTARY EVENTS	1. Recognizes the elementary events in daily life context.C158. Computes the probability of a complementary event. 2. Computes the probability of an event using measurement for a continuous sample space. 3. Selects correct probability from given options.
5	LP.5 - SURE AND IMPOSSIBLE EVENTS – PROBABILITY VALUE	1. Determines the probability of an event. 2. Recalls the probability of a sure event. 3. Recalls the probability of an impossible event. 4. Computes the probability of an event with equally likely outcomes. 5. Computes the probability of an elementary event
6	LP.6 - DECK OF CARDS	1. Determines the probability of an event 2. Applies the concept of probability in solving daily life problems. 3. Computes the probability of an event in daily life context using count (discrete probability i.e., countable sample space). 4. Computes the probability of an event in daily life context using measurement for a continuous sample space.
7	LP.7 - IMPORTANT PROBLEMS	1. Applies the concept of probability in solving daily life problems 2. Computes the probability of an event in daily life context using count (discrete probability i.e., countable sample space). 3. Computes the probability of an event in daily life context using measurement for a continuous sample space.
8	LP. 8 - GEOMETRY BASED QUESTIONS	1. Applies the concept of probability in solving daily life problems 2. Computes the probability of an event in daily life context using count (discrete probability i.e., countable sample space). 3. Computes the probability of an event in daily life context using measurement for a continuous sample space.
9	LP.9 - CASE BASED QUESTIONS	1. Applies the concept of probability in solving daily life problems 2. Computes the probability of an event in daily life context using count (discrete probability i.e., countable sample space). 3. Computes the probability of an event in daily life context using measurement for a continuous sample space.
10	Contextual Problems based on Probability related to day-to-day situations through Worksheet.	1. Applies the concept of probability in solving daily life problems 2. Recognizes the elementary events in daily life context. 3. Determines the probabilities of the elementary events in daily life context. 4. Computes the probability of an event in daily life context using count (discrete probability i.e., countable sample space). 5. Computes the probability of an event in daily life context using measurement for a continuous sample space.

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

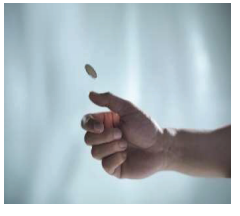
Chapter: **14. PROBABILITY**

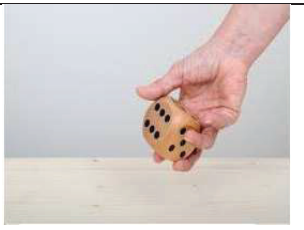
Total no. of periods for this chapter: **09**

Period No : **01 / 09**

Subtopic: Retrieval of Probability by Empirical formula

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.2** *Applies concepts from probability to solve problems on the likelihood of everyday events.*	**Introduction:** *(15 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). 1. When you are going to market to bring vegetables, may rain fall? What is the probable chance to fall rain.		**Daily Life examples pictures**

C-11.1 *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports* **Learning Outcomes::** 1. Determines the probability of an event and applies the concept in solving daily life problems. 2. Recognizes the elementary events in daily life context. 3, Determines the probabilities of the elementary events in daily life context.	2. What is the probable chance available of milk at milk booth. 3. When SSC results are announced what is the probable chance to get state first rank. **Ask the learners to identify the results of the following daily life Experiments**: **Bike Starting:**  Learner asks to identify the probable chances when his father starts bike. The learner has to compare equal chance for the result. **Tossing a coin:**  Learner asks to give the possibilities when tossing a coin. The learner has to compare equal chance for the result. **[Teacher plays the video and explains the content]** **Rolling a die:**	The learner asks to give the possibilities when bike starting. What result you observe when tossing a coin.	**playing articles like DICE,** **Marbles,** **Dart Board,** **Spin Board** (Diksha) Introduction to probability https:///dial/343E71 **Equally likely outcomes**

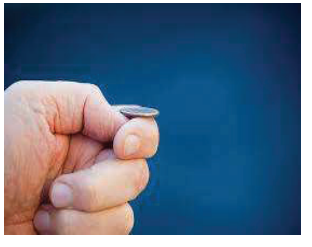


Learner asks to give what probable outcomes will get when rolling a die for 20 times.
https://diksha.gov.in/dial/34CA8N

Demonstration: *(25 minutes)*

Whole group activity: the learners ask to give the proper answers from the following daily life situations.:

Activity.1:



The learner has to prepare a table with the results when tossing a coin for 20 times.

The learner has to explore the probable chances for number of times "Head" occurs and number of times "Tail occurring" in fractional from.

LEARNER RETRIEVAL THE FORMULA FOR EMIPIRICAL PROBABILITY:

(Teacher write the formula on the Black Board)

What are the numbers may occur when throwing a die and note down?

Number of times a die is thrown	Number of times these scores turn up					
	1	2	3	4	5	6
20 times						

Note all the results when tossing a coin for 20 times

TOSSING A COIN	20 TIMES
HEAD	
TAIL	

How many times head occur?

	If we denote the number of times Head (E - Event) occurring as numerator and total number of times experiment performed as denominator is known as experimental probability. **Empirical Probability formula** $P(E) = \frac{Number\ of\ trials\ in\ which\ the\ event\ happened}{Total\ number\ of\ trials}$ **Activity.2:**  The learner has to note down where needle stop at which color for 30 times spin board. The student has to ask to write ratio of the particular color with the total number of times.	How many times Tail occur? What is fractional form for Head occurring? What is fractional form for Tail occurring? The learner has to note the color where the needle stops after each spin.	

			Number of times a die is thrown	30 TIMES		
			RED			
			ORANGE			
			YELLOW			
			GREEN			
			BLUE			
			BLUE			
			PRUPLE			
			GRAY			
			WHITE			
			BLACK			
			BROWN			

Summative Assessment Plan

(Only… where relevant)

1. Two coins are tossed simultaneously 500 times, and we get

   Two Heads : 105 times

   One Head : 275 times

   No Head : 120 times

   Find the probability of occurrence of each of these events.

Teachers' reflections and experiences:

1. Did I clearly communicate the lesson objectives to the students?
2. What strategies can I implement to improve classroom management?
3. Did the students actively participate and show interest in the lesson?
4. Did I assess student understanding effectively during the lesson?
5. How can I improve my assessment and feedback practices?
6. What were my strengths during the lesson?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **14. PROBABILITY**

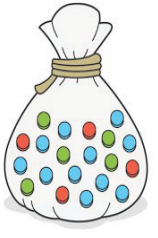
Total no. of periods for this chapter: **09**

Period No: **02 / 09**

Subtopic: THEORITICAL PROBABILITY FORMULA

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Learning Outcomes: **Curricular Competencies:** **C-6.2** *Applies concepts from probability to solve problems on the likelihood of everyday events* **C-11.1** *Applies mathematical knowledge and tools to*	**Introduction: (***5 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). 1. What is the probability of getting Head when tossing a coin. 2. List out the total outcomes when we tossing two coins at time. 3. Write all the outcomes when we throw a die. **Demonstration:** *(25 minutes)* **Tossing a coin:**		**Daily Life playing articles like** **DICE,** **Playing cards,** **Marbles,** **Dart Board,** **Spin Board**

analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports
 	
Learning Outcomes:
 	
1. Applies the concept of probability in solving daily life problems.
 	
2. Computes the probability of an event in daily life context using count (discrete probability i.e., countable sample space).
 	
3. Computes the probability of an event in daily life context using measurement for a continuous sample space.
	
	
	1. When tosses a coin what are the possible results (Teacher explains possible results are outcomes).
	2. Can you surely say exact result of tossing a coin at a particular time? (Teacher explains what is random experiment in this context)
	3. Teacher asks the students to do an experiment. Like tossing a coin rolling a die etc., And also teacher asks the student what are the possible outcomes occur.
	4. Any one can guess exact result?
	5. What do you call such experiment?
	6. What do you we call set of outcomes (Teacher explains sample space).
	7. Write the sample space of tossing a coin.
	   a. What is the probability of getting head while tossing a coin.
	   b. Write the sample space of when tossing two coins.
		While we performing an experiment we always taking unbiased coin. why?
		
		Describe about Random experiment in your own words.
		
		Is there any difference wrt Probability“when two coins are tossed simoultenously or two coins tossed at a time?
			Bags of Balls.
			
			https://diksha.gov.in/dial/34L6AB
			
			Definition of probability

	8. What is the probability of getting two heads when tossing two coins at a time. 9. Write the probability of getting same side of two coins when tossing two coins. 10. Write the sample space of when tossing two coins. 11. What is the probability of getting three heads when tossing two coins at a time. 12. Write the probability of getting same side of two coins when tossing two coins. **Activity:** **(Teacher will test understanding of the student through the following individual activity) :** *(5 minutes)* **Picking a Ball:**  A bag contains 4 red balls, 5 green balls and 11 blue balls, all the balls being of the same size. Krithika takes out a ball from the bag without looking into it.	Are all the balls have equal chance when picking a ball without seeing. Write the sample space? Find the probabilities of each colored ball when a ball is taken out randomly?	

Summative Assessment Plan

(Only… where relevant)

2. Write the sample space (total outcomes) when two coins. Are tossed?
3. If two coins are tossed simultaneously, what is the probability of getting exactly two heads?

Teachers' reflections and experiences:

1. Did the students actively participate and show interest in the lesson?
2. How can I increase student engagement and create a more interactive learning environment?
3. Did I assess student understanding effectively during the lesson?
4. Did I provide timely and constructive feedback to guide their learning?
5. How can I improve my assessment and feedback practices?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **14. PROBABILITY**

Total no. of periods for this chapter: **09**

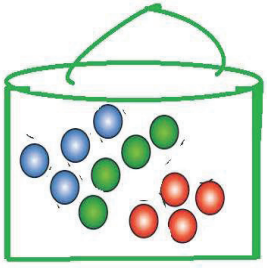
Period No : **03 / 09**

Subtopic: Sum of the probabilities of all the elementary events of an experiment is 1

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.2** *Applies concepts from probability to solve problems on the likelihood of everyday events* **C-11.1** *Applies mathematical knowledge and tools to*	**Introduction:** *(5 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). Which of the following experiments have equally likely outcomes? (i) Explain. 1. Are the equally likely outcomes of a driver attempts to start a car.? (May starts or may not starts) 2. Are the equally likely outcomes of a player attempts have to shoot a basketball? 3. Are the equally likely outcomes of the question of true or false?	Give some examples of equally likely outcomes? Are the outcomes of every experiment equally likely? Give examples of 5 experiments that have equally likely outcomes and five more examples that do not have equally likely outcomes.	**Daily Life playing articles like** **DICE, Dart Board,** **Spin Board**

analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports **Learning outcomes:** 1. Determines the probability of an event. 2. Recognizes the elementary events in daily life context. 3. Determines the probabilities of the elementary events in daily life context. 4. Computes the probability of an event in daily life context using measurement for a continuous sample space.	4. Are the equally likely chance when a baby is born may be a boy or a girl. **(Teacher retrieval of previous knowledge of equally likely outcomes)** **Demonstration:** *(15 minutes)* **ACTIVITY 1:** A bag contains a red ball, a blue ball and a yellow ball, all the balls being of the same size. Kritika takes out a ball from the bag without looking into it. What is the probability that she takes out the (i) yellow ball? (ii) red ball? (iii) blue ball. *1.* How many events are existing from the bag? *(Teacher may explain the concept the Elementary events - An elementary event is the event which has only one outcome in the sample space of the experiment.)* *2.* Write the probabilities for taken out yellow ball, red ball and blue ball? *(Teacher will suggest the symbolic form of probability like P(Y) or P(R) or P(B)* 3. Are the probabilities being equal for the events. 4. Find the sum of *P(Y), P(R) and P(B).* 5. What do you notice? **Teacher explains the formula for finding Theoretically / Classical Probability** **(Teacher should focus "why we go for theoretical probability")**	In cricket game empire toss the coin before start the game. Why? Describe elementary event in an experiment. In the activity are getting red ball, yellow ball and blue ball are elementary events. Are events like a throw of dice, probability of getting less than 3 and of getting a 3 or more than three are elementary events? **Formula for Probability (theoretical/classical)** = $\frac{Number\ of\ outcomes\ favourable\ to\ E}{Number\ of\ all\ possible\ outcomes\ of\ the\ exxperiment}$	https://diksha.gov.in/play/collection/do_3126053329838571521953 8?contentType=TextBookUnit (text book) Equally likely events **Probability- The sum of the probabilities of all possible outcomes is 1**

	Guide the learners to write the formula for probability (theoretical / classical) of an event. **Formula for Probability (theoretical/classical)** $= \frac{Number\ of\ outcomes\ favourable\ to\ E}{Number\ of\ all\ possible\ outcomes\ of\ the\ exxperiment}$ **Teacher Will play the video and explain the difference between emphatical probability and theoretical probability.** **Learner has to find the sum of the probabilities for all outcomes of an experiment through method of induction:** **Whole group activity:** *(20 minutes)*  Ask the learners to spin the wheel stopping by the needle pointer at any stage of the items mentioned on the spin board: **Experiment.2 : (Individual Activity)**	Can you toss a coin for 10000 times and note down the results? Explain one basic difference between the Empirical Probability and Theoretical Probability. 1. What are the events shown on the spin board? 2. Write the probabilities for each outcome.? 3. Test whether the sum of all probabilities of all outcomes is 1? 4. The sum of the probabilities of all the elementary events of an experiment is equal to : A. 2 B. 3 C. 4	(video from The Brighter) Experimental vs. Theoretical Probability (Video from Scam Squad)

	Picking a Ball from the bag:  The student has to find probability for each outcome of color ball in the bag. Ask learners to find the sum all the probabilities for all outcomes. By verifying they has to give their understanding.	D. 1 1. write the outcomes of the each colored balls in the bag. 2. What is the formula finding probability? 3. Find the sum of the probabilities of P(Blue Ball), P(Red Ball) and P(Green Ball) 4.Are these elementary events?	

Summative Assessment Plan

(Only… where relevant)

i. Suppose we throw a die once. (i) What is the probability of getting a number greater than 4? (ii) What is the probability of getting a number less than or equal to 4

ii. When a die is thrown, list the outcomes of an event of getting (a) a prime number (b) not a prime number. (c) a number greater than 5 (d) a number not greater than 5. Find the probabilities of the events (a), (b), (c), (d)

Teachers' reflections and experiences:

1. Did I cover all the planned content without rushing or leaving gaps?
2. How can I better manage the time allocated for each activity?
3. In what areas can I improve as a teacher?
4. How can I continue to develop my teaching skills and practices?
5. Did I encourage self-reflection and metacognition among students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **14. PROBABILITY**

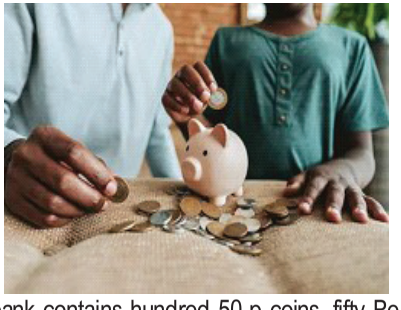
Total no. of periods for this chapter: **09**

Period No : **04 / 09**

Subtopic: Complimentary Events - Complement of the event E and

$$P(E) + P(\bar{E}) = 1$$

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.2** *Applies concepts from probability to solve problems on the likelihood of everyday events* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science,*	**Introduction:** *(10 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). 1. A coin is tossed then what is the sum of probabilities For getting head or tail. 2. A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. Find the sum probabilities that the ball drawn is (i) red? (ii) not red? 3. Give two examples of situations that have elementary events? 4. Is the probability existing of an event is $\frac{5}{3}$.	Oral quiz: Is getting a head complementary to getting a tail? Give reasons.?	**Daily Life playing articles like** **DICE,** **Playing cards,** **Marbles,** **Dart Board,** **Spin Board**

Visual Arts, Music, Vocational Education, and Sports **Learning Outcomes:** 1. Recognizes the elementary events in daily life context.C158. Computes the probability of a complementary event. 2. Computes the probability of an event using measurement for a continuous sample space. 3. Selects correct probability from given options.	**Teacher explains about the complementary events with examples.** **Also, Teacher plays the video and ask them to observe.** **Demonstration:** **Whole class Activity: 20min** 1.In case of a die is getting a 1 complementary to events getting 2, 3, 4, 5, 6? Give reasons for your answer. Let us assume that let E be an event getting I and $\bar{E}$ be an event getting 2,3,4,5,6 Teacher makes the students into pairs and ask Them to find $P(E)$ *and* $P(\bar{E})$ and ask them to find $P(E) + P(\bar{E})$ **Experiment.1 10min**  A piggy bank contains hundred 50 p coins, fifty Re. 1 coins, twenty Rs. 2 coins and ten Rs. 5 coins. If it is equally likely that	Let E be an event then what is the complement of E. $P(E) + P(\bar{E}) = ?$ Teacher give 4 cards red, blue, green and yellow are given. 1. What is the probability of the event of drawn the yellow card. 2. What is the probability of the event of drawn not the red card. 3. What observation you made when we add the probabilities of getting blue and not getting blue card. If E and E^{I} are complementary events, then which is correct: A. P(E) = 1 − P(E^{I}),	https://diksha.gov.in/dial/354XDL complementary events https://diksha.gov.in/dial/354XDL complementary events https://www.youtube.com/watch?v=zIFiEolHe80 complementary events (video from whats up Dude)

	one of the coins will fall out when the bank is turned upside down, what is the probability that the coin 1. will not be a Rs. 5 coin? 2. Will be a Rs 1 coin? 3. Will be a Rs 2 coin? Verify the events given in the examples are complementary or not? Discuss in pairs and justify your answer. 1.When a dice is thrown, getting an even number is complementary to getting an odd number 2. Getting an even number is complementary to getting an odd number from numbers 1, 2, ... 8. 3.Getting a Sunday is complementary to getting any day other than Sunday in a week. 4.. Winning a running race is complementary to losing it.	B. $P(E^{I}) = 1 - P(E)$, C. $P(E \cup E^{I}) = 1$, D. $P(E \cap E^{I}) = 0$. 1. How many types of coins contains the piggy bank.	

Summative Assessment Plan

(Only… where relevant)

4. A bag contains lemon flavored candies only. Malini takes out one candy without looking into the bag. What is the probability that she takes out?
   i) an orange flavored candy?
   (ii) a lemon-flavored candy?

5. When rolling a die if E represents getting 6 on top and $\bar{E}$ is not getting 6. Prove that $P(E) + P(\bar{E}) = 1$

6. If P(E) = 0.05, what is the probability of 'not E'

Teachers' reflections and experiences:

1. How can I incorporate more opportunities for students to reflect on their learning and assess their own progress?
2. Did I critically examine student work to gain insights into their understanding and identify areas for improvement?
3. How can I use student work as a valuable source of information for my teaching?
4. Did I effectively utilize formative assessments to monitor student progress and adjust instruction accordingly?
5. How can I further integrate assessment for learning strategies into my teaching practice?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **14. PROBABILITY**

Total no. of periods for this chapter: **09**

Period No : **05 / 09**

Subtopic: SURE, AND IMPOSSIBLE EVENTS – DECK OF CARDS

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.2** *Applies concepts from probability to solve problems on the likelihood of everyday events***C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports*	**Introduction:** *(5 minutes)* **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). 1. Probability of an event E + Probability of the event (not E) = _____ 2. The sum of the probabilities of all the elementary events of a random experiment _____ 3. If there are only red ball in a bag and you are going to choose a ball, the probability of choosing a red ball is 4. Give some examples of that the probability of an event is 0 and also probability of an event is 1.	1. What is the probability of getting Head or Tail when we tossing a coin.	**Daily Life playing articles like** **DICE,** **Playing cards,** **Marbles,** **Dart Board,**

Learning Outcomes:

1classifies the sure and certain event

Find the probability of deck of cards.

5. **After solving a problem Anupama said that probability of a given event is $\frac{7}{2}$. Do you agree with her. Justify.**

Demonstration: (10 minutes)

ACTIVITY 1: (Whole group activity)

Teacher will explain the concepts Sure event and Impossible event by asking the following questions of day-to-day life examples.

Consider the following examples

What is the probability to select an odd number from even number between 1 to 100.

What is the probability of an impossible event?

What is the probability of getting 6 or a number less than 6 in a single throw of a die?

Getting a blue ball out of the basket containing all colors of balls.

What is the probability of sure event?

Individual activity: *(5 minutes)*

Fill the following table with daily life situations:

SURE EVENTS	IMPOSSIBLE EVENTS

2. What is the probability for getting 7 when die is rolled.

3. What is the probability for getting a 'Sum 13' while throwing a pair of dice at a time.

4. What is the probability of taken out black ball from a bag contains red, green and blue balls.

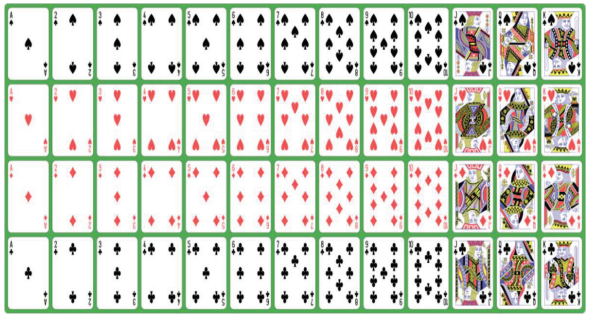
Spin Board

certain and impossible events

video from Infinity Learn NEET

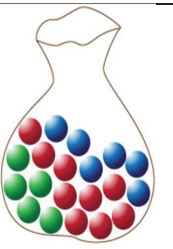
Teacher introduces about deck of cards by showing deck of cards and paly the video and explain about deck of cards

20 min



Match the following?

i) Number of suits	a) 52
ii)Number of cards in each suit	b) 2
iii)Number of face cards	c) 13
iv)Number of colors	d) 4



5. Are the probabilities of even or odd number when the needle stops after spin?

6. Can you conclude what are the limits of probability of any event.
7. Express about deck of cards in Flowchart.

https://www.youtube.com/watch?v=JytN3yHspis

video on deck of cards

	v) Total number of cards in a deck e) 12 Match the following: i) Spade ♦ ii) Hears ♣ iii) Diamonds ♥ iv) Club ♠ spades (♠), red hearts (♥), red diamonds (♦) and black clubs (♣).	How many non-numeric cards are there in deck of cards?	

Summative Assessment Plan

(Only… where relevant)

1. Write 2 any situations that leads impossible event?
2. Give examples of certain event.
3. A card is drawn form a deck of cards what is the probability that the card is i) red card ii) black face card.

Teachers' reflections and experiences:

1. Were there any disruptions or behavioral issues that I need to address?
2. What strategies can I implement to improve classroom management?
3. Did the students actively participate and show interest in the lesson?
4. 17. In what areas can I improve as a teacher?
5. 18. How can I continue to develop my teaching skills and practices?
6. 19. Did I encourage self-reflection and metacognition among students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **14. PROBABILITY**

Total no. of periods for this chapter: **09**

Period No: **06 / 09**

Subtopic: Problems related to deck of cards

<table>
<tr><th>Learning Outcomes & Indicators / Micro-Competencies</th><th>Teaching-Learning Process
This should include activities to facilitate learning along with broad time duration</th><th>Pointers for formative Assessment
This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.</th><th>Material Required</th></tr>
<tr>
<td>Curricular Competencies:
C-6.2 Applies concepts from probability to solve problems on the likelihood of everyday events
C-11.1 Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports</td>
<td>Introduction: (5 minutes)
Teacher asks the following questions and testing of previous knowledge (Individual work followed by pair sharing and whole grouping sharing).
Complete the table
<table>
<tr><th>A card is drawn at random from deck of cards</th><th>Number of favorable outcomes</th></tr>
<tr><td>1.spade card</td><td></td></tr>
<tr><td>2.face card</td><td></td></tr>
<tr><td>3.not a heart</td><td></td></tr>
<tr><td>4.red color card</td><td></td></tr>
<tr><td>5.any card</td><td></td></tr>
</table>
</td>
<td></td>
<td>Daily Life playing articles like
DICE,
Playing cards,
Spin Board</td>
</tr>
</table>

LEARNING OUTCOMES: 1. Determines the probability of an event 2. Applies the concept of probability in solving daily life problems. 3. Computes the probability of an event in daily life context using count (discrete probability i.e., countable sample space). 4. Computes the probability of an event in daily life context using measurement for a continuous sample space.	Whole class activity: **Teacher explains the problems related to deck of cards.** **20min** 1.One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card will probability that the card will (i) be an ace, (ii) not be an ace Ask the students to write total outcomes. And also ask the students find number of favorable outcomes for getting an ace card. Find the probability that the card will probability that the card will be an ace using formula. Now find the complement of an ace card. 2.One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting (i) a king of red color (ii) a face card (iii) a red face card (iv) the jack of hearts (v) a spade (vi) the queen of diamonds Teacher makes the students into groups and instructed to follow the following steps/questions. 1.what are the total outcomes for drawing a card.	The number of possible outcomes = 52 (Why?) Let E be the event 'the card is an ace' and F be the event 'card drawn is not an ace' Explain how do you find probability of not ace card.	

	2.what are the favorable outcomes for a king of red colour. 3. use the formula for finding probability and find P(a king of red color). Follow the above steps for solving question and apply remaining each question in the given problem and find their probabilities. **Teacher makes the students into groups ask them to discuss about the problem and ask them to present solutions Infront of the class. 15min** 1.Five cards—the ten, jack, queen, king and ace of diamonds, are well-shuffled with their face downwards. One card is then picked up at random. (i) What is the probability that the card is the queen? (ii) If the queen is drawn and put aside, what is the probability that the second card picked up is (a) an ace? (b) a queen? 2.All the three face cards of spades are removed from a well-shuffled pack of 52 cards. A card is then drawn at random from the remaining pack. Find the probability of getting (a) a black face card (b) a queen (c) a black card.	Find the sum of P (a spade)+P(a face card)? Prepare 5 more problems based on deck of cards on your own?	

Summative Assessment Plan

1. From a pack of 52 playing cards, jacks, queens, kings and aces of red color are removed. From the remaining a card is drawn at random. Find the probability that the card drawn is

(a) a black queen

(b) a red card

(c) a black jack

(d) a picture card (jacks, queens and kings are picture cards)

2. A card is drawn at random from a well shuffled deck of playing cards. Find the probability that the card drawn is

(i) a card of spades or an ace
(ii) a red king
(iii) neither a king nor a queen
(iv) either a king or a queen
(v) a face card
(vi) cards which is neither king nor a red card.

Teachers' reflections and experiences:

1. How can I ensure that students understand the objectives and can demonstrate their knowledge or skills related to them?
2. Did I use effective instructional strategies to engage students in the lesson?
3. In what areas can I improve as a teacher?
4. How can I continue to develop my teaching skills and practices?
5. Did I encourage self-reflection and metacognition among students?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **14. PROBABILITY**

Total no. of periods for this chapter: **09**

Period No: **07 / 09**

Subtopic: INTER DISCIPLINARY PROBLEMS

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-6.2 *Applies concepts from probability to solve problems on the likelihood of everyday events* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports*	**Introduction: (**5 minutes) **Teacher asks the following questions and testing of previous knowledge** (Individual work followed by pair sharing and whole grouping sharing). 1. Write all outcomes when tossing of two coins at a time 2. Write all outcomes when throwing two dice at a time. 3. Find the probability of getting both heads or both tails when a coin is tossed two times. 4. Find the probability of getting at least one tail when Rahim tosses two different coins simultaneously. 5. Probability of certain event? 6. Probability of impossible event?		**Daily Life playing articles like** **DICE,** **Playing cards,** **Marbles,** **Dart Board,**

	Demonstration: (30 minutes) **Teacher divides the class into 4 groups for solving the following important problems under personal supervision.:** **Problem .1 Solving:** (Whole group activity) Gopi buys a fish from a shop for his aquarium. The shopkeeper takes out one fish at random from a tank containing 5 male fish and 8 female fish. What is the probability that the fish taken out is a male fish?  **Problem .2 Solving:** (Whole group activity) Two dice, one red and one green, are thrown at the same time. Write down all the possible outcomes. What is the probability that the sum of the two numbers appearing on the top of the dice is (i) 8? (ii) 13? (iii) less than or equal to 12?	1. How many males and female fishes in the aquarium? 2. Write the probabilities for taken out for not male fish. 1. Write sample space for when throwing two dice at a time? 2. Fill the table of all outcomes when Throwing two dice at a time	**Spin Board**

Sample Space of outcomes ::

(1,1)(1,2)(1,3)(1,4)(1,5)(1,6)

(2,1)(2,2)(2,3)(2,4)(2,5)(2,6)

(3,1)(3,2)(3,3)(3,4)(3,5)(3,6)

(4,1)(4,2)(4,3)(4,4)(4,5)(4,6)

(5,1)(5,2)(5,3)(5,4)(5,5)(5,6)

(6,1)(6,2)(6,3)(6,4)(6,5)(6,6)

The student asks to solve the problem by group discussion

Assignment: Individual Activity: *(5 Minutes)*

1.A die is thrown once. Find the probability of getting (i) a prime number; (ii) a number lying between 2 and 6; (iii) an odd number.

2.Two dice are rolled simultaneously and counts are added (i) complete the table given below:

Event : 'Sum on 2 dice'	2	3	4	5	6	7	8	9	10	11	12
Probability	$\frac{1}{36}$						$\frac{5}{36}$				$\frac{1}{36}$

DICE		BLUE DICE					
		1	2	3	4	5	6
Green dice	1						
	2						
	3						
	4						
	5						
	6						

3. How many outcomes having sum is 8?
4. Give the probability of getting sum is 8 on both tops of the dice.
5. Getting sum 13 is possible outcome or not?
6. Probability of getting less than or equal to 12 is certain event. Justify.

https://www.youtube.com/watch?v=

	(ii) A student argues that 'there are 11 possible outcomes 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12. Therefore, each of them has a probability Justify your answer. (Teacher makes the students into groups and ask them to present Infront of the class)		8ZsEYKN0ht8 problem related video from Brian Veitch

Summative Assessment Plan

(Only… where relevant)

A game of chance consists of spinning an arrow which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7, 8 and these are equally likely outcomes. What is the probability that it will point at

1. 8 ?
2. an odd number?
3. a number greater than 2? 4.a number less than 9?

Teachers' reflections and experiences:

1. Did the students actively participate and show interest in the lesson?
2. How can I increase student engagement and create a more interactive learning environment?
3. Did I assess student understanding effectively during the lesson?
4. Did I provide timely and constructive feedback to guide their learning?
5. How can I improve my assessment and feedback practices?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

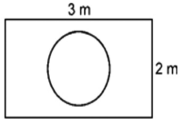
Class: **10**

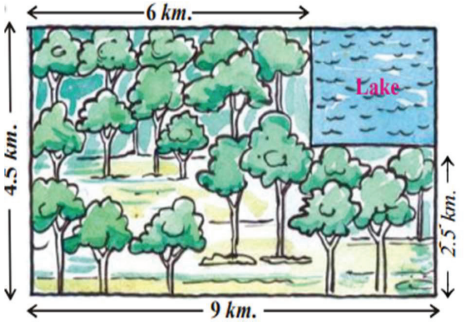
Chapter: **14. PROBABILITY**

Total no. of periods for this chapter: **09**

Period No: **08 / 09**

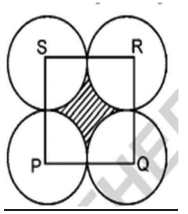
Subtopic: Probability of Geometry based questions

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
Curricular Competencies: **C-6.2** *Applies concepts from probability to solve problems on the likelihood of everyday events* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across*	**Teacher will discuss problems related to Geometry** **40min** 1.Suppose you drop a die at random on the rectangular region shown in figure. What is the probability that it will land inside the circle with diameter 1 m?  Teacher makes the students in pairs and ask them to find area of rectangular region. Ask the students to find area of circle.	What is the radius of the circle? What is the area of circle?	**Daily Life playing articles like**

Science, Social Science, *Visual Arts, Music, Vocational Education, and Sports* **LEARNING OUTCOMES:** 1. Applies the concept of probability in solving daily life problems. 2. Computes the probability of an event in daily life context using count (discrete probability i.e., countable sample space). 3. Computes the probability of an event in daily life context using measurement for a continuous sample space.	Find the probability that it will land inside the circle with diameter 1 m? 2. A missing helicopter is reported to have crashed somewhere in the rectangular region as shown in the figure. What is the probability that it crashed inside the lake shown in the figure?  given the helicopter is equally likely to crash anywhere in the region. Teacher explains the above situation and ask the students to find area of the entire rectangular region and also find the area of the lake now teacher asks the students to find the probability that it crashed inside the lake shown in the figure and present Infront of the class **Techer show the videos for related problems for more understanding)**	What is the ratio of circle to area of rectangular region What is area of rectangular region? What is the area of lake? What is the required probability?	https://www.youtube.com/watch?v=FNMf-6JZXVc problem related (video from Maths Pursuit) problem related (Video from Doubt hunt)

Summative assignment:

In the figure, each circle touch other two circles externally. The circles are congruent. If a point is selected at random from the interior of square PQRS, find the probability that it will not be in the shaded region.



Teachers' reflections and experiences:

1. Did the students actively participate and show interest in the lesson?
2. How can I increase student engagement and create a more interactive learning environment?
3. Did I assess student understanding effectively during the lesson?
4. Did I provide timely and constructive feedback to guide their learning?
5. How can I improve my assessment and feedback practices?

Chapter Plan (Unit plan/ lesson plan)

Period plan (40 Minutes)

Class: **10**

Chapter: **14. PROBABILITY**

Total no. of periods for this chapter: **08**

Period No: **09 / 09**

Subtopic: Probability of Geometry based questions

Learning Outcomes & Indicators / Micro-Competencies	**Teaching-Learning Process** This should include activities to facilitate learning along with broad time duration	**Pointers for formative Assessment** This should include strategies that will be used to Check for Understanding - e.g., questions / worksheets / experiments / assignments / self-assessment checklists/etc.	**Material Required**
C-6.2 *Applies concepts from probability to solve problems on the likelihood of everyday events* **C-11.1** *Applies mathematical knowledge and tools to analyze problems/ situations in multiple subjects across Science, Social Science, Visual Arts, Music, Vocational Education, and Sports*	**Teacher makes the students into groups and ask the students to read question given case study questions carefully and answer in groups.** **CASE STUDY 1:** On a weekend Rani was playing cards with her family. The deck has 52 cards. If her brother drew one card. 		

	1. Find the probability of getting a king of red colour. a) 1/26 b) 1/13 c) 1/52 d) 1/4 **2. Find the probability of getting a face card.** a) 1/26 b) 1/13 c) 2/13 d) 3/13 **3. Find the probability of getting a jack of hearts.** a) 1/26 b) 1/52 c) 3/52 d) 3/26 **4. Find the probability of getting a jack of hearts.** a) 3/13 b) 1/13 c) 1/52		

d) 1/4

5. Find the probability of getting a jack of hearts.
a) 1/26

b) 1/13

c) 1/52

d) 1/4

CASE STUDY 2:
Rahul and Ravi planned to play Business
(board game) in which they were supposed to use two dice.

1. Ravi got first chance to roll the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is 8?
a) 1/26 b) 5/36

c) 1/18 d) 0

2. Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is 13?
a) 1

	b) 5/36 c) 1/18 d) 0 **3. Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is less than or equal to 12?** a) 1 b) 5/36 c) 1/18 d) 0 **4. Rahul got next chance. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is equal to 7?** a) 5/9 b) 5/36 c) 1/6 d) 0 **5. Now it was Ravi's turn. He rolled the dice. What is the probability that he got the sum of the two numbers appearing on the top face of the dice is greater than 8?** a) 1 b) 5/36 c) 1/18 d) 5/18		

	Teacher will take different situations and prepare case study type questions		

Summative assignment

Teachers' reflections and experiences:

1. Did I cover all the planned content without rushing or leaving gaps?
2. How can I better manage the time allocated for each activity?
3. What were my strengths during the lesson?
4. How can I use student work as a valuable source of information for my teaching?
5. Did I effectively utilize formative assessments to monitor student progress and adjust instruction accordingly?
6. How can I further integrate assessment for learning strategies into my teaching practice?

Teacher should use the following worksheets for more practice/extended Learning.
And also use remaining periods for (any left) extended learning by using reference books.

WORK SHEET on PROBABILITY

rite the correct answer in the brackets

1. An event is very unlikely to happen. Its probability is closest to ( )

   (a)0.0001 (b)0.001 (c)0.01 (d)0.1

2. If the probability of an event is p, the probability of its complementary event will be ( )

   (a)p-1 (b)p (c) 1-p (d)1- 1 / p

3. The probability of getting a bad egg in a lot of 400 is 0.035. The number of bad eggs in the lot is ( )

(a)7 (b)14 (c)21 (d)28

4 The probability that a non leap year selected at random will contain 53 Sundays is ( )

(a) 1 / 7 (b) 2 / 7 (c) 3 / 7 (d) 5 / 7

5 The probability expressed as a percentage of a particular occurrence can never be ( )

(a)less than 100 (b)less than 0 (c)greater than 1 (d)anything but a whole number

6. There are 6 marbles in a box with number 1 to 6 marked on each of them.

What is the probability of drawing a marble with number 2?

(a) 1 / 6 (b) 1 / 5 (c) 1 / 3 (d) 1 / 2.

7. A coin is flipped to decide which team starts the game. What is the probability of your team will start?

(a) 1 / 4 (b) 1 / 2 (c) 1 (d) 0

8. A die is thrown once . What will be the probability of getting a prime number?

(a) 1 / 6 (b) 1 / 2 (c) 1 (d) 0

Cards are marked with numbers 1 to 25 are placed in the box and mixed thoroughly. One card is drawn at random from the box.

Answer the following questions (Q9-Q10)

9. What is the probability of getting a number 5?

(a) 1 (b) 0 (c) 1 / 25 (d) 1/ 5

10. What is the probability of getting a number less than 11?

(a) 1 (b) 0 (c) 1 5 (d) 2 5

nswer the following: (short answer type)

11. Cards with numbers 2 to 101 are placed in a box. A card is selected at random. Find the probability that the card has (i) an even number (ii) a square number

12. In a game the entry fee is Rs 5. The game consists of tossing a coin three times. If one or two heads show, Sweta gets her entry fee back. If she throws 3 heads, she receives double the entry fees. Otherwise, she will lose. For tossing a coin three times, find the probability that she (i)loses the entry fee. (ii)gets double entry fee. (iii)just gets her entry fee.

nswer the following: (Essay type)

13. A number x is selected at random from the numbers 1, 2, 3 and 4. Another number y is selected at random from the numbers 1, 4, 9 and 16. Find the probability that product of x and y is less than 16.

14. A child's game has 8 triangles of which 3 are blue and rest are red, and 10 squares of which 6 are blue and rest are red. One piece is lost at random. Find the probability that it is a (i) triangle (ii) square (iii) square of blue colour (iv) triangle of red colour. (v) neither a triangle of red colour nor a square of blue colour.

15. A game of chance consists of spinning an arrow, which comes to rest pointing at one of the numbers 1, 2, 3, 4, 5, 6, 7 and 8

and these numbers are equally likely outcomes.

a) What is the probability that the arrow will point at 8?

b) What is the probability that arrow will point at an odd number?

c) What is the probability that arrow will point at a number greater than 2?

OR

Find the probability that arrow will point at number less than 8.

DEPARTMENT OF SCHOOL EDUCATION

RIGHT TO EDUCATION

SAMAGRA SHIKSHA - A.P.

EDUCATION FOR ALL

STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING (SCERT)