केन्द्रीय विद्यालय संगठन
KENDRIYA VIDYALAYA SANGATHAN

REGIONAL OFFICE, CHENNAI

ONE DAY WORKSHOP

TGT (MATHS)

28.09.2022

VENUE
KENDRIYA VIDYALAYA, CLRI, CHENNAI

STUDY MATERIAL

FOR CLASS X MATHEMATICS

INDEX

List of Participants Attended

S NO	Name of the Regular Teacher Mrs/Ms/Mr	Name of the KV
1	PRIYANKA	KV HVF AVADI
2	BABLI SIKDAR	KV NO.1 TRICHY
3	BANDANA RANI	KV GOLDEN ROCK TRICHY
4	R UMA	COIMBATORE
5	DEBORAH Y GRACE	KV NO.1 PONDICHERRY(S-1)
6	POONAM BAGHEL	KV DGQA
7	ARI KUMAR B	KV NO.1 MADURAI
8	K.MOHANA KUMARI	KV ASHOK NAGAR
9	JYOTHI R NAIR	KALPAKKAM NO.2
10	M.LATHA	KV NAGERCOIL
11	SARITA SHARMA KACHWAL	KV AFS SULUR
12	T. B. OMPRAKASH	KV2 AFS TAMBARAM
13	M. MANIVANNAN	KV ANNA NAGAR
14	MANORANCHITTAM VELU	KV AFS AVADI
15	PRADEEP KUMAR	NO.II, PORT BLAIR
16	SAKSHAM	KV DINDIGUL
17	M.A. RASHEETHA BEGUM	GILL NAGAR
18	NARENDRA KUMAR MEENA	DHARMAPURI
19	MINIMOL.K.A.	NO.II TRICHIRAPPALLI
20	DHREERAJ KUMAR	KV VIJAYANARAYANAM
21	G. VIJAYALAKSHMI	KV ARUVANKAADU
22	CHANDAN AGRAWAL	KV MANDAPAM
23	ADITYA NATH TRIPATHI	NO 1 PORT BLAIR
24	SHIPRA DIXIT	KV IIT CHENNAI
25	MRS.PRABHA DEVI	KV 2 MADURAI

Work Assigned

S NO	Name of the Regular Teacher Mrs/Ms/Mr	Name of the KV	Work Assigned- Study Material/Model Papers/Action Plan
1.	PRIYANKA	KV HVF AVADI	CHAPTER 1: REAL NUMBERS
2.	BABLI SIKDAR	KV NO.1 TRICHY	CHAPTER2: POLYNOMIALS
3.	DEBORAH Y GRACE	KV NO.1 PONDICHERRY(S-1)	CHAPTER 3: LINEAR EQUATIONS
4.	BANDANA RANI	KV GOLDEN ROCK TRICHY	CHAPTER 4: QUADRATIC EQUATIONS
5.	POONAM BAGHEL	KV DGQA	CHAPTER 5: ARITHMETIC PROGRESSION
6.	JYOTHI R NAIR	KALPAKKAM NO.2	CHAPTER 6: TRIANGLES
7.	SARITA SHARMA KACHWAL	KV AFS SULUR	CHAPTER 7 : COORDINATE GEOMETRY
8.	M. MANIVANNAN	KV ANNA NAGAR	CHAPTER 8: TRIGONOMETRY
9.	SHIPRA DIXIT	KV IIT CHENNAI	CHAPTER 8: TRIGONOMETRY
10.	PRADEEP KUMAR	NO.II, PORT BLAIR	CHAPTER : 9 HEIGHTS AND DISTANCES
11.	SAKSHAM	KV DINDIGUL	CHAPTER 10: CIRCLES
CHAPTER 11 DELETED			
12	NARENDRA KUMAR MEENA	DHARMAPURI	CHAPTER 12: AREAS RELATED TO CIRCLES
13	MINIMOL.K.A.	NO.II TRICHIRAPPALLI	CHAPTER 13: SURFACE AREAS AND VOLUMES
14	ADITYA NATH TRIPATHI	NO 1 PORT BLAIR	CHAPTER 13: SURFACE AREAS AND VOLUMES
15	DHREERAJ KUMAR	KV VIJAYANARAYANAM	CHAPTER 14: STATISTICS
16	CHANDAN AGRAWAL	KV MANDAPAM	CHAPTER 15: PROBABILITY

17.	R UMA	COIMBATORE	PREPARATION OF MODEL PAPER FOR STANDARD
18.	ARI KUMAR B	KV NO.1 MADURAI	PREPARATION OF QUESTION PAPER FOR BASIC
19	K.MOHANA KUMARI	KV ASHOK NAGAR	PREPARATION OF QUESTION PAPER FOR STANDARD
20.	M.LATHA	KV NAGERCOIL	ACTION PLAN (PPT) FOR LOW ACHIEVERS
21.	T. B. OMPRAKASH	KV2 AFS TAMBARAM	PPT ON CHAPTER WISE DELETED PORTIONS
22.	MANORANCHITTAM VELU	KV AFS AVADI	PREPARATION OF MODEL PAPER FOR STANDARD
23.	M.A. RASHEETHA BEGUM	GILL NAGAR	PREPARATION OF MODEL PAPER FOR BASIC
24.	G. VIJAYALAKSHMI	KV ARUVANKAADU	PREPARATION OF MODEL PAPERS FOR BASIC
25	Mrs.Prabha Devi	KV 2 MADURAI	ACTION PLAN FOR HIGHER ACHIEVERS (PPT)

DAY SCHEDULE

TIME	PROGRAMME
9:00 – 10:00	Inaugural Ceremony
10:00 – 10:15	Tea Break
10:15 -10:30	Chapter wise deleted portions
10:30 – 11:30	Session by Resource Person
11:30 – 12:30	Presentation open discussion of Model papers by the participants
12:30 – 1:30	Lunch Break
1:30 – 2:30	Session by Resource Person
2:30 – 3:30	Presentation/ discussion of study materials by participants
3:30 – 4:00	Action Plans to get quantity and quality results
4:00 – 4:30	Tea Break
4:30 – 5:00	Valedictory Function ➢ Impressions by the participants ➢ Review of the day by the resource persons ➢ Address by the Principal ➢ Vote of Thanks ➢ National Anthem

REPORT OF THE WORKSHOP

Kendriya Vidyalaya CLRI organized Maths workshop on 28th September 2022. 30 TGTs'/PGTs' of mathematics subject attended the workshop. The workshop was presided over by Miss. Rukmani, DC officiating, Chennai region.

The inaugural ceremony began at 9.15 A.M with the lighting the lamp followed by the prayer song. The welcome address was presented by the Venue Principal, Shri.Y.RamaPrasad. This was followed by the session on the deleted portions for class 10th which was led by Mr. Om Prakash of KV2 Tambaram and was discussed in detail. Then followed the session on Error analysis dealt by Shri. Srinivasan , PGT Maths of KV, Ashok Nagar. At 11.30 a.m the participants presented the model papers and all the participants discussed with vigor and enthusiasm.

In the post noon session Shri. Sankara Subramaniam PGT Maths of KV1 Tambaram took up the topic of 'Competency based curriculum' and 'Assertion and Reasoning' type of questions .He made it lively and also interactive with good examples

The participants presented the study material prepared by them in the next session. After the tea break, the valedictory function was held wherein the participants presented their impressions about the workshop and a review of the entire day's activities was presented by one of the resource persons. After the address by the venue principal the day came to an end with the singing of national anthem.

The coordinators Mr. A.M. Vijayan, PGT (Maths) and MR. S. Govindarajan, PGT (Maths) of KV CLRI well planned and conducted successfully.

The participants must have been benefitted by the workshop and they might have gone back to their schools with confidence to train their children in a better way.

NEW CURRICULUM (IX-X)(CODE NO. 041)
Session 2022-23

The Syllabus in the subject of Mathematics has undergone changes from time to time in accordance with growth of the subject and emerging needs of the society. The present revised syllabus has been designed in accordance with National Curriculum Framework 2005 and as per guidelines given in the Focus Group on Teaching of Mathematics which is to meet the emerging needs of all categories of students. For motivating the teacher to relate the topics to real life problems and other subject areas, greater emphasis has been laid on applications of various concepts.

The curriculum at Secondary stage primarily aims at enhancing the capacity of students to employ Mathematics in solving day-to-day life problems and studying the subject as a separate discipline. It is expected that students should acquire the ability to solve problems using algebraic methods and apply the knowledge of simple trigonometry to solve problems of height and distances. Carrying out experiments with numbers and forms of geometry, framing hypothesis and verifying these with further observations form inherent part of Mathematics learning at this stage. The proposed curriculum includes the study of number system, algebra, geometry, trigonometry, mensuration, statistics, graphs and coordinate geometry, etc.

The teaching of Mathematics should be imparted through activities which may involve the use of concrete materials, models, patterns, charts, pictures, posters, games, puzzles and experiments.

Objectives

The broad objectives of teaching of Mathematics at secondary stage are to help the learners to:

- consolidate the Mathematical knowledge and skills acquired at the upper primary stage;
- acquire knowledge and understanding, particularly by way of motivation and visualization, ofbasic concepts, terms, principles and symbols and underlying processes and skills;
- develop mastery of basic algebraic skills;
- develop drawing skills;
- feel the flow of reason while proving a result or solving a problem;
- apply the knowledge and skills acquired to solve problems and wherever possible, by morethan one method;
- to develop ability to think, analyze and articulate logically;
- to develop awareness of the need for national integration, protection of environment,observance of small family norms, removal of social barriers, elimination of gender biases;
- to develop necessary skills to work with modern technological devices and mathematicalsoftware's.
- to develop interest in mathematics as a problem-solving tool in various fields for its beautifulstructures and patterns, etc.

- to develop reverence and respect towards great Mathematicians for their contributions to thefield of Mathematics;
- to develop interest in the subject by participating in related competitions;
- to acquaint students with different aspects of Mathematics used in daily life;
- to develop an interest in students to study Mathematics as a discipline.

COURSE STRUCTURE CLASS –X

Units	Unit Name	Marks
I	NUMBER SYSTEMS	06
II	ALGEBRA	20
III	COORDINATE GEOMETRY	06
IV	GEOMETRY	15
V	TRIGONOMETRY	12
VI	MENSURATION	10
VII	STATISTICS & PROBABILTY	11
	Total	**80**

UNIT I: NUMBER SYSTEMS

1. REAL NUMBER (15) Periods

Fundamental Theorem of Arithmetic - statements after reviewing work done earlier andafter illustrating and motivating through examples, Proofs of irrationality of $\sqrt{2}, \sqrt{3}\ \sqrt{5}$

UNIT II: ALGEBRA

1. POLYNOMIALS (8) Periods

Zeros of a polynomial. Relationship between zeros and coefficients of quadraticpolynomials.

2. PAIR OF LINEAR EQUATIONS IN TWO VARIABLES (15) Periods

Pair of linear equations in two variables and graphical method of theirsolution, consistency/inconsistency.

Algebraic conditions for number of solutions. Solution of a pair of linear equations in twovariables algebraically - by substitution, by elimination. Simple situational problems.

3. QUADRATIC EQUATIONS (15) Periods

Standard form of a quadratic equation $ax^2 + bx + c = 0, (a \neq 0)$. Solutions of quadratic equations (only real roots) by factorization, and by using quadratic formula. Relationship between discriminant and nature of roots.

Situational problems based on quadratic equations related to day to day activities to be incorporated.

4. ARITHMETIC PROGRESSIONS (10) Periods

Motivation for studying Arithmetic Progression Derivation of the n^{th} term and sum of thefirst n terms of A.P. and their application in solving daily life problems.

UNIT III: COORDINATE GEOMETRY

Coordinate Geometry (15) Periods

Review: Concepts of coordinate geometry, graphs of linear equations. Distance formula.Section formula (internal division).

UNIT IV: GEOMETRY

1. TRIANGLES (15) Periods

Definitions, examples, counter examples of similar triangles.

1. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other twosides in distinct points, the other two sides are divided in the same ratio.
2. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallelto the third side.
3. (Motivate) If in two triangles, the corresponding angles are equal, their correspondingsides are proportional and the triangles are similar.
4. (Motivate) If the corresponding sides of two triangles are proportional, theircorresponding angles are equal and the two triangles are similar.
5. (Motivate) If one angle of a triangle is equal to one angle of another triangle and thesides including these angles are proportional, the two triangles are similar.

2. CIRCLES (10) Periods

Tangent to a circle at, point of contact

1. (Prove) The tangent at any point of a circle is perpendicular to the radius through thepoint of contact.
2. (Prove) The lengths of tangents drawn from an external point to a circle are equal.

UNIT V: TRIGONOMETRY

1. INTRODUCTION TO TRIGONOMETRY (10) Periods

Trigonometric ratios of an acute angle of a right-angled triangle. Proof of their existence (well defined); motivate the ratios whichever are defined at 0° and 90°. Values of the trigonometric ratios of 30^0, 45^0 and 60^0. Relationships between the ratios.

2. TRIGONOMETRIC IDENTITIES (15) Periods

Proof and applications of the identity $sin^2A + cos^2A = 1$. Only simple identities to be given.

3. HEIGHTS AND DISTANCES: Angle of elevation, Angle of Depression. (10)Periods

Simple problems on heights and distances. Problems should not involve more than tworight triangles. Angles of elevation / depression should be only 30°, 45°, and 60°.

UNIT VI: MENSURATION

1. AREAS RELATED TO CIRCLES (12) Periods

Area of sectors and segments of a circle. Problems based on areas and perimeter / circumference of the above said plane figures. (In calculating area of segment of a circle, problems should be restricted to central angle of 60°, 90° and 120° only.

2. SURFACE AREAS AND VOLUMES (12) Periods

Surface areas and volumes of combinations of any two of the following: cubes, cuboids,spheres, hemispheres and right circular cylinders/cones.

UNIT VII: STATISTICS AND PROBABILITY

1. STATISTICS (18) Periods

Mean, median and mode of grouped data (bimodal situation to be avoided).

2. PROBABILITY (10) Periods

Classical definition of probability. Simple problems on finding the probability of anevent.

MATHEMATICS-Standard
QUESTION PAPER DESIGN
CLASS – X (2022-23)

Time: 3 Hours **Max. Marks: 80**

S. No.	Typology of Questions	Total Marks	% Weightage (approx.)
1	**Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, andstating main ideas	43	54
2	**Applying:** Solve problems to new situations by applying acquiredknowledge, facts, techniques and rules in a different way.	19	24
3	**Analysing :** Examine and break information into parts by identifying motives orcauses. Make inferences and find evidence to support generalizations **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. **Creating:** Compile information together in a different way by combining elementsin a new pattern or proposing alternative solutions	18	22
	Total	80	100

INTERNAL ASSESSMENT	**20 MARKS**
Pen Paper Test and Multiple Assessment (5+5)	10 Marks
Portfolio	05 Marks
Lab Practical (Lab activities to be done from the prescribed books)	05 Marks

MATHEMATICS-
Basic QUESTION
PAPER DESIGN
CLASS – X (2022-23)

Time: 3Hours **Max. Marks: 80**

S. No.	Typology of Questions	Total Marks	% Weightage (approx.)
1	**Remembering:** Exhibit memory of previously learned material by recalling facts, terms, basic concepts, and answers. **Understanding:** Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	60	75
2	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	12	15
3	**Analysing :** Examine and break information into parts by identifying motives orcauses. Make inferences and find evidence to support generalizations **Evaluating:** Present and defend opinions by making judgments about information, validity of ideas, or quality of work based on a set of criteria. **Creating:** Compile information together in a different way by combining elementsin a new pattern or proposing alternative solutions	8	10
	Total	80	100

INTERNAL ASSESSMENT	**20 MARKS**
Pen Paper Test and Multiple Assessment (5+5)	10 Marks
Portfolio	05 Marks
Lab Practical (Lab activities to be done from the prescribed books)	05 Marks

PRESCRIBED BOOKS:

1. Mathematics - Textbook for class IX - NCERT Publication
2. Mathematics - Textbook for class X - NCERT Publication
3. Guidelines for Mathematics Laboratory in Schools, class IX - CBSE Publication
4. Guidelines for Mathematics Laboratory in Schools, class X - CBSE Publication
5. Laboratory Manual - Mathematics, secondary stage - NCERT Publication
6. Mathematics exemplar problems for class IX, NCERT publication.
7. Mathematics exemplar problems for class X, NCERT publication.

DELETED PORTIONS

S.No.	Chapter	Deleted Topics
1	Chapter 1 - Real Numbers	➢ Euclid's Division Lemma ➢ Decimal Representation of Rational Numbers interms of terminating / non-terminating recurring decimals.
2	Chapter 2 - Polynomials	➢ Statement and simple problems on Division algorithm for polynomials with real coefficients.
3	Chapter 3 - Pair of Linear Equations in two variables	➢ Cross Multiplication Method ➢ Simple problems on equations reducible to linear equations.
4	Chapter 4 – Quadratic Equations	➢ Method of Completing the squares to solve Quadratic Equation
5	Chapter 5 – Arithmetic Progressions	➢ No deletion
6	Chapter 6 – Triangles	➢ Areas of two similar triangles theorem ➢ Pythagoras Theorem and its converse
7	Chapter 7 – Coordinate Geometry	➢ Area of a triangle
8	Chapter 8 – Introduction to Trigonometry	➢ Trigonometric rations of complementary angles
9	Chapter 9 – Some Applications of Trigonometry	➢ No deletion
10	Chapter 10 – Circles	➢ No deletion
11	Chapter 11 – Constructions	➢ Full Chapter Deleted
12	Chapter 12 – Areas Related to Circles	➢ Plane figures involving triangles, simple quadrilaterals and circle (Combination of plane figures)
13	Chapter 13 – Surface Area and Volumes	➢ Frustum of a Cone ➢ Problems involving converting one type of metallic solid into another solid and other mixed problems
14	Chapter 14 – Statistics	➢ Cumulative Frequency Graph
15	Chapter 15 – Probability	➢ No deletion

CHAPTER: 01 REAL NUMBERS

Introduction to Real Numbers

- Real numbers constitute the union of all rational and irrational numbers.
- Any real number can be plotted on the number line.

Prime Factorisation

- Prime Factorisation is the method of expressing a natural number as a product of prime numbers. Example: 36=2×2×3×3 is the prime factorisation of 36.

Fundamental Theorem of Arithmetic

- The Fundamental Theorem of Arithmetic states that the prime factorisation for a given number is unique if the arrangement of the prime factors is ignored.
- Example: 36=2×2×3×3 OR, 36=2×3×2×3Therefore, 36 is represented as a product of prime factors (Two 2s and two 3s) ignoring the arrangement of the factors.

Method of Finding LCM

- Example: To find the Least Common Multiple (L.C.M) of 36 and 56, 1. 36=2×2×3×3 56=2×2×2×7
- 2.The common prime factors are 2×2
- 3. The uncommon prime factors are 3×3 for 36 and 2×7 for 56.
- 4.LCM of 36 and 56 = 2×2×3×3×2×7 which is 504

Method of Finding HCF

- H.C.F can be found using two methods - Prime factorisation and Euclid's division algorithm.
- HCF is always a factor of LCM.

Prime Factorisation:

- Given two numbers, we express both of them as products of their respective prime factors. Then, we select the prime factors that are common to both the numbers Example - To find the H.C.F of 20 and 24 20=2×2×5 24=2×2×2×3The factor common to 20 and 24 is 2×2, which is 4, which in turn is the H.C.F of 20 and 24.
- **Product of Two Numbers = HCF X LCM of the Two Numbers**
- For any two positive integers a and b, a×b = H.C.F×L.C.M.
- **Example** - For 36 and 56, the H.C.F is 4 and the L.C.M is 504 36×56=2016 4×504=2016. Thus, 36×56=4×504. The above relationship, however, doesn't hold true for 3 or more numbers

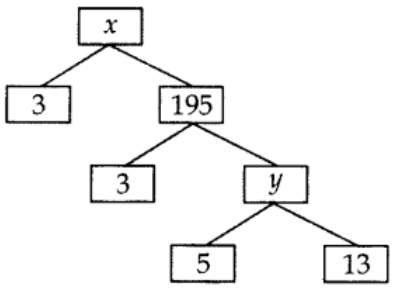
Applications of HCF & LCM in Real-World Problems

- L.C.M can be used to find the points of common occurrence. This could be the common ringing of bells that ring with different frequencies, the time at which two persons running at different speeds meet, and so on.

Irrational Numbers

- Any number that cannot be expressed in the form of $\frac{P}{q}$ (where p and q are integers and q≠0.) is an irrational number. Examples - √2,π, e and so on.
- Example: 3 divides 36, which implies that 3 divides 6.
- √p is irrational when 'p' is a prime. For example, 7 is a prime number and √7 is irrational. The above statement can be proved by the method of "Proof by contradiction".
- The sum or difference of a rational number and an irrational number is an irrational number.
- The product or division of a rational number with an irrational number is an irrational number.

	MCQ (1 MARK EACH)
Q1	HCF of the smallest composite number and smallest prim number is: A. 4 B. 2 C. 4 D. 0
Q2	If a is an odd number, b is not divisible by 3 and LCM of a and b is P then the LCM of 3a and 2b is: A. 5P B. 3P C. 6P D. 2P
Q3	What is the HCF of $3^3 \times 5$ and $3^2 \times 5^2$? A. 45 B. 225 C. 15 D. 60
Q4	The least number that is divisible by all the from 1 to 5 is: A. 70 B. 60 C. 90 D. 80
Q 5	The product of three consecutive positive integers is divisible by A. 4 B. 6 C. 5 D. None of these
Q 6	The LCM of two numbers is 1200. Which of the following cannot be their HCF? A. 600 B. 500 C. 400 D. 200

Q 7	If the HCF(26,169) = 13 then, LCM(26,169)= A. 26 B. 52 C. 338 D. 13
Q 8	The largest number that divides 70 and 125, which leaves the remainders 5 and 8, is: A. 65 B. 15 C. 13 D. 25
Q 9	If P is a prime number then, what is the LCM of P, P^2, P^3? A. P B. P×P C. 0 D. P^3
Q 10	The Muscle Gym has bought 63 treadmills and 108 elliptical machines. The gym divides them into several identical sets of treadmills and elliptical machines for its branches located throughout the city, with no exercise equipment left over. What is the greatest number of branches the gym can have in the city? A. 7 B. 18 C. 108 D. 9
	VERY SHORT ANSWERS (2 MARKS)
1.	HCF and LCM of two numbers are 9 and 459 respectively. If one of the numbers is 27, find the other number.
2.	If HCF of a and b is 12 and product of these numbers is 1800.What is the LCM of these numbers?
3.	Express 98 as a product of its primes. What is the sum of the exponent of its prime?
4	Find the LCM of 96 and 360 by using the fundamental theorem of arithmetic.
5.	Complete the following factor tree and find the composite number x. 

	SHORT ANSWERS (3 MARKS)
1.	The LCM of two numbers is 14 times their HCF. The sum of LCM and HCF is 600. If one number is 280, then find the other number.
2	If the least prime factor of p is 3 and least prime factor of q is 5, then what is the least prime factor of (p+q)?
3.	The traffic lights at three different road crossings change after every 48 seconds, 72 seconds and 108 seconds respectively. If they change simultaneously at 7 am, at what time will they change simultaneously again?
4.	Three farmers have 490kg, 588kg and 882kg of wheat respectively. Find the maximum capacity of a bag so that the wheat can be packed in an exact number of bags.
5.	Find the largest number which divides 70 and 125 leaving remainder 5 and 8 respectively.
	CASE STUDY 1 (4 MARKS)
1.	Sandeep, a newly appointed IAS officer, wants to give a thank-giving party to all her mentors, teachers and guides who motivated and taught him to achieve this aim. He decided to give gifts to all of them. He has 36 diaries, 60 golden pens. He does not want to discriminate among his teachers, mentors and guide.So he decided to distribute them equally among all of them. 

	(i) How many maximum guests can Sandeep invite?
	(ii) How many diaries and golden pens each guest will get? Sandeep decided to add 42 watches also. In this case how many maximum guests can Sandeep invite?
	(iii) How many items of each category each guest will get? If Sandeep decides to add 3 more watches, takes 6 diaries out then what is the maximum number of guests Sandeep can invite?
	CASE STUDY 2
	To enhance the reading skills of the grade X students, the school nominates you and two more 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. 
	(i) What is the minimum number of books you acquire for the class library, so that they can be distributed equally among students of Section A and Section B?
	(ii) The HCF of (32,36) will be?
	(iii) If p and q are positive integers such that p=a×b×b and q=a×a×b, where a,b are prime numbers, then what is the LCM of (p,q) ? 36 can be expressed as a product of its primes as _____?
2.	A street shopkeeper prepares 396 Gulab jamuns and 342 rasgullas he packs them, in combination. Each container consists of either Gulab jamuns or rasgullas but has an equal number of pieces. Find the number of pieces he should put in each box so that the number of boxes is the least.

3.	State Fundamental Theorem of Arithmetic. Is it possible that HCF and LCM of two numbers are 24 and 540 respectively? Justify your answer.
4.	Prove that $\sqrt{5}$ is irrational and hence show that $3 + \sqrt{5}$ is also irrational.
5.	Find HCF of 378, 180 and 420 by prime factorisation method. Is HCF × LCM of three numbers equal to the product of the three numbers?

Chapter 2: Polynomials

Polynomial

A polynomial is an algebraic expression consisting of variables and coefficients, that involves operations like addition, subtraction, multiplication and non-negative integer exponents of variables.

For e.g. $x + 6$, $y^2 + 5y - 1$, $3x$, etc.

Difference between algebraic expressions and polynomials

An algebraic expression can have exponents that are **rational numbers.** However, a polynomial is an algebraic expression in which the exponent on any variable is a **whole number**.

Hence, we can say that all the polynomials are algebraic expressions, but all the algebraic expressions are not polynomials.

For e.g.

(i) $5x^3 + 3x + 1$ is an example of a polynomial. It is an algebraic expression as well.

(ii) $2x + 3\sqrt{x}$ is an algebraic expression, but not a polynomial since the exponent on x is $\frac{1}{2}$ which is not a whole number.

Degree of a Polynomial

For a polynomial in one variable the highest exponent on the variable in a polynomial is called the degree of the polynomial.

For e.g. The degree of the polynomial $x^2 + 2x + 3$ is 2, as the highest power of x in the given expression is x^2**.**

Types of polynomials

Polynomials can be classified based on:

(i) Number of terms

(ii) Degree of the polynomial

Types of polynomials based on the number of terms:

(a) **Monomial**: A polynomial with just one term. Example: $2x$, $6x^2$, $9xy$

(b) **Binomial**: A polynomial with two terms. Example: $4x^2 + x$, $5x + 4$

(c) **Trinomial**: A polynomial with three terms. Example: $x^2 + 3x^3 + 4$

Types of polynomials based on degree:

(a) **Linear polynomial**: A polynomial whose degree is one is called a linear polynomial. For example, $2x + 1$ is a linear polynomial.

(b) **Quadratic polynomial:** A polynomial of degree two is called a quadratic polynomial. For example, $3x^2 + 8x + 5$ is a quadratic polynomial.

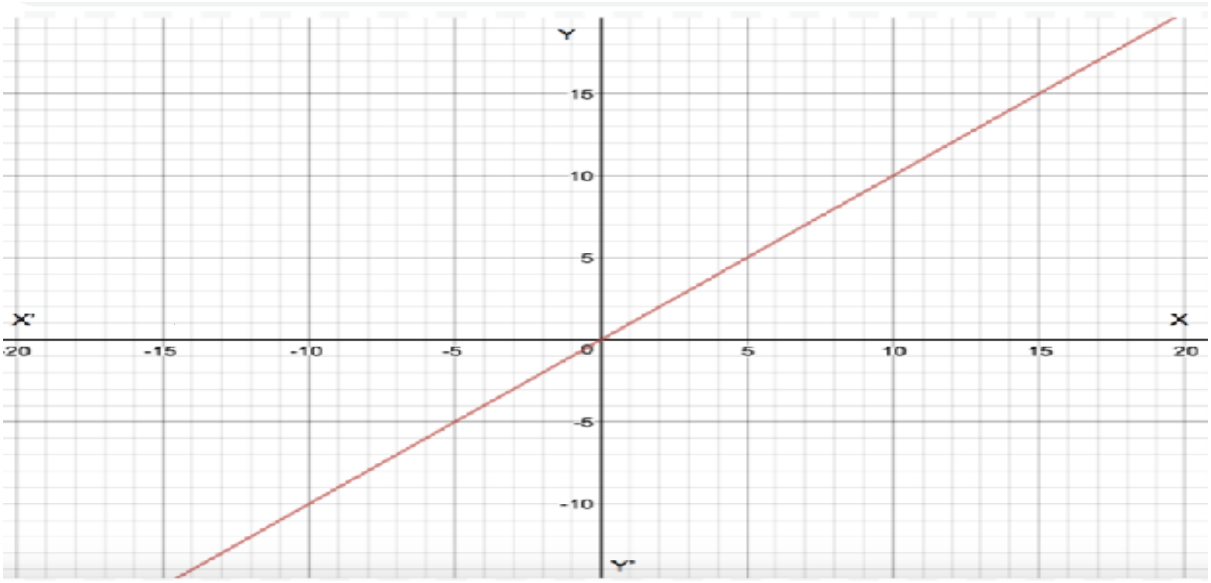
(c) **Cubic polynomial**: A polynomial of degree three is called a cubic polynomial. For example, $2x^3 + 5x^2 + 9x + 15$ is a cubic polynomial.

Graphical representations

Representing equations on graph

Any equation can be represented as a graph on the Cartesian plane, where each point on the graph represents the x and y coordinates of the point that satisfies the equation. An equation can be seen as a constraint placed on the x and y coordinates of a point, and any point that satisfies that constraint will lie on the curve.

For example, the equation $y = x$, on a graph, will be a straight line that joins all the points which have their x coordinate equal to their y coordinate. Example: (1,1), (2,2) and so on.



Zeroes of a Polynomial

A zero of a polynomial ***p(x)*** is the value of ***x*** for which the value of ***p(x)*** is 0. If ***k*** is a zero of ***p(x)***, then ***p(k) = 0.***

For example, consider a polynomial $p(x) = x^2 - 3x + 2$.

When $x = 1$, the value of $p(x)$ will be equal to

$p(1)=12 - 3\times1 + 2$

$=1-3+2$

$=0$

Since $p(x) = 0$ at $x = 1$, we say that 1 is a zero of the polynomial $x^2 - 3x + 2$.

Number of zeroes

In general a polynomial of degree ***n*** has atmost ***n*** zeroes.

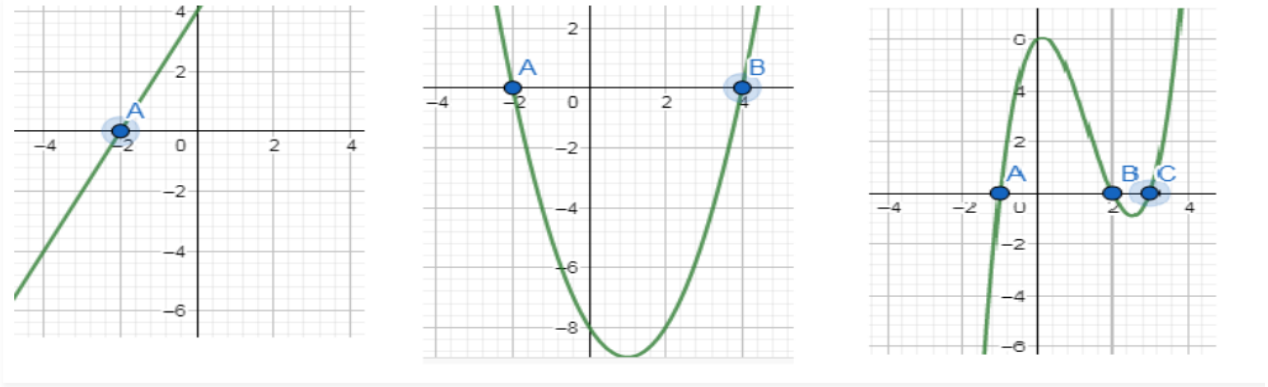
(i) A linear polynomial has one zero.

(ii) A quadratic polynomial has at most two zeroes.

(iii) A cubic polynomial has at most three zeroes.

Geometrical meaning of zeroes

Geometrically, zeros of a polynomial are the points where its graph cuts the x-axis.



(i) One zero (ii) Two zeros (iii) Three zeros

Here A, B and C correspond to the zeros of the polynomial represented by the graphs.

The factorisation of Quadratic Polynomials

Quadratic polynomials can be factorised by splitting the middle term.

For example, consider the polynomial $2x^2 - 5x + 3$

- The middle term in the polynomial $2x^2 - 5x + 3$ is –5. This must be expressed as a sum of two terms such that the product of their coefficients is equal to the product of 2 and 3 (coefficient of x^2 and the constant term)
- –5 can be expressed as $(-2) + (-3)$, as $-2 \times -3 = 6 = 2 \times 3$
- Thus, $2x^2 - 5x + 3 = 2x^2 - 2x - 3x + 3$
- Now, identify the common factors in individual groups
  $2x^2 - 2x - 3x + 3 = 2x(x-1) - 3(x-1)$
- Taking $(x-1)$ as the common factor, this can be expressed as
  $2x(x-1) - 3(x-1) = (x-1)(2x-3)$

Relationship between Zeroes and Coefficients of polynomials

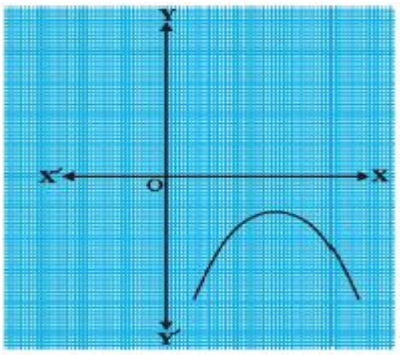
Type of Polynomial	General form	No. of zeroes	Relationship between zeroes and coefficients
Linear	$ax + b, a \neq 0$	1	$k = -\frac{b}{a}$, *i.e.* $k = -\frac{\text{Constant term}}{\text{Coefficient of x}}$
Quadratic	$ax^2 + bx + c, a \neq 0$	2	Sum of zeroes $(\alpha + \beta) = -\frac{\text{Coefficient of x}}{\text{Coefficient of x}^2} = -\frac{b}{a}$ Product of zeroes $(\alpha\beta) = \frac{\text{Constant term}}{\text{Coefficient of x}^2} = \frac{c}{a}$

The expression for quadratic polynomial whose sum and product of zeroes are known can be written as:

$$x^2 - (\text{sum of zeroes})x + \text{product of zeroes}$$

Multiple Choice Questions (1 mark each)

1. If the zeroes of the quadratic polynomial $x^2 + (a + 1)x + b$ are 2 and –3, then
   (a) a = – 7, b = – 1 (b) a = 5, b = –1
   (c) a = 2, b = – 6 (d) a = 0, b = – 6
2. The zeroes of the polynomial $x^2 - 3$ are
   (a) $-\sqrt{3}$ and $-\sqrt{3}$ (b) $\sqrt{3}$ and $\sqrt{3}$
   (c) $\sqrt{3}$ and $-\sqrt{3}$ (d) $\sqrt{3}$ and $\sqrt{2}$
3. Which of the following is a polynomial?
   (a) $x^2 - 5x + 3$ (b) $\sqrt{x} + \frac{1}{\sqrt{x}}$
   (c) $x^{-2} - x + 4$ (d) $\frac{1}{x} + 7$
4. If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is
   (a) 10 (b) –10
   (c) –7 (d) –2
5. The quadratic polynomial, the sum of whose zeroes is –5 and their product is 6, is
   (a) $x^2 + 5x + 6$ (b) $x^2 - 5x + 6$
   (c) $x^2 - 5x - 6$ (d) $-x^2 + 5x + 6$
6. The number of zeroes of the polynomial from the graph is



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

7. If α, β are the zeroes of the polynomials $f(x) = x^2 + x + 1$, then $\frac{1}{\alpha} + \frac{1}{\beta}$

(a) 0 (b) 1 (c) –1 (d) 2

8. A quadratic polynomial can have at most _____ zeroes.

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

9. The sum and the product of the zeroes of polynomial $6x^2 - 5$ respectively are

(a) 0, $\frac{-6}{5}$ (b) 0, $\frac{6}{5}$ (c) 0, $\frac{5}{6}$ (d) 0, $\frac{-5}{6}$

10. A quadratic polynomial whose zeroes are $\frac{3}{5}$ and $\frac{-1}{2}$ is

(a) $10x^2 - x - 3$ (b) $10x^2 + x - 3$

(c) $10x^2 - x + 3$ (d) $10x^2 + x + 3$

Very Short Answer Type Questions (2 marks each)

1. Find the condition that zeroes of polynomial $p(x) = ax^2 + bx + c$ are reciprocal of each other.
2. Find the zeroes of the quadratic polynomial $\sqrt{3}x^2 - 8x + 4\sqrt{3}$.
3. If α and β are the zeroes of the polynomial $ax^2 + bx + c$, find the value of $\alpha^2 + \beta^2$.
4. Find a quadratic polynomial, the sum and product of whose zeroes are $\frac{-8}{3}$ and $\frac{4}{3}$.
5. Find the zeroes of the quadratic polynomial $3x^2 - 75$.

Short Answer Type Questions (3 marks each)

1. Show that $\frac{1}{2}$ and $\frac{-3}{2}$ are the zeroes of the polynomial $4x^2 + 4x - 3$ and verify the relationship between zeroes and coefficients of polynomial.
2. Find a quadratic polynomial whose zeroes are reciprocals of the zeroes of the polynomial $f(x) = ax^2 + bx + c$, $a \neq 0$, $c \neq 0$.
3. If α and β are the zeroes of the polynomial $6y^2 - 7y + 2$, find a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.
4. Find a quadratic polynomial, the sum and product of whose zeroes are –8 and 12 respectively. Hence find the zeroes.
5. Find the zeroes of the quadratic polynomial $p(x) = x^2 - 3x - 28$ and verify the relationship between the zeroes and the coefficients of the polynomial.

Case Study Questions (4 marks each)

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.




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

(ii) (1)

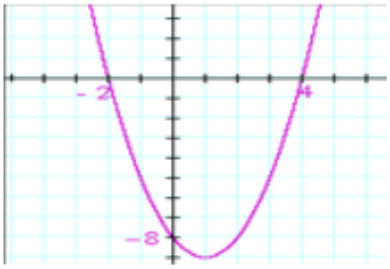
If α *and* $\frac{1}{\alpha}$ are the zeroes of the qudratic polynomial $2x^2 - x + 8k$, then k is

(iii) (2)

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

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.

(i) In the graph, how many zeroes are there for the polynomial? (1)



(ii) The two zeroes in the above shown graph are (1)

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

Chapter 3: Pair of Linear Equations in two variables

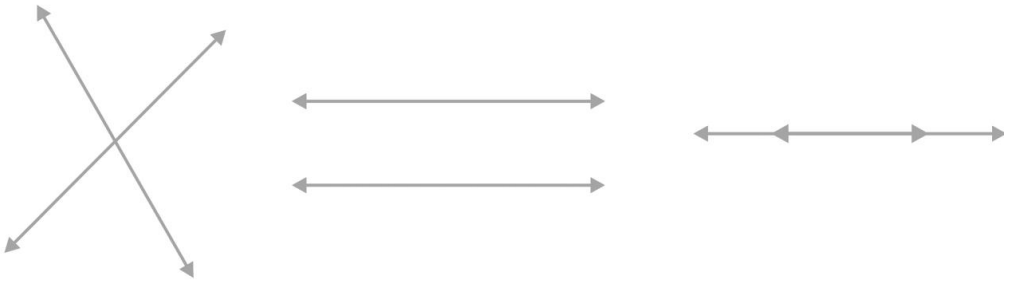
GIST OF THE TOPIC:

- Two linear equations in the same two variables are called a pair of linear equations in two variables. The most general form of a pair of linear equations is

  $a_1x+b_1y+c_1 =0$

  $a_2x+b_2y+c_2 =0$

  where a_1, a_2, b_1, b_2, c_1, c_2 are real numbers. The coefficients of x and y cannot be zero simultaneously for an equation.
- The **geometrical representation of a pair of linear equation in two variables** will be two straight lines which would satisfy one of the three following possibilities
  1. The two lines will intersect at a point (Fig A)
  2. The two lines will be parallel (Fig B)
  3. The two lines will coincide with each other (Fig C)



(a) (b) (c)

Solution to a pair of linear equations in two variables:

- The existence of solutions for a pair of linear equations based on the graphical representation are as follows:
  1. The lines may **intersect in a single point**. In this case, the pair of equations has a **unique** solution (consistent pair of equations)
  2. The lines may be **parallel**. In this case, the equations have **no solution** (inconsistent pair of equations).
  3. The lines may be coincident. In this case, the equations have infinitely many solutions. (dependent -consistent pair of solutions).
- On comparing the ratios of co-efficient of x and y in the given pair of linear equations, a_1/a_2 , b_1/b_2, c_1/c_2, the nature of the solutions can be found as following

Comparing the ratios	Graphical representation	Algebraic interpretation
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines	Exactly one solution
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Co-incident lines	Infinitely many solutions
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Parallel lines	No solution

Algebraic Methods of Solving a Pair of Linear Equations:

Substitution Method
Steps:

- Find the value of one variable, say y in terms of the other variable, i.e., x from either equation, whichever is convenient.
- Substitute this value of y in the other equation, and reduce it to an equation in one variable, i.e., in terms of x, which can be solved
- Substitute the value of x (or y) obtained in Step 2 in the equation used in Step 1 to obtain the value of the other variable.

Elimination Method
Steps:

- First multiply both the equations by some suitable non-zero constants to make the coefficients of one variable (either x or y) numerically equal.
- Then add or subtract one equation from the other so that one variable gets eliminated.
- Solve the equation in one variable (x or y) so obtained to get its value.
- Substitute this value of x (or y) in either of the original equations to get the value of the other variable.

Sample Questions

I. Answer the following questions

1. If a pair of linear equations is inconsistent, then the lines are:

   (a) Parallel (b) Always coincident
   (c) Always intersecting (d) Intersecting or coincident
   Ans: (a)Parallel

2. The pairs of equations $3x + 3y + 10 = 0$ and $9x + 7y + 30= 0$ have

   (a) Unique solution (b) Exactly two solutions
   (c) Infinitely many solutions (d) No solution
   Ans: (a)Unique solution

3. The correct pair of linear equations in two variables representing the following situation is
   '10 students of Class X took part in a Mathematics quiz. If the number of girls is 4 more than the number of boys, find the number of boys and girls who took part in the quiz'.
   (a)$2x+y=10$, $x-y=4$
   (b)$x+2y=10$, $y=4+x$
   (c)$x+y=10$, $y=4+x$
   (d)$x+y=10$, $x-y=4$
   Ans: (c)$x+y=10$,$y=4+x$

4. If the lines $3x+ky-2=0$ and $2x+5y+1=0$ are parallel, then what is the value of k? (a) 2/15 (b) 15/2 (c) 4/15 (d) 15/4

Ans: (b)15/2

5. The solution of the equations $x-y=2$ and $x+y=4$ is:

(a) 3 and -1 (b) 4 and 3 (c) 5 and 1 (d) 3 and 1

Ans: (d) 3 and 1

6. A pair of linear equations which has a unique solution $x=3$, $y=-3$ is

(a) $x+y=-1$; $2x-3y=-5$
(b) $2x+5y=-9$; $4x+10y=-18$
(c) $2x-y=1$; $3x+2y=0$
(d) $x-4y-14=0$; $5x-y-13=0$

Ans: (b) $2x+5y=-9$; $4x+10y=-18$

7. The pair of equations $x=1$ and $x=2$ has

(a) no solution
(b) unique/one solution
(c) two solutions
(d) infinitely many solutions

Ans: no solution

8. The sum of the digits of a two-digit number is 10. The first digit is 2 more than the second digit. The number is

(a) 46 (b) 82 (c) 64 (d) 28

Ans: (c) 64

9. The graph of $x=-10$ is a line parallel to the

(a) x-axis (b) y-axis (c) both x- and y-axis (d) none of these

Ans: (b) y-axis

10. **Assertion:** The pairs of equations $2x+4y-10=0$ and $-4x-8y+20=0$ have infinitely many solution.

Reason: If $a_1/a_2 = b_1/b_2 = c_1/c_2$, then the pair of equations has infinitely many solutions.

a) both assertion and reason are correct and reason is correct explanation for assertion

b) both assertion and reason are correct but reason is correct explanation for assertion

c) assertion is correct but reason is false

d) both assertion and reason are false

Ans: a) both assertion and reason are correct, and reason is correct explanation for assertion

II. Very short answers

1. Find whether the following pair of linear equations is consistent or inconsistent:

$2x + 2y = 8$

$6x – 4y = 9$

Solution:

Here, $a_1=2$, $a_2=6$, $b_1=2$,$b_2=-4$

$a_1/a_2 = \frac{2}{6} = \frac{1}{3}$,

$b_1/b_2 = \frac{2}{-4} = \frac{-1}{2}$

Therefore,

$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

Hence the given pair of linear equations are consistent.

2. Find whether the lines representing the following pair of linear equations intersect at a point, are parallel or coincident: $8x – 3y + \frac{1}{4} = 0$,$16x – 6y + \frac{1}{2} = 0$

Solution:

$a_1=8$, $a_2=16$, $b_1=-3$,$b_2=-6$, $c_1=\frac{1}{4}$,$c_2=\frac{1}{2}$

$a_1/a_2 = \frac{8}{16} = \frac{1}{2}$,

$b_1/b_2 = \frac{-3}{-6} = \frac{1}{2}$

$c_1/c_2 = \frac{\frac{1}{4}}{\frac{1}{2}} = \frac{1}{2}$

Here,

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Therefore the lines are co-incident

4. If the system of equations $8x + 2y = 9$ and $k x + y = 2$ has a unique solution, find the value of k

Solution:

For a system of equation having unique solution, $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$

Hence $\frac{8}{k} \neq \frac{2}{1}$

$\frac{8x1}{2} \neq k$

$k \neq 4$

Hence k can take any value other than 4.

4. Solve: **9x + l8y = 46**
x + 2y = 10

Solution:

Let 9x+18y=46 be eq(1)
and x+2y=10 be eq(2)

From eq (2),we get $y=\frac{10-x}{2}$ …(3)

Substituting eq(3) in eq(1) we get, $9x+18(\frac{10-x}{2})=46$

$9x+(\frac{180-18x}{2})=46$

18x+180-18x=92

180=92 which is a false statement

Therefore the given equations are inconsistent and have no solution

5. Find the number of solutions of the following pair of linear equations .

4x + 8y – 32 = 0
2x + 4y = 16

Solution:

Here $a_1/a_2 = \frac{4}{2} = 2$

$b_1/b_2 = \frac{8}{4} = 2$

$c_1/c_2 = \frac{-32}{-16} = 2$

Therefore

$$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$$

So, the given equations have infinitely many solutions.

III. Short Answers

1. **The difference between two numbers is 15 and one number is four more than twice the other number. Form the pair of linear equations and find the numbers.**

Solution:

Let the two numbers be ‘x’ and ‘y’

According to the question,

x-y=15 ……(1)

x=4+2y ……(2)

On substituting (2) in (1)

4+2y-y=15

y=15-4

y=11

Substituting y=11 in (2)

x=4+2(11)

x=4+22

x=26

Therefore the two numbers are 11 and 26

2. **Draw the graphs of the pair of equations x + y = 10 and 2x-3y = – 4. Also find the points where the lines meet the x-axis.**

Solution:

x+y=10 …..(1)

y=10-x

x	5	6
y	5	4

Therefore the coordinates of eq(1) are (5,5),(6,4)

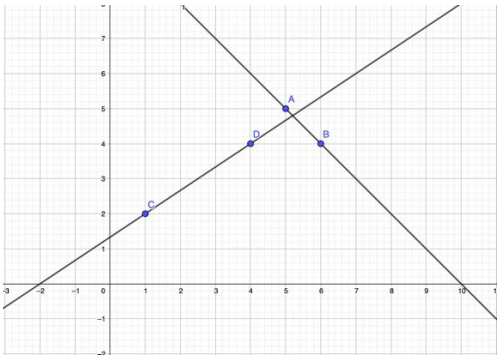
2x-3y=-4 …..(2)

y=2x+4/3

x	1	4
y	2	4

Therefore the coordinates of eq(2) are (1,2),(4,4)

Graph



From the graph, the lines meet the x-axis at -2 and 10 respectively

3. **For what value or '*k*' will the following pair of linear equations have infinitely many solutions kx + 3*y* = k – 3**

12x +ky=k

Solution:

For equations having infinitely many solutions,

$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

$\frac{k}{12} = \frac{3}{k}$ and $\frac{3}{k} = \frac{k-3}{k}$

$k^2=36$ $3k=k^2-3k$

$k=\sqrt{36}$ $k^2-6k=0$

$k=\pm 6$ $k(k-6)=0$

$k=0$(not possible) or $k=6$

For k=6, the equations have infinitely many solutions.

4. **The path of a train A is given by the equation 10x + 2y – 4 = 0 and the path of another train B is given by the equation 20x + 4y – 12 = 0 represent this situation graphically**

Solution:

Path of train A:10x+2y-4=0 …(1)\

$$y = \frac{4-10x}{2}$$

x	1	0
y	-3	2

Therefore the coordinates of eq(1) are (1,-3),(0,2)

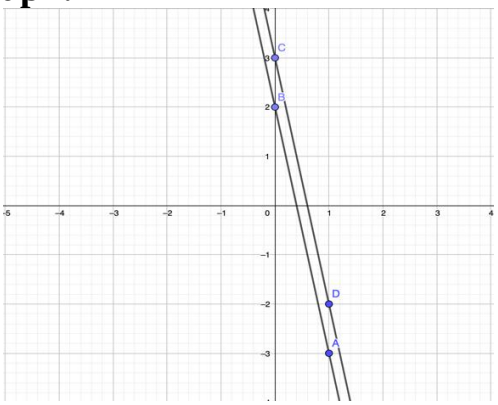
Path of train B:20x+4y-12=0 …(2)

$$y=\frac{12-20x}{4}$$

x	0	1
y	3	-2

Therefore the coordinates of eq(2) are (0,3),(1,-2)

Graph:



5. **Solve 9x-15y=18 …(1)**
   11x-5y=10 …(2)

Solution:

(1)$\Rightarrow$ 9x-15y=18

(2)x3$\Rightarrow$33x-15y=30 (-)

-24x=-12

$$x=\frac{12}{24}$$

$$x=\frac{1}{2}$$

Substituting $x=\frac{1}{2}$ in (1), we get

$9(\frac{1}{2})-15y=18$

$-15y=18-\frac{9}{2}$

$-15y=\frac{27}{2}$

$y= -\frac{27}{30}$

Hence $x=\frac{1}{2}$, $y= -\frac{27}{30}$ is the required solution

IV. Long Answers

1. **Form a pair of linear equations in two variables using the following information and solve it graphically: Five years ago, Sheela was twice as old as Tina. Ten year later Sheela's age will be ten years more than Tina's age. Find their present ages. What was the age of Sheela when Tina was born?**

   Solution:

   Let the age of Tina be 'x' and age of Sheela be 'y'
   Age of Tina five years ago=x-5
   Age of Sheela five years ago=y-5
   Age of Tina after ten years=x+10
   Age of Sheela after ten years=y+10
   According to the question,

   Situation-1

   y-5=2(x-5)
   Solving we get, y-5=2x-10
   2x-y-5=0 …(1)

   Situation-2

   y+10=10+(x+10)
   Solving we get, y+10=x+20
   x-y+10=0 …(2)

   Using Elimination method,
   (1) $\Rightarrow$ 2x-y=5
   (2)$\Rightarrow$x-y=-10 (-)

   x=15
   Substituting x=15 in (1)
   2(15)-y-5=0
   30-y-5=0
   y=25

   Therefore the present age of Tina is 15 years and age of Sheela is 25 years

   The age of Sheela when Tina was born= 25-15= 10 years

2. **Solve the following pair of linear equations graphically, x + 3y = 6;2x-3y = 12.Also find the area of the triangle formed by the lines representing the given equations with y-axis**

Solution:

x + 3y = 6 …(1)

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

x	0	3
y	2	1

Therefore the coordinates of eq(1) are (0,2),(3,1)

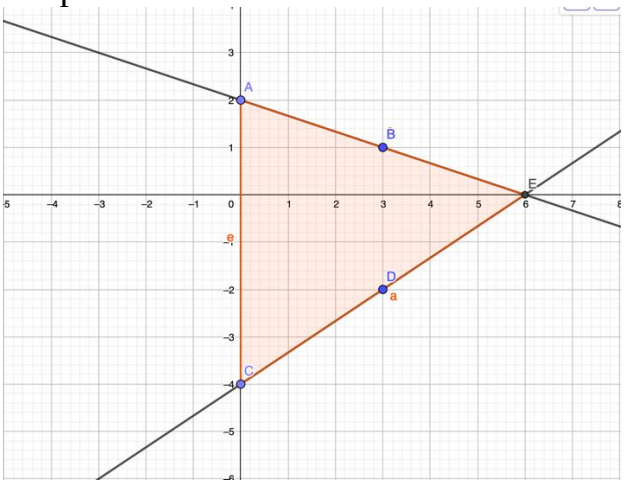
2x-3y = 12 …(2)

$y=\frac{2x-12}{3}$

x	0	3
y	-4	-2

Therefore the coordinates of eq(2) are (0,-4),(3,-2)

Graph:



From graph: In triangle ACE, base=AC=6 units and height=6 units

Area of the triangle=$\frac{1}{2}$xbh

Area of triangle ACE= $\frac{1}{2}$X6X6=18 sq.units

3. **Madhu went to a bank to withdraw 10000. He asked the cashier to give her 100 and 200 notes only. Madhu got 60 notes in all. Find how many notes of 100 and 200 she received.**

Solution:

Let the number of Rs.100 and Rs.200 notes be ‘x’ and ‘y’

According to the question,

100x+200y=10000 …(1)

x+y=60 …(2)

$$y=60-x \quad \ldots(3)$$

Substituting (3) in (1), we get

$$100x+200(60-x)=10000$$
$$100x+12000-200x=10000$$
$$100x=2000$$
$$x=20$$

Substituting x=20 in (3)

$$y=60-20$$
$$y=40$$

Therefore Madhu got 20 notes of Rs.100 and 40 notes of Rs.200

Case Study Questions:

1. Ram went to a shop. He observes the following two situations.

On 1st day: The cost of 4 kg of almonds and 2 kg of cashew was Rs 6400.

On 2nd day: The cost of 1 kg of cashew and 6 kg of almond was Rs 7200.

Denoting the cost of 1 kg almonds by Rs x and cost of 1 kg cashew by Rs y, answer the following questions.

(a) Represent algebraically the situation of day-I.

Ans: $4x+2y=6400$

(b) Represent algebraically the situation of day-II.

Ans: $6x+y=7200$

(c) The linear equation represented by day-I, intersect the x axis at ___

Ans: $x=1600$

(d) Find the cost of 1kg almond

Ans: x=Rs.1000

(e) Find the cost of 1 kg cashew

Ans: y=Rs.1200

2.Dinesh went to park along with his friends. The ticket charge for the park is Rs.50 for children and Rs.150 for adults. He paid 750 rupees in total. Also the park cash counter sold 250 tickets that particular day for Rs.27500 in total.

(a) Write the algebraic expression for above statements

Ans: Considering number of children went to park to be ‘x’ and number of adults to be ‘y’

The linear equations are

$$50x+150y=27500$$
$$x+y=250$$

(b)How many children went to the park

Ans:100

(c)How many adults went to the park

Ans:150

CHAPTER 5: ARITHEMATIC PROGRESSION

BRIEFING:

An arithmetic progression (AP) is a progression in which the **difference** between two **consecutive** terms is constant.

the standard form of the arithmetic progression is given by the formula,

a, a + d, a + 2d, a + 3d, a + 4d, ….

the first term is represented by the letter “a”, last term is represented by “l”, the common difference between two terms is represented by “d” and the number of terms is represented by the letter “n”.

The difference between two consecutive terms in an AP, (*which is constant*) is the “**common difference**“**(d)** of an A.P. the difference between any two consecutive terms, for any A.P, if the common difference is:

- **positive**, the AP is **increasing**.
- **zero**, the AP is **constant**.
- **negative**, the A.P is **decreasing.**

The formula to find the common difference between the two terms is given as:

Common difference, $d = (a_n – a_{n-1})$

Where,

a_n represents the nth term of a sequence

a_{n-1} represents the previous term. i.e., $(n-1)^{th}$ term of a sequence.

IMPORTANT FORMULAE

The nth term of an AP

The nth term of an A.P is given by $\boldsymbol{a_n = a + (n-1)\,d.}$, where **a** is the first term, **d** is a common difference and **n** is the number of terms.

Sum of Terms in an AP

The sum to n terms of an A.P is given by:

$$\boldsymbol{S_n = n/2[2a+(n-1)d]}$$

The sum of n terms of an A.P is also given by

$$\boldsymbol{S_n = n/2(a+l)}$$

QUESTIONS

MCQ:

Q1: The 10th term from the end of the A.P. 4, 9,14, …, 254 is
(a) 209
(b) 205
(c) 214
(d) 213

Q2: The n^{th} term of an A.P. is given by $a_n = 3 + 4n$. The common difference is
(a) 7
(b) 3
(c) 4
(d) 1

Q3: The sum of the first 15 multiples of 8 is
(a) 920
(b) 860
(c) 900
(d) 960

Q4: If p – 1, p + 3, 3p – 1 are in AP, then p is equal to
(a) 4
(b) -4
(c) 2
(d) -2

Q5: The sum of first ten natural number is
(a) 55
(b)155
(c) 65
(d) 110

Q6: The n^{th} term of an A.P. 5, 2, -1, -4, -7 ... is
(a) 2n + 5
(b) 2n - 5
(c) 8 - 3n
(d) 3n – 8

Q7: The list of numbers -10, -6, -2…….is

(a)an AP with d = -16
(b) an AP with d = 4
(c) an AP with d = -4
(d) not an AP

Q8: If the common difference of an AP is 3, then $a_{20} - a_{15}$ is
(a) 5
(b) 3
(c) 15
(d) 20

Q9: The sum of all odd integers between 2 and 100 divisible by 3 is
(a) 17
(b) 867
(c) 876
(d) 786

Q10: The first and last term of an A.P. are 1 and 11. If the sum of its terms is 36, then the number of terms will be:

(a)5

(b)6

(c) 7

(d)8

VSA: 2M:

1. Find the 15^{th} term of the 21, 24, 27, . . .
2. Which term of the AP : 3, 9, 15, 21, . . . , is 99?
3. How many two-digit numbers are divisible by 3?
4. In an AP, if $S_n = n(4n + 1)$, find the AP.
5. Find the 10th term from the last term of the AP : 8, 10, 12, . . ., 126.

SA: 3M:

1. If the 3rd and the 9th terms of an AP are 4 and – 8 respectively, which term of this AP is zero?
2. Which term of the AP : 3, 15, 27, 39, . . . will be 132 more than its 54th term?
3. If the numbers n – 2, 4n – 1 and 5n + 2 are in AP, find the value of n.
4. Solve the equation: 1+4+7+…….+x=287.
5. Find the sum of all the 11 terms of an AP whose middle most term is 30.

CASE STUDY QUESTIONS: 4M:
India is competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year.

Based on the above information, answer the following questions:

1. Find the production during first year.

(a) 4000

(b) 5000

(c) 6000

(d) 7000

2. Find the production during 8th year.

(a) 20400

(b) 20000

(c) 30400

(d) 30000

3. Find the production during first 3 years.

(a) 20000

(b) 21000

(c) 21600

(d) 30000

4. Find the difference of the production during 7th year and 4th year.

(a) 60600

(b) 21000

(c) 61600

(d) 6600

CASE STUDY 2:

Your friend Veer wants to participate in a 200m race. He can currently run that distance in 51 seconds and with each day of practice it takes him 2 seconds less. He wants to do it in 31 seconds.

1. Which of the following terms are in AP for the given situation

a) 51,53,55….

b) 51, 49, 47….

c) -51, -53, -55….

d) 51, 55, 59…

2. What is the minimum number of days he needs to practice till his goal is achieved

a) 10

b) 12

c) 11

d) 9

3. Which of the following term is not in the AP of the above given situation

a) 41

b) 30

c) 37

d) 39

4. If nth term of an AP is given by an = 2n + 3 then common difference of an AP is

a) 2

b) 3

c) 5

d) 1

Long Answer: 5M:

1. If sum of first 6 terms of an AP is 36 and that of the first 16 terms is 256, find the sum of first 10 terms.

2. A sum of Rs 1000 is invested at 8% simple interest per year. Calculate the interest at the end of each year. Do these interests form an AP? If so, find the interest at the end of 30 years making use of this fact.

3. How many terms of the AP: –15, –13, –11,--- are needed to make the sum –55? Explain the reason for double answer.

CHAPTER 6
TRIANGLES

- TOPIC 1: similar triangles, Definition, examples, Basic proportionality theorem
- TOPIC 2: Criterion of Similarity (AA,AAA, SSS, SAS) Results based on it

TOPIC 1 SIMILARITY

- Two figures having same shapes (size may or may not same) are called similar figures
- Pair of all regular polygons are similar figures
- All circles are similar figures
- .All equilateral triangles are similar

Similar triangles: If two triangles are said to be similar if

(a) Their corresponding angles are equal

(b) Ratio of their corresponding sides are equal/proportional

Basic proportionality Theorem/ Thales Theorem: If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.

TOPIC 2

Criterion of similarity (AAA,AA, SSS, SAS) and Results related on it.

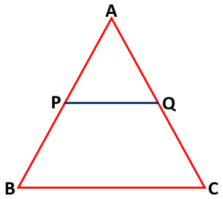
Revision notes

- In two triangles, if the corresponding angles are equal, then the corresponding sides are in the same ratio, then the triangles are similar (AAA similarity criterion)
- If in two triangles,the two angles of one triangle are respectively equal to the corresponding angles of the other triangle, then the two triangles are similar.(AA similarity criterion)
- If the corresponding sides of any two triangles are proportional, then the corresponding angles are equal and the two triangles are similar (SSS similarity criterion)
- If one angle of a triangle is equal to one angle of the other triangle and the corresponding sides including are proportional. Then the triangle are similar (SAS criterion

MCQ

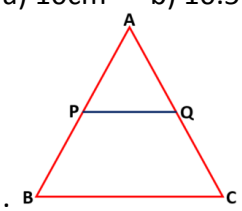
1) In the given figure PQIIBC,If AP=3cm, PB= 4 cm and AQ= 6 cm find QC

a) 2cm b) 6cm c) 8cm d) none of these



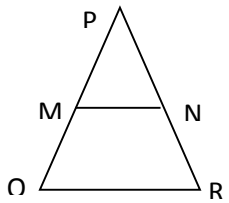
2)In the given figure in triangle ABC, PQ II BC and $\frac{AP}{PB} = \frac{3}{5}$ AQ= 28cm, find QC

a) 10cm b) 10.5 cm c) 46.6 cm d) 9.5 cm



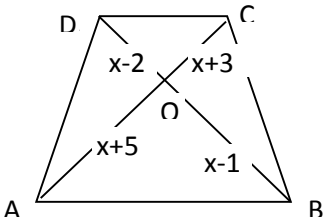
3) In the given figure MNII QR,If PM=xcm MQ=10cm,PN=(x-2), NR= 6cm then x= ---- cm

a) 4 cm b) 5 cm c) 10 cm d)9cm



4) In the given figure , if ABIIDC , find the value of x

A 8cm b) 7cm c) 6 cm d) none of these



5) All ---------- triangles are similar

a) l scalene b) isosceles c) equilateral d) right

6)In ΔABC, if DE || BC, AD = x, DB = x – 2, AE = x + 2 and EC = x – 1, then value of x is

a. 3 b. 4 c. 5 d. 6

7)In ΔLMN, ∠L = 50° and ∠N = 60°, If ΔLMN ~ ΔPQR, then find ∠Q

a. 40° b. 50° c. 60° d.120°

8) In triangles ABC and DEF, ∠B = ∠E, ∠F = ∠C and AB = 3DE. Then, the two triangles are

a. congruent but not similar
b. similar but not congruent
c. neither congruent nor similar
d. congruent as well as similar

9)In ABC, given that DE||BC, D is the midpoint of AB and E is a midpoint of AC. The ratio AE:EC is __.

a. **1: 1** **b. 2:1** **c. 1:3** **d. 3:1**

10)If in two Δs ABC and DEF, $\frac{AB}{DF} = \frac{BC}{EF} = \frac{CA}{ED}$, then

a. ΔABC ~ ΔDEF

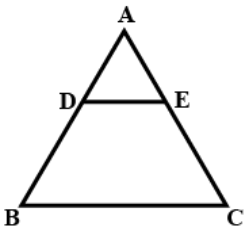
b. ΔABC ~ ΔEDF

c. ΔABC ~ ΔEFD

d. ΔABC ~ ΔDFE

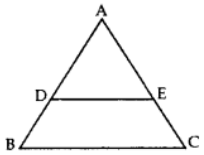
Very short Answer (2 MARKS)

1) In the given figure, $\frac{AD}{BD} = \frac{AE}{EC}$ and ∠ADE=70°, $\angle BAC = 50°$, then ∠BCA=

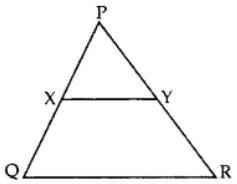


2)If ΔABC ~ ΔRPQ, AB = 4 cm, BC = 5 cm, AC = 6 cm, RP = 8 cm and PQ = 10, then find QR.

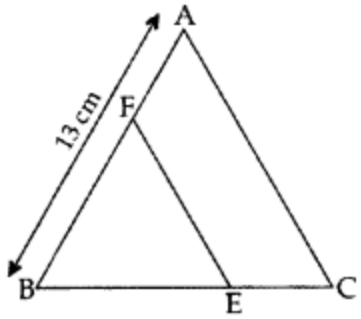
3)I n the given figure, if DE || BC, AE = 8 cm, EC = 2 cm and BC = 6 cm, then find DE.



4)In the given figure, XY || QR, *PQXQ*=73 and PR = 6.3 cm, find YR.



5) n the figure, EF || AC, BC = 10 cm, AB = 13 cm and EC = 2 cm, find AF.



SA (3 marks)

1)In the ΔABC, DE II BC and AD=$\frac{1}{2}$ BD. If BC= 4.5 cm , find DE

2) In ΔABC, DE II BC. If $\frac{AD}{DB} = \frac{2}{3}$, find $\frac{BC}{DE}$

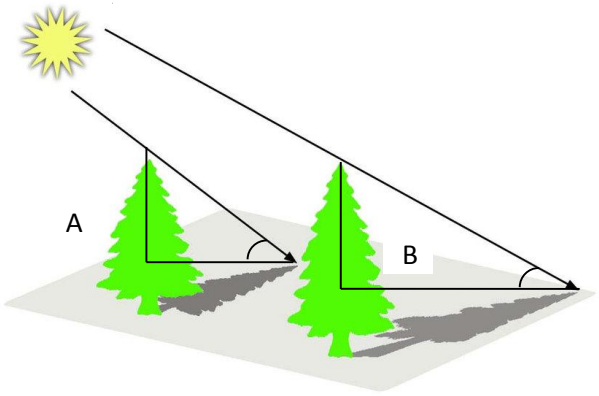
3) In. ΔABC, Dand E are points on AB and AC respectively such that DE II BC. If BD= CE, Prove that ΔABC is isosceles.

4) In ΔABC, Dand E are points on sides AB and AC respectively such that DE II BC and AD:DB=3:1.If EA= 6.6cm find AC

5) A vertical stick 12cm casts a shadow 8cm long on the ground.At the same time , a tower casts a shadow 40m long on the ground. Find the height of the tower.

CASE STUDY I

In the hot Indian summers, we are all glad to have the trees and their shade. But do you know how shadows are formed? Shadows are formed when light, for example, sunlight, falls on opaque objects. Consider the shadows of two trees A and B. The shadow of two trees A and B formed at 6 pm on a particular day is given in the diagram.The height of tree A is 5m and the height of tree B is 7m. The length of the shadow of tree B is 21m.



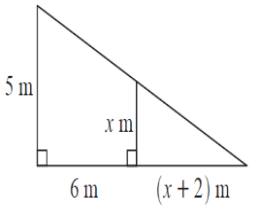
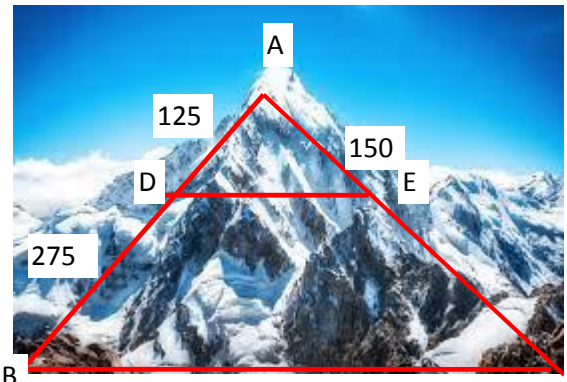


Fig :2

1) What is the length of the shadow of tree A?
2) What concept is used for finding the height of the tree?
3) What is the value of x in figure 2

CASE STUDY 2

Mountaineering is the perfect activity for adventure lovers. Every year, several mountaineers attempt to climb the Mount Everest.



The path of two mountaineers from the base camps B and C are shown above. D and E are two mid camping areas in between their paths and the line joining Dand E is parallel to the line joining Band C.

1) Find the distance between Eand C
2) What is the ratio of the distance between DE and BC?

SOLUTIONS

VSA (1 mark)

1)8cm
2)46.6 cm
3)5cm
4)7cm
5) Equilateral triangles
6) 4
7) 120°

8) Similar but not congruent
9)1:1
10) $\Delta ABC \sim \Delta DFE$

Very Short Answers (2 MARKS)

1) 60°
2)12 cm
3)DE=4.8 cm
4)YR= 2.7cm
5) AF=2.6cm

SA (3 MARKS)

1) In Δ ABC, AB=AD+BD. Also AD=$\frac{1}{2}$ BD

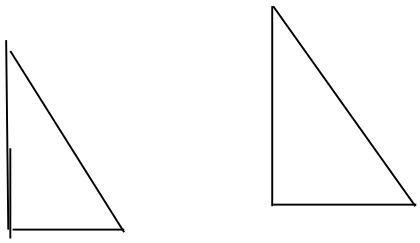
Ie: BD= 2 AD
. ThusAB= AD+2AD=3AD
Since DEII BC, $\frac{DE}{BC} = \frac{AD}{AB}$
$\frac{DE}{4.5} = \frac{AD}{3AD}$
DE= 1.5cm

2) In Δ ABC and Δ ADE,
∠A=∠A (Common)
∠ADE= ∠B (Corresponding angles)
∠AED = ∠C Corresponding angles
Δ ABC ~ Δ ADE (AA criterion)
$\frac{AD}{DB} = \frac{2}{3}$
$3AD = 2DB$
AB=AD+DB
2AB= 2AD+2DB
2AB= 2AD+3AD
2AB=5AD
$\frac{AB}{AD} = \frac{5}{2}$
$Since$ Δ ABC ~ Δ ADE $\frac{AB}{AD} = \frac{BC}{DE}$
$\frac{BC}{DE} = \frac{5}{2}$

3) In Δ ABC , it is given that BD= CE
Since DE II BC, By Thales theorem $\frac{AD}{BD} = \frac{AE}{EC}$
$\frac{AD}{CE} = \frac{AD}{EC}$ ie: AD= AE
AB= AD+BD and AC= AE+EC
OR AB= AC and AD= AE (proved above)
So Δ ABC is isosceles

4) In ΔABC, DEII BC
$\frac{AD}{DB} = \frac{AE}{EC}$
$\frac{3}{1} = \frac{AE}{EC}$
$\frac{3}{1} = \frac{6.6}{EC}$
$EC = \frac{6.6}{3}$ =2.2 cm

5)



$\frac{Height\ of\ the\ stick}{height\ of\ the\ tower} = \frac{shadow\ of\ stick}{shadow\ of\ tower}$

$\frac{12}{x} = \frac{8}{4000}$ (40m= 4000cm)

x= $\frac{12x4000}{8}$ = 12x500= 6000cm =60m

Height of the tower= 60m

CASE STUDY 1

1)15m

2)Similarity of triangles

3)x=2 and -5 (rejecting –ve value for distance)

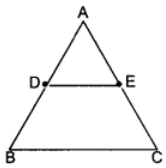
X=2

CASE STUDY 2

1) 330Km
2) 5:11

(Long answer type questions) **(5 marks each)**

1. Prove 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.
   Using the above result, do the following:
   In Fig. DE || BC and BD = CE. Prove that ΔABC is an isosceles triangle.



Solution:

Given: A triangle ABC in which a line parallel to side BC intersects other two sides AB and AC at D and E respectively.

To Prove: $\frac{AD}{DB} = \frac{AE}{EC}$.

Construction: Join BE and CD and then draw $DM \perp AC$ and $EN \perp AB$.

Proof: Area of $\Delta ADE = \left(\frac{1}{2} \text{ base} \times \text{height}\right)$.

So, $ar(\Delta ADE) = \frac{1}{2}(AD \times EN)$

and $ar(\Delta BDE) = \frac{1}{2}(DB \times EN)$

Similarly, $ar(\Delta ADE) = \frac{1}{2}(AE \times DM)$

and $ar(\Delta DEC) = \frac{1}{2}(EC \times DM)$

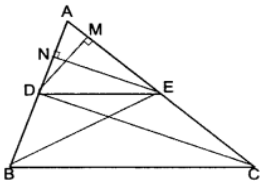


Fig. 7.45

Therefore, $\frac{ar(\Delta ADE)}{ar(\Delta BDE)} = \frac{\frac{1}{2} AD \times EN}{\frac{1}{2} DB \times EN} = \frac{AD}{DB}$ ...(i)

and $\frac{ar(\Delta ADE)}{ar(\Delta DEC)} = \frac{\frac{1}{2} AE \times DM}{\frac{1}{2} EC \times DM} = \frac{AE}{EC}$ ...(ii)

Now, ΔBDE and ΔDEC are on the same base DE and between the same parallel lines BC and DE.

So, $ar(\Delta BDE) = ar(\Delta DEC)$ ...(iii)

Therefore, from (i), (ii) and (iii) we have, $\frac{AD}{DB} = \frac{AE}{EC}$

Second Part

As $DE \| BC$

$\therefore \quad \frac{AD}{DB} = \frac{AE}{EC} \Rightarrow \frac{AD}{DB} + 1 = \frac{AE}{EC} + 1$

$\Rightarrow \quad \frac{AD + DB}{DB} = \frac{AE + EC}{EC} \Rightarrow \frac{AB}{DB} = \frac{AC}{EC}$

$\Rightarrow$ AB = AC (As DB = EC)

$\therefore \Delta ABC$ is an isosceles triangle.

2. In Fig., ABCD is a trapezium with AB || DC. If ΔAED is similar to ΔBEC, prove that AD = BC.

Solution:

In ΔEDC and ΔEBA we have

$\angle 1 = \angle 2$ [Alternate angles]

$\angle 3 = \angle 4$ [Alternate angles]

$\angle CED = \angle AEB$ [Vertically opposite angles]

$\therefore \Delta EDC \sim \Delta EBA$ [By AA criterion of similarity]

$\Rightarrow \quad \frac{ED}{EB} = \frac{EC}{EA} \Rightarrow \frac{ED}{EC} = \frac{EB}{EA}$ ...(i)

It is given that $\Delta AED \sim \Delta BEC$

$\therefore \quad \frac{ED}{EC} = \frac{EA}{EB} = \frac{AD}{BC}$ ...(ii)

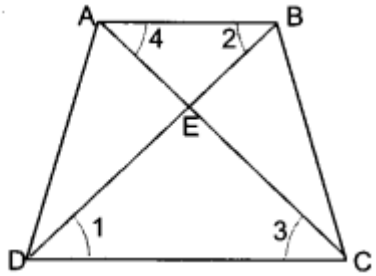


Fig. 7.37

From (i) and (ii), we get

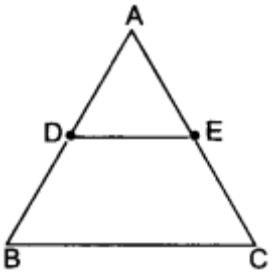
$\frac{EB}{EA} = \frac{EA}{EB} \Rightarrow (EB)^2 = (EA)^2 \Rightarrow EB = EA$

Substituting $EB = EA$ in (ii), we get

$\frac{EA}{EA} = \frac{AD}{BC} \Rightarrow \frac{AD}{BC} = 1 \Rightarrow AD = BC$

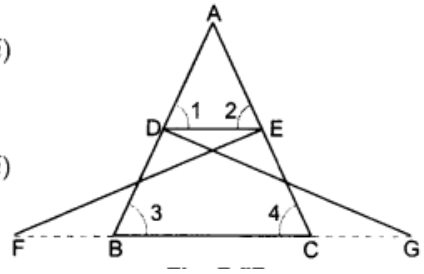
3. State BPT. Using Basic Proportionality Theorem, prove that a line drawn through the mid-point of one side of a triangle parallel to another side bisects the third side.
Solution:

Statement: 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.



Given: A ΔABC in which D is the mid-point of AB and DE is drawn parallel to BC, which meets AC at E.
To prove: AE = EC
Proof: In ΔABC, DE || BC
∴ By Basic Proportionality Theorem, we have
AD/DB = AE/EC …(i)
Now, since D is the mid-point of AB
⇒ AD = BD …(ii)
From (i) and (ii), we have
AD/DB = AE/EC
⇒ 1 = AE/EC
Hence, E is the mid-point of AC.

4. In Fig., ΔFEC ≅ΔGDB and ∠1 = ∠2. Prove that ΔADE ~ ΔABC.
Solution:
Since ΔFEC ≅ΔGDB



$\Rightarrow \quad EC = BD \quad ...(i)$

It is given that

$\angle 1 = \angle 2$

$\Rightarrow \quad AE = AD$ [Sides opposite to equal angles are equal] ...(ii)

From (*i*) and (*ii*), we have

$$\frac{AE}{EC} = \frac{AD}{BD}$$

$\Rightarrow \quad DE \,||\, BC$ [By the converse of basic proportionality theorem]

$\Rightarrow \quad \angle 1 = \angle 3$ and $\angle 2 = \angle 4$ [Corresponding angles]

Thus, in Δ' s *ADE* and *ABC*, we have

$\angle A = \angle A$ [Common]

$\angle 1 = \angle 3$

$\angle 2 = \angle 4$ [Proved above]

So, by *AAA* criterion of similarity, we have

$\Delta ADE \sim \Delta ABC$

COORDINATE GEOMETRY (CHAPTER - 7)

IMPORTANT CONCEPTS & FORMULAS :

Basic points to remember:

- The distance of a point from the y-axis is called its x-coordinate, or abscissa.
- The distance of a point from the x-axis is called its y-coordinate, or ordinate.
- The coordinates of a point on the x-axis are of the form (x, 0).
- The coordinates of a point on the y-axis are of the form (0, y).
- The coordinates of a point are of the form (+ , +) in the first quadrant, (–, +) in the second quadrant, (–, –) in the third quadrant, and (+, –) in the fourth quadrant, where + denotes a positive real number and – denotes a negative real number.

Formulae in this chapter:

❖***Distance Formula:*** The distance between any two points P(x_1 , y_1), and Q(x_2 , y_2) is given by:

PQ = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

- ***Distance of a point from origin:*** The distance of a point P(x, y) from origin O is given by:

OP = $\sqrt{(x^2 + y^2)}$

❖***Section formula :*** The coordinates of the point P(x, y) which divides the line segment joining the points A(x_1 , y_1), and B(x_2 , y_2) internally, in the ratio $m_1 : m_2$ are:

P(x , y) = $\left[\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right]$

- ***Midpoint formula:*** The coordinates of the point P(x, y) which is the midpoint of the line segment joining the points A(x_1 , y_1), and B(x_2 , y_2) are:

P(x , y) = $\left[\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right]$

PLEASE KEEP IN MIND

- To check whether the three points form an isosceles triangle or an equilateral triangle, find out the distance between all the three points and if the two sides or three sides are same, we can conclude the answer respectively.
- To check whether the three points A, B and C are collinear either show AB + BC = AC or you can prove it by calculating the area of a triangle formed by these three points is zero.
- To calculate the area of any quadrilateral, divide it into two triangles then find the area of individual triangle and add them.
- Please try to remember all the properties of quadrilaterals and triangles, for the questions which ask to check whether the points form any geometrical shape or not.

A. *Multiple Choice Questions:*

1. AOBC is a rectangle whose three vertices are A(0, 3), O(0, 0) and B(3, 0). The length of its diagonal is:

(a) 5 (c) $\sqrt{34}$

(b) 3 (d) 4

2. The perimeter of a triangle with vertices (0, 4), (0, 0) and (3, 0) is:

(a) 5 (c) 11

(b) 12 (d) 4

3. If the distance of the point (4,a) from x-axis is half its distance from y-axis, then a=

(a) 4 units (c) 2 units

(b) 8 units (d) 6 units

4. If the distance between the points (8,p) and (4,3) is 5 units, then value of p is

(a) 6 (c) both (a) and (b)

(b) 0 (d) none of these

5. If the origin is the mid-point of the line segment joined by the points (2,3) and (x,y), then the value of (x,y) is

(a) (2, 3) (c) $(-2,-3)$

(b) $(-2,3)$ (d) $(2,-3)$

6. If four vertices of a parallelogram taken in order are $(-3,-1)$, (a,b), $(3,3)$ and (4, 3), then a:b =

(a) 1:4 (c) 1:2

(b) 4:1 (d) 2:1

7. The point on x-axis equidistant from the points P(7, 6) and Q$(-3,4)$ is:

(a) $(-2,0)$ (c) (0, 4)

(b) (3, 0) (d) (0, 3)

8. The x- axis divides the join of P(2, -3) and Q(5, 6) in the ratio:

(a) 2 : 3 (c) 1 : 2

(b) 2 : 1 (d) 3 : 5

9. A line intersects the y-axis and x-axis at the points P and Q, respectively. If $(2,-5)$ is the mid-point of PQ, then the coordinates of P and Q are, respectively

(a) $(0,-5)$, (2, 0) (c) (0, 10), $(-4,0)$

(b) $(0,4)$, $(-10,0)$ (d) $(0,-10)$, $(4,0)$

10. If the points A(1, 2), O(0, 0) and C(a, b) are collinear, then:

(a) $a = b$ (c) $a = 2b$

(b) $2a = b$ (d) $a = -b$

B. Very Short Answer Type Question:

11. Find the coordinates of a point A, where AB is the diameter of a circle whose centre is O(2,3) and B $(1,-4)$.

12. The line joining the points $(2,-1)$ and $(5,-6)$ is bisected at P. If P lies on the line $2x + 4y + k = 0$, find the value of k.

13. The coordinates of A and B are (1,2) and (2,3) respectively. If P lies on AB, find the coordinates of P such that $\frac{AP}{PB} = \frac{4}{3}$.

14. State whether the following statement is true or false. Justify your answer: Point P$(5,-3)$ is one of the two points of trisection of the line segment joining the points A$(7,-2)$ and B$(1,-5)$.

15. If the joining the points A$(4,-5)$ and B(4,5) is divided by the point P such that $\frac{AP}{AB} = \frac{2}{5}$, find the coordinates of P.

C. Short Answer Type Question:

16. If (1,p/3) is the midpoint of the line segment joining the points (2, 0) and (0, 2/9), then show that the line 5x + 3y + 2 = 0 passes through the point (-1, 3p).

17. Three consecutive vertices of a parallelogram ABCD are A(1, 2), B(1, 0) and C(4, 0). Find the fourth vertex D..

18. Find the value of x for which the distance between (x, 7) and (-1, -5) is 13 units.

19. Find a point on the y-axis which is equidistant from the point A(6, 5) and B(-4, 3).

20. If the distance of P(x, y) from the points A(3, 6) and B(-3, 4) are equal.
Prove that 3x + y = 5.

D. Long Answer Type Questions:

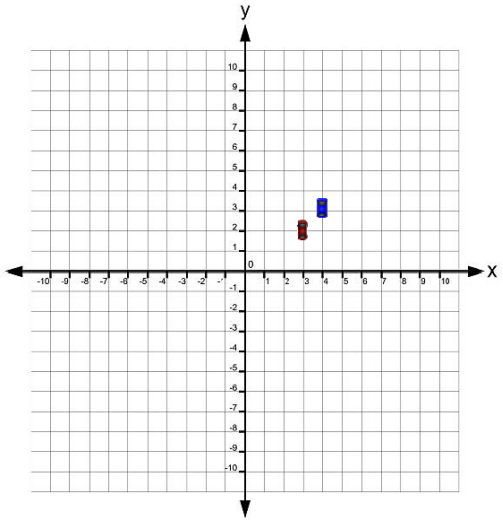
21. If (-3,2), (1, -2) and (5, 6) are the mid-points of the sides of a triangle, find the coordinates of the vertices of the triangle.

22. If coordinates of two adjacent vertices of a parallelogram are (3, 2), (1, 0) and diagonals bisect each other at (2, -5), find the coordinates of other two vertices.

23. If A(-2, 1), B(a, 0), C(4, b) and D(1, 2) are the vertices of a parallelogram ABCD, find the values of a and b. Hence find the lengths of its sides.

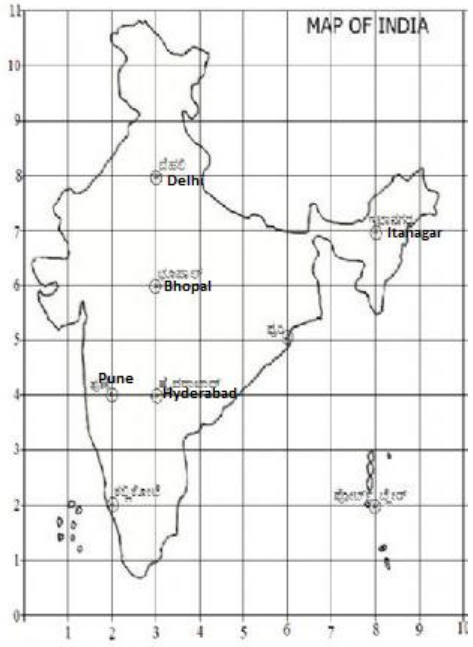
E. Case Study Questions:

24. A few cars are parked in the parking area. A red car is parked in the position of (3, 2), and a blue car is parked in the position of (4, 3).



I. What is the distance between red and blue cars?
II. What is the distance between Origin and the blue car?
III. If you want to park a yellow car exactly between the red car and the blue car then what should be the position of the yellow car?
IV. If you want to park a green car in such a way that the blue car is exactly between the red car and the green car. then what should be the position of the green car?

25. observe the map and answer the following question.



I. What is the distance between Delhi and Itanagar?

II. What should be the coordinates of the points exactly half-way between Hyderabad and Itanagar?

III. What should be the coordinates of the points on the same line as Pune and Bhopal, where Bhopal stands exactly in the middle?

======XXX======

Answer Key

A. **1.** (c); $\sqrt{34}$

2. (b) ; 12

3. (c) ; 2 units

4. (c) ; both (a) and (b)

5. (c) ; $(-2, -3)$

6. (d) ; 2:1

7. (b); (3, 0)

8. (c) ; 1 : 2

9. (d) $(0, -10), (4,0)$

10. (b); $2a = b$

B. **11.** A = (3,10)

12. k = 7

13. P = (11/7, 18/7)

14. True

15. P = (4,-15/7)

C. **16.** Proof

17. D(4, 2)

18. x = 4 or -6

19. (0, 9)

20. Proof

D. **21.** (9, 2), (1, 10) and (-7, -6).

22. (1, -12) and (3, -10)

23. a = 1, b = 1. Length of the sides AB = BC = CD = DA = $\sqrt{10}$ units.

24. I. $\sqrt{2}$ units

II. 5 units

III. $(\frac{7}{2}, \frac{5}{2})$

IV. (5, 4)

25. I. $\sqrt{26}$ units

II. $(\frac{11}{2}, \frac{11}{2})$

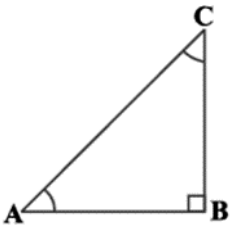
III. (4, 8)

CHAPTER:8
INTRODUCTION TO TRIGONOMETRY

Gist of the Topic	Learning Objectives	Learning Outcomes
Trigonometric Ratios	Describe trigonometry in order study the relationship between side and angle of a triangle	Determine all trigonometric ratios with respect to a given acute angle (of a right triangle) in order to use them in solving problems in daily life contexts like finding heights of different structures of distances or distances from them
	Define and distinguish various trigonometric ratios in order to describe and verify Sine, Cosine, Tangent, Cosecant, Secant, Cotangent of an angle	
	Use given trigonometric ratio(s) in order to find and verify other trigonometric ratios/angles of the triangle	

In this chapter, Learning Objectives in detail:

In a right triangle ABC, right-angled at B,



The trigonometric ratios of the angle A in right triangle ABC are defined as follows:

$$\text{Sine of } \angle A = \frac{\text{side opposite to angle A}}{\text{hypotenuse}} = \frac{BC}{AC}$$

$$\text{Cosine of } \angle A = \frac{\text{side adjacent to angle A}}{\text{hypotenuse}} = \frac{AB}{AC}$$

$$\text{tangent of } \angle A = \frac{\text{side opposite to angle A}}{\text{side adjacent to angle A}} = \frac{BC}{AB}$$

$$\text{cosecant of } \angle A = \frac{1}{\sin of \angle A} = \frac{\text{hypotenuse}}{\text{side opposite to angle A}} = \frac{AC}{BC}$$

$$\text{secant of } \angle A = \frac{1}{\cos of \angle A} = \frac{\text{hypotenuse}}{\text{side adjacent to angle A}} = \frac{AC}{AB}$$

$$\text{cotangent of } \angle A = \frac{1}{\text{tangent } of \angle A} = \frac{\text{side adjacent to angle A}}{\text{side opposite to angle A}} = \frac{AB}{BC}$$

The ratios defined above are abbreviated as sin A, cos A, tan A, cosec A, sec A and cot A respectively. Note that the ratios **cosec A, sec A and cot A** are respectively, the reciprocals of the ratios sin A, cos A and tan A.

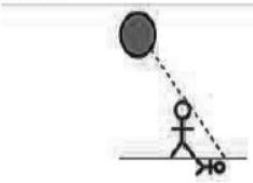
Also, observe that tan A= $\frac{BC}{AB}$ = $\frac{\frac{BC}{AC}}{\frac{AB}{AC}} = \frac{\sin A}{\cos A}$ and cot A = $\frac{\cos A}{\sin A}$

So, the **trigonometric ratios** of an acute angle in a right triangle express the relationship between the angle and the length of its sides

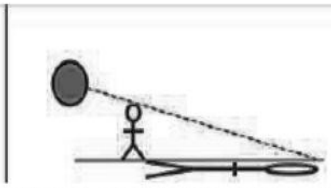
If one of the trigonometric ratios of an acute angle is known, the remaining trigonometric ratios of the angle can be easily determined.

From our observations, it is now clear that **the values of the trigonometric ratios of an angle do not vary with the lengths of the sides of the triangle, if the angle remains the same.**

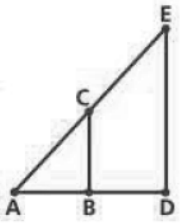
Activity: me and my shadow



When the sun is high, your shadow is short



When the sun is low, your shadow is long



Student Activity 1B

Measure the length of the shadow of some tall object e.g. flagpole or goalpost. Length of the shadow of a tall object which you cannot physically measure e.g. goalpost _____cm.

Student Activity 1C

Back in class – Measuring the angle of elevation of the sun

- Decide what scale to use.
- Draw an accurate diagram on graph paper.

Question-:

Measure the angle of elevation of the sun from Diagram 1 above using a protractor.

- Angle of elevation of the sun at _____ (time) on _____ (date) was _____.
- Check your answer with other students in the class.
- If you were to measure the angle of elevation of the sun at 10 a. m and another class measured the angle at 11 a.m. what would be the difference in the measurements?_____.

Student Activity 1D

Knowing the angle of elevation of the sun, measure the height of a tall object using the length of its shadow as previously measured.

- Decide what scale to use. Scale: _____
- Draw an accurate diagram on graph paper using the length of the shadow, the angle of elevation of the sun and forming right-angled triangle (ASA).

Question-:

Measure the height of the goalpost from Diagram 2 above and using the scale factor convert to its actual height.

- Check the answer with other students in the class.

Conclusion for part 2:

The height of the goalpost is _____cm approximately. Would you expect the same answer if you took the measurements at different times of the day? Explain your answer._____

_____

Assignment for Evaluation of Learning outcomes:

SECTION A

1.MCQs

i) 1) If $\sin\theta = \frac{5}{13}$ then cos θ =

a) $\frac{12}{13}$ b) $\frac{5}{13}$ c) $\frac{5}{12}$ d) $\frac{\sqrt{5}}{13}$

2) If tan θ = $\sqrt{3}$, the sec θ =

a) 2 b) $\frac{2}{\sqrt{3}}$ c) $\sqrt{\frac{3}{2}}$ d) $\frac{1}{\sqrt{3}}$

3) $\frac{1+\tan^2\theta}{\cos^2\theta}$ =

a) 1 b) $\frac{1}{\sin^2\theta - \cos^2\theta}$ c) $\sec^2\theta$ d) $\frac{1}{3}$

4) If 4 tan θ = 3, then $\frac{4\sin\theta - \cos\theta}{4\sin\theta + \cos\theta}$ is equal to

a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) $\frac{2}{3}$ d) $\frac{3}{4}$

5) If $\tan\theta = \frac{m}{n}$, then $\frac{m\sin\theta - n\cos\theta}{m\sin\theta + n\cos\theta}$ =

a) $\frac{m^2 - n^2}{m^2 + n^2}$ b) $\frac{n^2 - m^2}{n^2 + m^2}$ c) $\frac{m^2 + n^2}{m^2 - n^2}$ d) 1

6) If cot θ = $\frac{7}{8}$, then the value of $\frac{(1+\sin\theta)(1-\sin\theta)}{(1+\cos\theta)(1-\cos\theta)}$ is

a) $\frac{49}{64}$ b) $\frac{64}{49}$ c) $\frac{7}{8}$ d) $\frac{8}{7}$

7) In right triangle ABC, right angled at C, if tan A = 1, then the value of 2 sin A cos A is

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

8) In ΔABC, if ∠B = 90° and cot A = 1, then the value of cos C sin A – cos A sin C is

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

9) If $\cot A + \frac{1}{\cot A} = 2$ then $\cot^2 A + \frac{1}{\cot^2 A}$ =

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

10) If $\sin A = \frac{12}{13}$, then tan A =

a) $\frac{12}{5}$ b) $\frac{13}{5}$ c) $\frac{5}{12}$ d) $\frac{13}{12}$

SECTION B

Very short answer Questions:

11) If tan θ = $\frac{20}{21}$, then find the value of $\frac{\cos\theta - \sin\theta}{\cos\theta + \sin\theta}$

12) If 5 tan α = 4, then find the value of $\frac{5\sin\alpha - 3\cos\alpha}{5\sin\alpha + 2\cos\alpha}$

13) If tan θ = $\frac{a}{b}$, then find the value of $\frac{\cos\theta + \sin\theta}{\cos\theta - \sin\theta} =$

14) If tan θ = $\frac{20}{21}$, then find the value of $\frac{1 - \sin\theta + \cos\theta}{1 + \cos\theta + \sin\theta} =$

15) Find the maximum value of $\frac{1}{\sec\theta}$

SECTION C

Short Answer Questions:

16.If ∠ ∠A and ∠ ∠B are acute angles such that cos A = cos B, then show that ∠ ∠A = ∠B.

17.Given 15 cot A = 8, find sin A and sec A.

18. If 3 cot A = 4, check whether $\frac{1-\tan^2 A}{1+\tan^2 A} =$ = $\cos^2$ A- $\sin^2$A or not.

19. In triangle ABC, right-angled at B, if tan A = $\frac{1}{\sqrt{3}}$, find the value of

(i) sin A cos C + cos A sin C

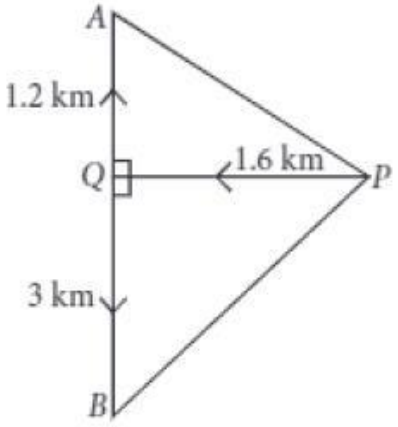
(ii) cos A cos C – sin A sin C

20. If cosec $\theta = \frac{13}{12}$ then evaluate $\frac{2\sin\theta - 3\cos\theta}{4\sin\theta - 9\cos\theta}$

SECTION D

Case study based question -1

Two aeroplanes leave an airport, one after the other. After moving on runway, one flies due North and other flies due South. The speed of two aeroplanes is 400 km/hr and 500 km/hr respectively. Considering PQ as runway and A and B are any two points in the path followed by two planes, then answer the following questions.



1. If $\angle APQ = \theta$ tanθ=

a) $\frac{1}{2}$ b) $\frac{1}{\sqrt{2}}$ c) $\frac{\sqrt{3}}{2}$ d) $\frac{3}{4}$

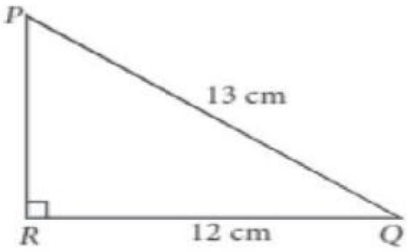
2. The value of cosec B in this figure is

a) $\frac{17}{8}$ b) $\frac{12}{5}$ c) $\frac{5}{12}$ d) $\frac{8}{17}$

3.Find the value of $\sec^2 A + \tan^2 B$ in the given figure.

Case study based question -2

Anita, a student of class 10th, has to made a project on 'Introduction to Trigonometry. She decides to make a bird house which is triangular in shape. She uses cardboard to make the bird house as shown in the figure. Considering the front side of bird house as right angled triangle *PQR*, right angled at R, answer the following quest



1. if $\angle PQR = \theta$, then cosθ =

(a) $\frac{12}{13}$ (b) $\frac{12}{5}$ (c) $\frac{5}{12}$ (d) $\frac{13}{12}$

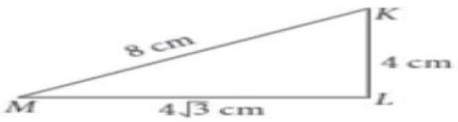
2. The value of secθ

(a) $\frac{12}{13}$ (b) $\frac{12}{5}$ (c) $\frac{5}{12}$ (d) $\frac{13}{12}$

3. Find the value of tan P + Cot P

Case study-based question -3

Ritu's daughter is feeling so hungry and so thought to eat something. She looked into the fridge and found some bread pieces. She decided to make a sandwich. She cut the piece of bread diagonally and found that it forms a right angled triangle, with sides 4 cm, 4√3 cm and 8 cm. On the basis of above information, answer the following questions



1. The value of $\angle M$

(a) 30^0 (b) 60^0 (c) 45^0 (d) none of these

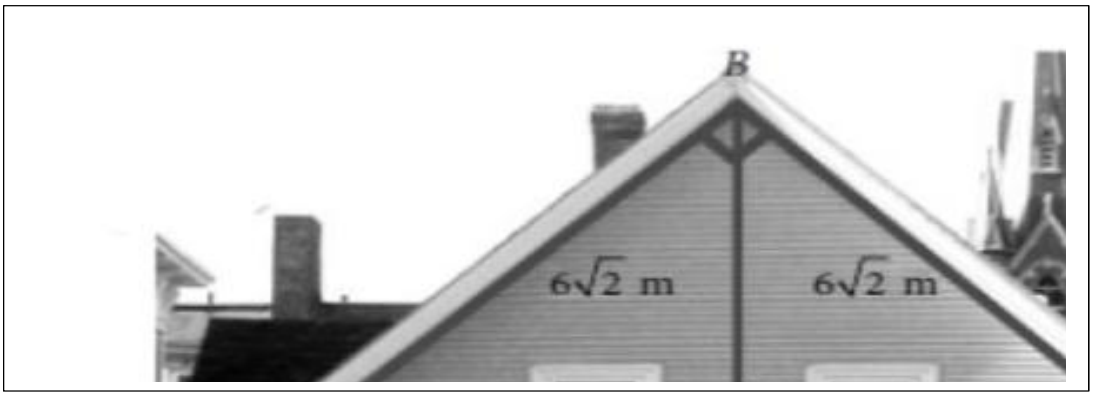
2. The value of $\angle K$

(a) 30^0 (b) 60^0 (c) 45^0 (d) none of these

3.Find the value of $\frac{tan^2 45°-1}{tan^2 45°+1}$

Case study-based question -4

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



1. If D is the mid point of AC, then BD =

(a) 2m (b) $3m$ (c) 4m (d) 6m

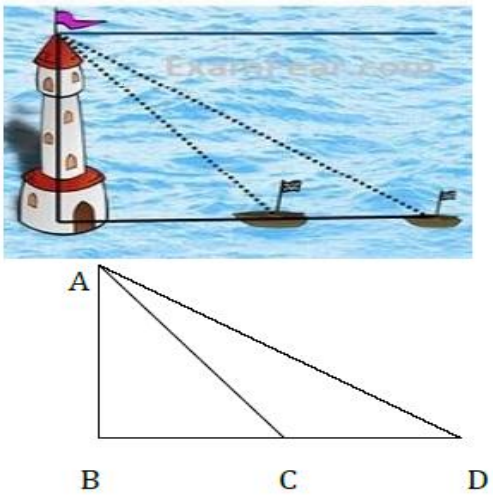
2. The value of $\angle A$

(a) 30^0 (b) 60^0 (c) 45^0 (d) none of these

3. Find the value of $\tan^2 C + \tan^2 A$

Case study-based question -5

As observed from the top of a 60 m high light house from the sea level, the angles of depression of two ships are 28° and 45° . one ship is exactly behind the other on the same side of the lighthouse. (tan 28° =0.5317)



1. The distance between the two ships

a)112.85m b) 85.02m c)52.85m d) 52m

2.The distance between the foot of the light house and the first ship is

a) 60m b) 112.85m c) 52.85m d) 45m

3.Find the distance from the top of the light house and the first ship?

CHAPTER : 9 HEIGHTS AND DISTANCES

1) INTRODUCTION (Gist of the Topic)

The topic heights and distance is one of the applications of Trigonometry, which is extensively used in real-life. The words height and distance are frequently used in the trigonometry while dealing with its applications. In the height and distances application of trigonometry, the following concepts are included:

- Measuring the heights of towers or big mountains
- Determining the distance of the shore from the sea
- Finding the distance between two celestial bodies

It should be noted that finding the height of bodies and distances between two objects is one of the most important applications of trigonometry.

Important Definitions:-

- **1) Line of Sight –** The line which is drawn from the eyes of the observer to the point being viewed on the object is known as the line of sight.

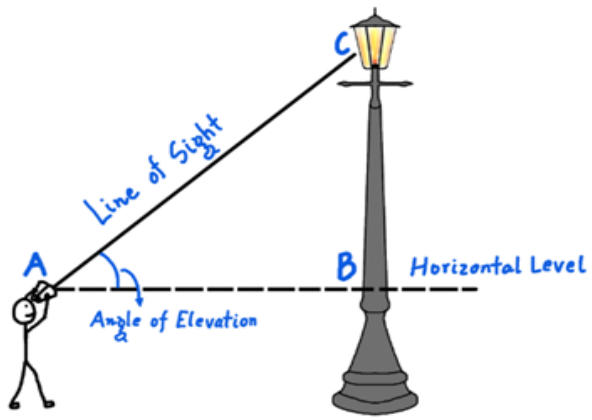


Figure 1: Angle of Elevation: A boy looking at the lamp

- **2) Angle of Elevation –** The angle of elevation of the point on the object (above horizontal level) viewed by the observer is the angle which is formed by the line of sight with the horizontal level.
- **3) Angle of Depression –** The angle of depression of the point on the object (below horizontal level) viewed by the observer is the angle which is formed by the line of sight with the horizontal level

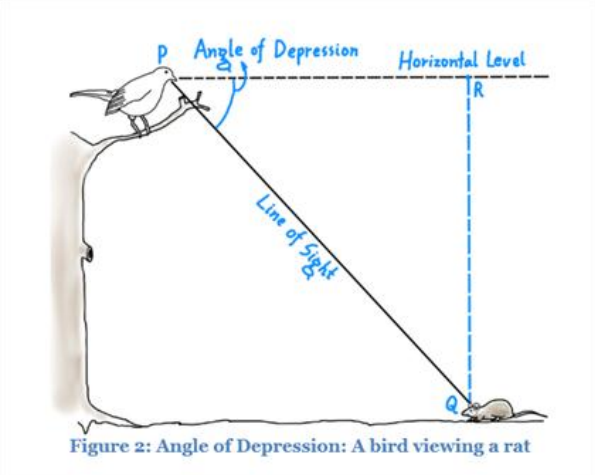
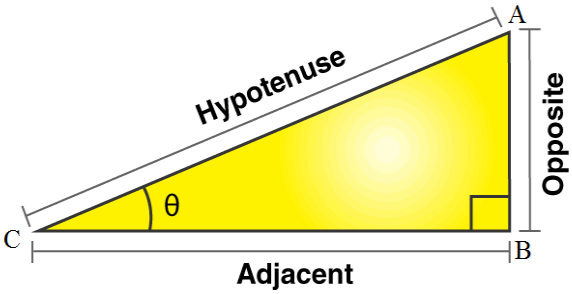


Figure 2: Angle of Depression: A bird viewing a rat

2) IMPORTANT FORMULAE:-

- Any two of the three parameters (Height, Distance of an object from the foot , Angle of elevation or the angle of depression) will be provided in the question. This type of problems can be solved using the formulas given below:-

In right triangle ABC,



$\sin \theta$ = Opposite/Hypotenuse = AB/AC

$\cos \theta$ = Adjacent/Hypotenuse = BC/AC

$\tan \theta$ = Opposite/Adjacent = AB/BC

3) MULTIPLE CHOICE QUESTIONS

Q1. If the length of the shadow of a tree is decreasing then the angle of elevation is:

(a) Increasing
(b) Decreasing
(c) Remains the same
(d) None of the above

Q2. The angle of elevation of the top of a building from a point on the ground, which is 30 m away from the foot of the building, is 30°. The height of the building is:

(a) 10 m
(b) $30/\sqrt{3}$m

(c) $\sqrt{3}$/10 m

(d) 30 m

Q3. If the height of the building and distance from the building foot's to a point is increased by 20%, then the angle of elevation on the top of the building:

(a) Increases

(b) Decreases

(c) Do not change

(d) None of the above

Q4. If a tower 6m high casts a shadow of $2\sqrt{3}$ m long on the ground, then the sun's elevation is:

(a) 60°

(b) 45°

(c) 30°

(d) 90°

Q5. The angle of elevation of the top of a building 30 m high from the foot of another building in the same plane is 60°, and also the angle of elevation of the top of the second tower from the foot of the first tower is 30°, then the distance between the two buildings is:

(a) $10\sqrt{3}$ m

(b) $15\sqrt{3}$ m

(c) $12\sqrt{3}$ m

(d) 36 m

Q6. The angle formed by the line of sight with the horizontal when the point is below the horizontal level is called:

(a) Angle of elevation

(b) Angle of depression

(c) No such angle is formed

(d) None of the above

Q7. The angle formed by the line of sight with the horizontal when the point being viewed is above the horizontal level is called:

(a) Angle of elevation
(b) Angle of depression
(c) No such angle is formed
(d) None of the above

Q8. From a point on the ground, which is 15 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 60°. The height of the tower (in m) standing straight is:

(a) $15\sqrt{3}$
(b) $10\sqrt{3}$
(c) $12\sqrt{3}$
(d) $20\sqrt{3}$

Q9. The line drawn from the eye of an observer to the point in the object viewed by the observer is said to be

(a) Angle of elevation
(b) Angle of depression
(c) Line of sight
(d) None of the above

Q10. When the shadow of a pole H m high is $\sqrt{3}$ H m long, the angle of elevation of the Sun is

(a) 30°
(b) 60°
(c) 45°
(d) 15°

VERY SHORT ANSWER (2 Marks)

Q1. The height of a tower is 10 m. What is the length of its shadow when Sun's altitude is 45° ?

Q2. If the ratio of the height of a angle tower and the length of 7 its shadow is $\sqrt{3}$: 1, what is the of elevation of the Sun ?

Q3. What is the angle of elevation of the Sun when the length of the shadow of a vertical pole is equal to its height ?

Q4. From a point on the ground, 20 m away from the foot of a vertical tower, the angle of elevation of the top of the tower is 60°, what is the height of the tower ?

Q5. The angle of elevation of the top of a tower at a point on the ground is 30°. What will be the angle of elevation, if the height of the tower is tripled?

SHORT ANSWER QUESTIONS (3 Marks)

Q1. A tree breaks due to a storm and the broken part bends so that the top of the tree touches the ground making an angle of 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 original height of the tree.

Q2. An observer 1.5 m tall is 20.5 m away from a tower 22 m high. Determine the angle of elevation of the top of the tower from the eye of the observer.

Q3. The angle of elevation of the top of a tower from two points distant s and t from its foot are complementary. Prove that the height of the tower is $\sqrt{s}$ t.

Q4. A circus artist is climbing a 20 m long rope, which is tightly stretched and tied from the top of a vertical pole to the ground. Find the height of the pole, if the angle made by the rope with the ground level is 30°.

Q5. The angle of elevation of the top of a hill at the foot of a tower is 60° and the angle of elevation of the top of the tower from the foot of the hill is 30°. If the tower is 50 m high, what is the height of the hill ?

CASE STUDY QUESTIONS (4 Marks)

CASE STUDY-1

A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Rajpath (formerly called the Kingsway), is about 138 feet (42 m) in height.

Q1. What is the angle of elevation if they are standing at a distance of 42m away from the monument?

a) 30^o
b) 45^o
c) 60^o
d) 90^o
Answer: b) 45^o

Q2.They want to see the tower at an angle of 60^o. So, they want to know the distance where they should stand and hence find the distance.

a) 25.24 m

b) 20.12 m

c) 42 m

d) 24.64 m

Answer: a) 25.24 m

Q3. If the altitude of the Sun is at 60^o, then the height of the vertical tower that will cast a shadow of length 20 m is

a) $20\sqrt{3}$ m

b) $20/\sqrt{3}$ m

c) $15/\sqrt{3}$ m

d) $15\sqrt{3}$ m

Answer: a) $20\sqrt{3}$ m

Q4. The ratio of the length of a rod and its shadow is 1:1. The angle of elevation of the Sun is

a) 30^o

b) 45^o

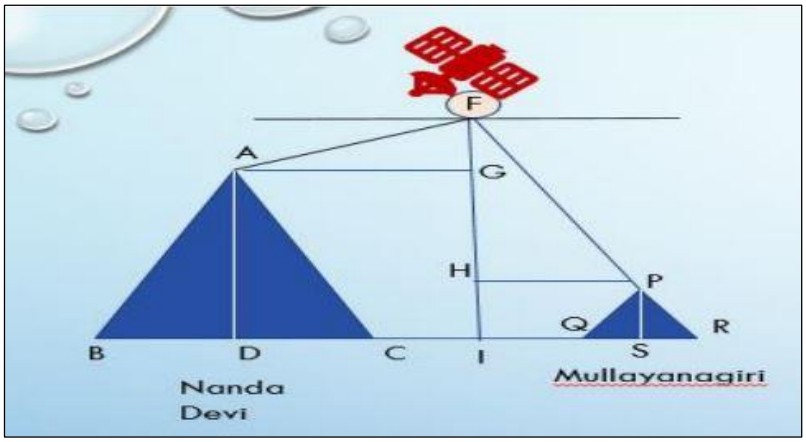
c) 60^o

d) 90^o

Answer: b) 45^o

CASE STUDY-2

A Satellite flying at height h is watching the top of the two tallest mountains in Uttarakhand and Karnataka, them being Nanda Devi(height 7,816m) and Mullayanagiri (height 1,930 m). The angles of depression from the satellite, to the top of Nanda Devi and Mullayanagiri are 30° and 60° respectively. If the distance between the peaks of the two mountains is 1937 km, and the satellite is vertically above the midpoint of the distance between the two mountains.



Q1) The distance of the satellite from the top of Nanda Devi is

a) 1139.4 km
b) 577.52 km
c) 1937 km
d) 1025.36 km
Answer: a) 1139.4 km

Q2) The distance of the satellite from the top of Mullayanagiri is

a) 1139.4 km
b) 577.52 km
c) 1937 km
d) 1025.36 km
Answer: c) 1937 km

Q3) The distance of the satellite from the ground is

a) 1139.4 km

b) 577.52 km

c) 1937 km

d) 1025.36 km

Answer: b) 577.52 km

Q4) What is the angle of elevation if a man is standing at a distance of 7816m from Nanda Devi?

a) 30^o
b) 45^o
c) 60^o
d) 0^o
Answer: b) 45^o

LONG ANSWER QUESTIONS (5 Marks)

Q1.**Two ships are there in the sea on either side of a light house in such a way that the ships and the light house are in the same straight line. The angles of depression of two ships as observed from the top of the light house are 60° and 45°. If the height of the light house is 200 m, find the distance between the two ships. [Use $\sqrt{3}$ = 1.73]**

Answer – 315.33 m

Q2. **Two poles of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point between them on the road, the angles of elevation of the top of the poles are 60° and 30°, respectively. Find the height of the poles and the distances of the point from the poles.**

Answer – The height of the poles are $20\sqrt{3}$ m and the distance from the point of elevation are 20 m and 60 m respectively.

Q3. A vertical tower stands on a horizontal plane and is surmounted by a vertical flag-staff. At a point on the plane 70 m away from the tower, an observer notices that the angles of elevation of the top and the bottom of the flagstaff are respectively 60° and 45°. Find the height of the flag-staff and that of the tower.

Answer – The height of flag staff is 51.24 m and height of tower is 70 m.

CHAPTER 10: CIRCLES

1. A circle touches x-axis at A and y-axis at B. If O is origin and OA = 5 units, then diameter of the circle is 1

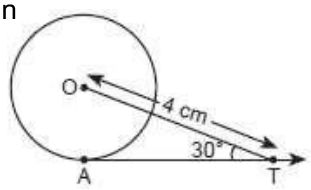
   (a) 8 units (b) 10 units (c) 10 $\sqrt{2}$ units (d) 8 $\sqrt{2}$ units

2. From a point P which is at a distance of 13 cm from the centre O of a circle of radius 5 cm, the pair of tangents PQ and PR to the circle are drawn. Then the area of the quadrilateral PQOR is 1

   (a) 60 cm^2 (b) 65 cm^2 (c) 30 cm^2 (d) 32.5 cm^2

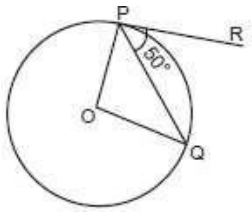
3. figure AT is a tangent to the circle with centre O such that OT = 4 cm and ∠OTA = 30°. Then AT is equal to 1
   (a) 4 cm (b) 2 cm (c) 2 3 cm (d) 4 3 cm

In



4. In figure if O is centre of a circle, PQ is a chord and the tangent PR at P makes an angle of 50° with PQ, then ∠POQ is equal to 1

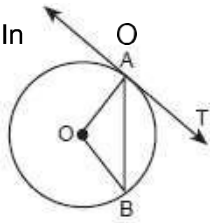
In



(a) 100° (b) 80° (c) 90° (d) 75°

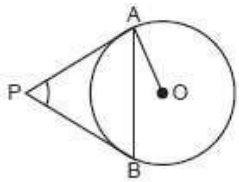
5. figure, is the centre of a circle, AB is a chord and AT is the tangent at A. If ∠AOB = 100°, then ∠BAT is equal to 1

In



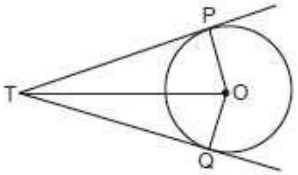
(a) 100° (b) 40° (c) 50° (d) 90°

6. In the figure PA and PB are tangents to the circle with centre O. If ∠APB = 60°, then ∠OAB is 1



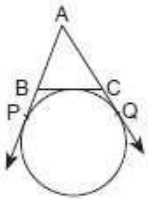
(a) 30° (b) 60° (c) 90° (d) 15°

7. In the given figure, and TQ are two tangents to a circle with centre O, such that ∠POQ = 110°. Then ∠PTQ is equal 1



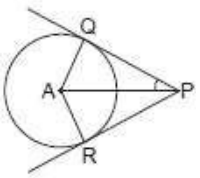
(a) 55° (b) 70° (c) 110° (d) 90°

8. In figure, AP, AQ and BC are tangents to the circle. If AB = 5 cm, AC = 6 cm and BC = 4 cm, then the length of AP (in cm) is 1



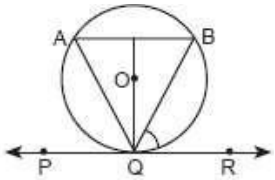
(a) 7.5 (b) 15 (c) 10 (d) 9

9. In figure, PQ and PR are tangents to a circle with centre A. If ∠QPA = 27°, then ∠QAR equals to 1



(a) 63° (b) 153° (c) 126° (d) 117°

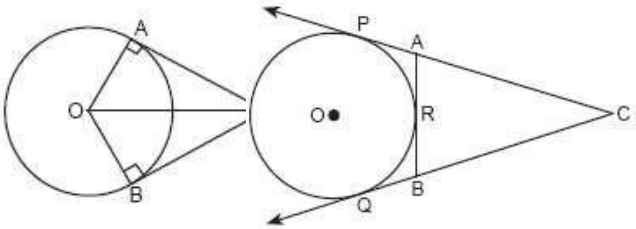
10. figure if PQR is the tangent to a circle at Q whose centre is O, AB is a chord parallel to PR and ∠BQR = 70°, then ∠AQB is equal to 1



(a) 20° (b) 40° (c) 35° (d) 45°

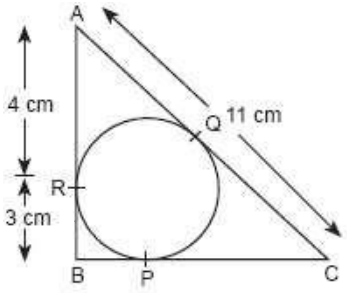
2 MARK QUESTIONS

1. In figure if ∠ATO = 40°, find ∠AOB. 2

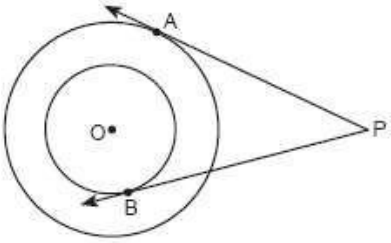


2. In figure, CP and CQ are tangents to a circle with centre O. ARB is another tangent touching the circle at R. If CP = 11 cm, and BC = 7 cm, then find the length of BR. 2

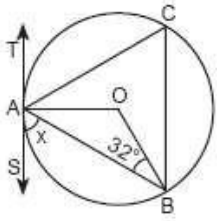
3. In figure, ΔABC is circumscribing a circle. Find the length of BC. 2



4. In figure, there are two concentric circles, with centre O and of radii 5 cm and 3 cm. From an external point P, tangents PA and PB are drawn to these circles. If AP = 12 cm, find the length of BP. 2



5. In the given figure, TAS is a tangent to the circle, with centre O, at the point A. If $\angle OBA = 32°$, find the value of *x*. 2

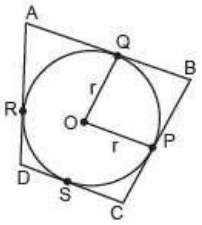


3 MARK QUESTIONS

1. ABC is an isosceles triangle, in which AB = AC, circumscribed about a circle. Show that BC is bisected at the point of contact. 3

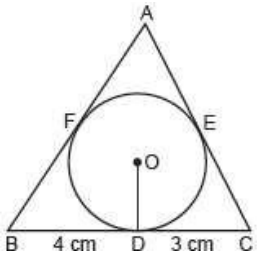
2. 3

In the figure, a circle is inscribed in a quadrilateral ABCD in which $\angle B = 90°$. If AD = 23 cm, AB = 29 cm and DS = 5 cm, find the radius (*r*) of the circle.



3. 3

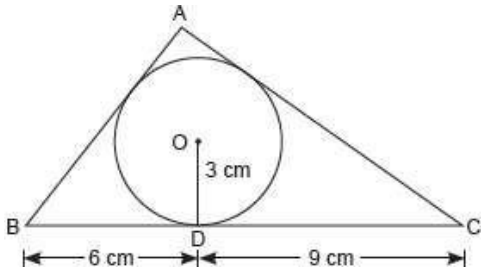
In figure, a triangle ABC is drawn to circumscribe a circle of radius 2 cm such that the segments BD and DC into which BC is divided by the point of contact D are the lengths 4 cm and 3 cm respectively. If area of $\Delta ABC = 21\ cm^2$, then find the lengths of sides AB and AC.



-

4. Prove that the intercept of a tangent between two parallel tangents to a circle subtends a right angle at the centre. 3

5. In figure, a triangle ABC is drawn to circumscribe a circle of radius 3 cm, such that the segments BD and DC are respectively of lengths 6 cm and 9 cm. If the area of ΔABC is 54 cm^2, then find the lengths of sides AB and AC. 3

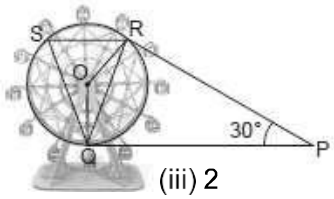


CASE STUDY

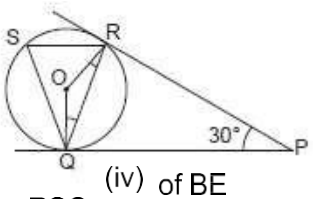
-

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. 4

   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. [CBSE Question Bank]



(iii) 2



(iv) of BE

∠RSQ

In the given figure find ∠ROQ

(i) 60 (ii) 100 (iii) 150

(b) Find ∠RQP

(i) 75 (ii) 60 (iii) 30

(c) Find ∠RSQ

(i) 60 (ii) 75 (iii) 100 (iv) 30

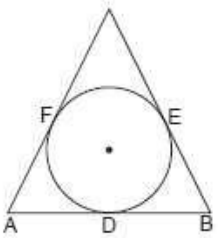
(d) Find ∠ORP

(i) 90 (ii) 70 (iii) (iv) 60

4

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. [CBSE Question Bank] -



a) find the length of AD
i) 7 ii) 8 iii) 5 iv) 9

b) Find the length of BE
i) 8 ii) 5 iii) 2 iv) 9

c) Find the length of CF

(i) 9 (ii) 5 (iii) 2 (iv) 3

(d) If radius of the circle is 4 cm, Find the area of ΔOAB

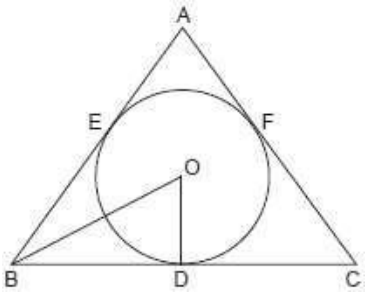
(i) 20 (ii) 36 (iii) 24 (iv) 48

(e) Find area of ΔABC

(i) 50 (ii) 60 (iii) 100 (iv) 90

5 MARK QUESTIONS

1. A circular region is inscribed in a triangular boundary as shown in figure. - 5



Each boundary of triangular part is act as tangent to the circle, where O is centre of circle and OD ⊥ BC.

Answer the questions based on above

(a) What will be the radius of the circle, if BD = 24 cm and OB = 25 cm?

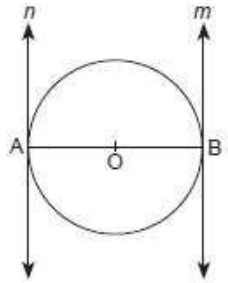
(b) Determine CD, if OC = 26 cm.

(c) As AB and AC act as tangents to the circle at E and F and AE = 8 cm, then what is the perimeter of ΔABC.

(d) Determine area of ΔBOC.

(e) What is the area of ΔABC?

2. A circle can have at most two parallel tangents, one at a point on it and the other at a point diametrically opposite to it. Here AB is diameter of a circle and tangent n and tangent m are parallel to each other. Answer the questions based on above. 5

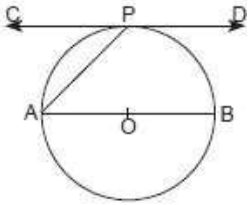


(a) What is the distance between two parallel tangents of a circle of radius 6 cm.

(b) Two parallel tangents touches the circle at points A and B. Find the distance between parallel tangents if area of circle is 25 π cm^2.

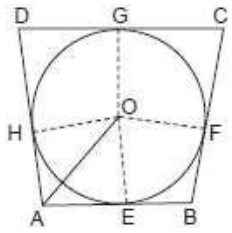
(c) What is the maximum number of parallel tangents a circle can have?

(d) CD is tangent to circle at P. If ∠PAB = 30°. Determine ∠CPA, where O is centre of circle.



(e) How many tangents can be drawn to a circle from a point lying inside the circle?

3. A welfare society of birds constructed a circular tank to serve as a bird bath as shown in figure 5



Here ABCD is a quadrilateral sides AB, BC, CD, DA act as tangents to circle at E, F, G and H. Here AB = 5 m, CD = 6 m and BC = 7 m

Answer the questions based on above.

(a) Distance BC =

(i) 11 m (ii) 4 m (iii) 7 m (iv) 6 m

(b) If O is centre of tank and AH and AE inclined to each other at angle 100°, then ∠HOE =

(i) 80° (ii) 100° (iii) 40° (iv) 140°

(c) If ∠GOF = (3x – 8)° and ∠GCF = (2x + 3)° then x =

(i) 80° (ii) 100° (iii) 37° (iv) 73°

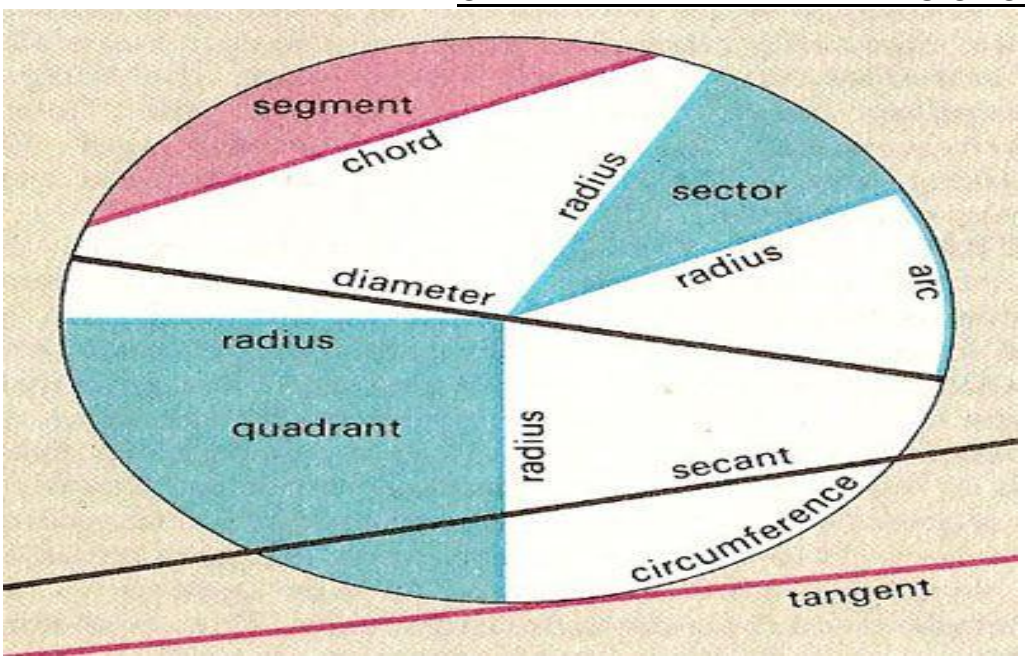
(d) DOHA is an a

(i) right angled triangle (ii) equilateral triangle (iii) both (i) and (ii) (iv) None of these

(e) ∠HAO =

(i) ∠HOE (ii) ∠AEO (iii) ∠AEB (iv) ∠OAE

CHAPTER 12: AREA RELATED TO CIRCLES



- CIRCLE- A circle is a two-dimensional figure. It is a curved-shape that has all its points at an equal distance from the center.
- Area of a Circle

Area of a circle is πr^2 , where $\pi == \frac{22}{7}$ or ≈ 3.14
r is the radius of the circle
π is the ratio of the circumference of a circle to its diameter

Example: Find the area of a circle with radius = 7cm.
Solution: Given, radius of circle = 7cm
By the formula we know;
Area of circle = πr^2
= $\pi(7)^2$
= $\frac{22}{7}$ X 7 = 154 sq.cm.

- Circumference of a Circle

The circumference of a circle is the distance covered by going around its boundary once.
Circumference of a circle = 2πr
Example: The circumference of a circle whose radius is 21cm, is given by;
C = 2πr
= 2 X $\frac{22}{7}$ X (21) = 132 cm

- Segment of a Circle

A circular segment is a region of a circle that is “cut off” from the rest of the circle by a secant or a chord.

- Sector of a Circle

A circle sector/ sector of a circle is defined as the region of a circle enclosed by an arc and two radii. The smaller area is called the minor sector and the larger area is called the major sector.

- Angle of a Sector

The angle of a sector is the angle that is enclosed between the two radii of the sector.

Area of a sector = $= \frac{\theta}{360^\circ} \times \pi r^2$

- Length of an arc of a sector

The length of the arc of a sector can be found by using the expression for the circumference of a circle and the angle of the sector, using the following formula:

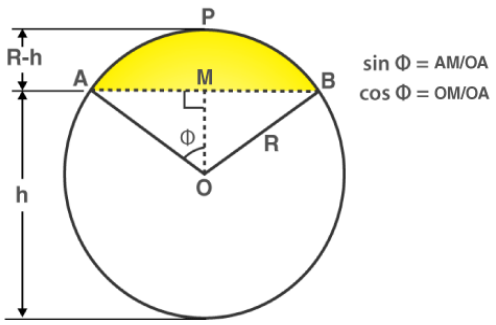
- $L = \frac{\theta}{360^\circ} \times 2\pi r$

- Area of a Triangle

The Area of a triangle is $= \frac{1}{2} \times$ base $\times$ height

If the triangle is an equilateral then Area $= (\sqrt{3}/4) \times a^2$ where “a” is the side length of the triangle

- Area of a Segment of a Circle



- Area of segment APB (highlighted in yellow)

  = (Area of sector OAPB) – (Area of triangle AOB)

  $= [\frac{\theta}{360^\circ} X \pi r^2] - [\frac{1}{2} \times AB \times OM]$

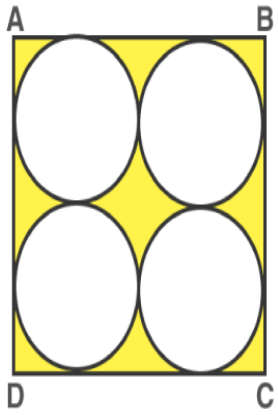
Formulas List

All these formulas are tabulated as given below for quick revision.

Parameters of Circles	**Formulas**
Area of the sector of angle θ	$\frac{\theta}{360^\circ} \times \pi r^2$
Length of an arc of a sector of angle θ	$\frac{\theta}{360^\circ} \times 2\pi r$
Area of major sector	$\pi r^2 - \frac{\theta}{360^\circ} \times \pi r^2$
Area of a segment of a circle	Area of the corresponding sector – Area of the corresponding triangle
Area of the major segment	πr^2 – Area of segment (minor segment)

Areas of Combination of Plane figures

For example: Find the area of the shaded part in the following figure: Given the ABCD is a square of side 28 cm and has four equal circles enclosed within.



Area of the shaded region

Looking at the figure we can visualize that the required shaded area = Area of square (ABCD) − 4 × Area of Circle

Also, the diameter of each circle is 14 cm.

$=(l^2)-4\times(\pi r^2)$

$=(28^2)-[4\times(\pi\times49)]$

$=784-[4\times22/7\times49]$

$=784-616$

$=168\ cm^2$

(MCQ) 1 M

1.The area of a circle is 49 π cm^2. Its circumference is

(a) 7π cm (b) 14π cm (c) 21π cm (d) 28π cm

2.The perimeter of circular field is 242 cm. The area of the field is

(a) 9317 cm^2 (b) 18634 cm^2 (c) 4658.5 cm^2 (d) none of these

3.The circumference of two circles are in the ratio 2 : 3. The ratio of their areas is

(a) 2 : 3 (b) 4 : 9 (c) 9 : 4 (d) none of these

4.On increasing the diameter of circle by 40%, its area will be increased by

(b) 40% (b) 80% (c) 96% (d) none of these

5.The areas of the two circle are in the ratio 4 : 9. The ratio of their circumference is

(a) 2 : 3 (b) 4 : 9 (c) 9 : 16 (d) 4 : 9

6.The radius of wheel is 0.25 m. How many revolutions will it make in covering 11 km?

(a) 2800 (b) 4000 (c) 5500 (d) 7000

7.A steel wire when bent in the form of a square, encloses an area of 121 sq. cm. The same

wire is bent in the form of a circle. Find the area of the circle.
(a) 111 cm^2 (b) 184 cm^2 (c) 154 cm^2 (d) 259 cm^2

8.A bicycle wheel makes 5000 revolutions in moving 11 km. Find the diameter of the wheel.
(a) 60 cm (b) 70 cm (c) 66 cm (d) 68 cm

9.The diameter of the wheels of a bus is 140 cm. How many revolutions per minute must a wheelmake in order to move a t a speed of 66km/hr?
(a) 240 (b) 250 (c) 260 (d) 270

10. The minute hand of a clock is 12 cm long. Find the area of the face of the clock described by theminute hand in 35 minutes.
(a) 265 cm^2 (b) 266 cm^2 (c) 264 cm^2 (d) none of these

11.A sector of 56^0, cut out from a circle, contains 17.6 cm^2. Find the radius of the circle.
(b) 6 cm (b) 7 cm (c) 5 cm (d) 8 cm

12.The circumference of a circle is 8 cm. Find the area of the sector whose central angle is 72^0.
(c) 123 cm^2 (b) 123.5 cm^2 (c) 123.2 cm^2 (d) none of these

13. A racetrack is in the form of a ring whose inner circumference is 352 m and outer circumferenceis 396 m. Find the width of the track.
(a) 4 m (b) 6 m (c) 8 m (d) 7 m

14. A square ABCD is inscribed in a circle of radius 'r'. Find the area of the square in sq. units.
(a) $3r^2$ (b) $2r^2$ (c) $4r^2$ (d) none of these

15. Find the area of a right-angled triangle, if the radius of its circumcircle is 2.5 cm and the altitude drawn to the hypotenuse is 2 cm long.
(b) 5 cm^2 (b) 6 cm^2 (c) 7 cm^2 (d) none of these

(VSA) 2 M

1.A paper is in the form of a rectangle ABCD in which AB = 18 cm and BC = 14 cm. A semicircular portion with BC as diameter is cut off. Find the area of the remaining paper.

2.A steel wire, bent in the form of a square, encloses an area of 121 sq. cm. The same wire is bentin the form of a circle. Find the area of the circle.

3.A road, which is 7m wide, surrounds a circular park whose circumference is 352m. Find the areaof the road.

4.A racetrack is in the form of a ring whose inner and outer circumference are 437 m and 503 mrespectively. Find the width of the track and also it area.

SA (3 M)

1. If the radius of a circle is 4.2 cm, compute its area and circumference.

2.A chord subtends an angle of 90°at the centre of a circle whose radius is 20 cm. Compute the area of the corresponding major segment of the circle.

3.A square is inscribed in a circle. Calculate the ratio of the area of the circle and the square.

4.The cost of fencing a circular field at the rate of Rs. 24 per metre is Rs. 5280.The field is to be ploughed at the rate of Rs. 0.50 per m^2. Find the cost of ploughing the field (Take π = 22/7).

Long Answer (4M)

1. A calf is tied with a rope of length 6 m at the corner of a square grassy lawn of side 20 m. If the length of the rope is increased by 5.5m, find the increase in the area of the grassy lawn in which the calf can graze.
2. Find the radius of a circle whose circumference is equal to the sum of the circumferences of two circles of radii 15 cm and 18 cm.
3. Find the area of the minor segment of a circle of radius 14 cm, when the angle of the corresponding sector is 60°.
4. If the difference between the circumference and the radius of a circle is 37 cm, then using π = 22/7, calculate the circumference (in cm) of the circle.
5. The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes.
6. A pipe of wire 22 cm long is bent into the form of an arc of a circle subtending an angle of 60° at its centre. Find the radius of the circle. [use π = 22/7]

7.In the given Fig. 12.58, the side of square is 28 cm and radius of each circle is half of the length of the side of the square where O and O' are centres of the circles. Find the area of shaded region.

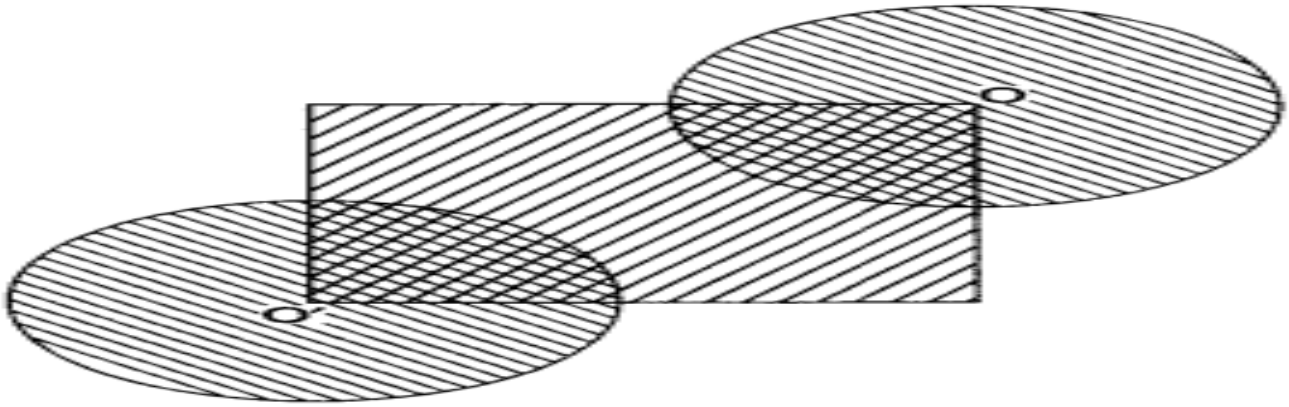


Fig. 12.58

8.Two circles touch externally. The sum of their areas is 130 r sq. cm

And the distance between their centres is 14 cm. Find the radii of the

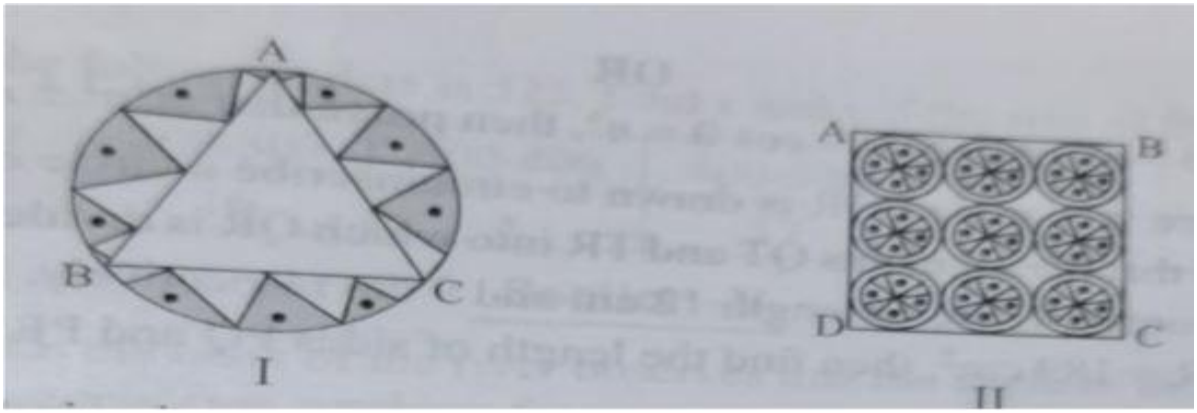
9.Two circles touch internally. The sum of their areas is 116π cm and distance between their centres is 6 cm. Find the radii of the circles.

10.The short and long hands of a clock are 4 cm and 6 cm long respectively. Find the sum of distances travelled by their tips in 2 days.

CASE STUDY

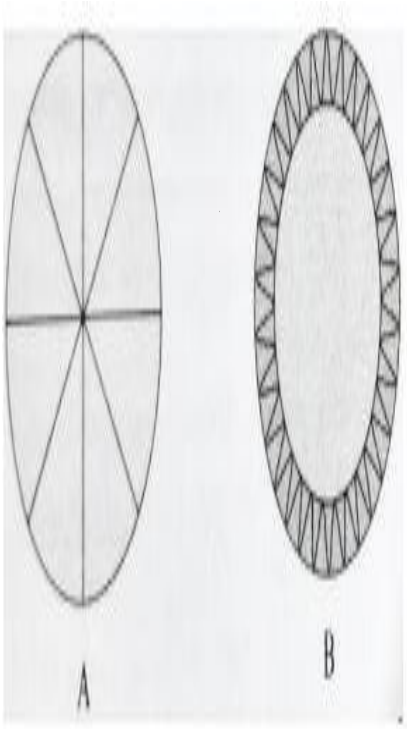
Pookalam is the flower bed or flower pattern designed during Onam in Kerala. It is similar as Rangoli in North India and Kolam in Tamil Nadu. During the festival of Onam, your school is planning to conduct a Pookalam competition. Your friend who is a partner in competition, suggests two designs given below.

Observe these carefully.



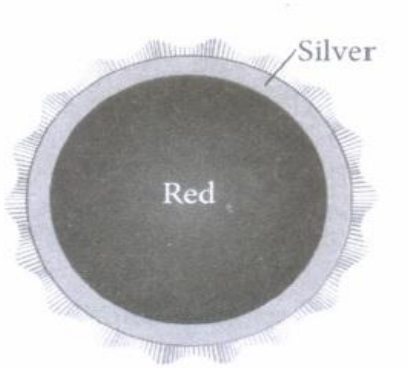
Design I: This design is made with a circle of radius 32cm leaving equilateral triangle ABC in the middle as shown in the given figure.
Design II: This Pookalam is made with 9 circular design each of radius 7cm.
Refer Design I:
1. The side of equilateral triangle is
2. The altitude of the equilateral triangle is
3.Area of the remaining portion of the square ABCD is

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
2.The area of each sector of the brooch is
3.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?

- Principle of a school decided to give badges to students who are chosen for the post of Head boy, Head girl, Prefect and Vice Prefect. Badges are circular in shape with two colour area, red and silver, as shown in figure. The diameter of the region representing red colour is 22 cm and silver colour is filled in 10.5 ern wide ring. Based on the above information, answer the following questions.



(i) The radius of circle representing the red region is
(a) 9 cm (b) 10 cm (c) 11 cm (d) 12 cm

(ii) Find the area of the red region.

(a) 380.28 cm^2 (b) 382.28 cm^2 (c) 384.28 cm^2 (d) 378.28 cm^2
(iii) Find the radius of the circle formed by combining the red and silver region.

(a) 20.5 cm (b) 21.5 cm (c) 22.5 cm (d) 23.5 cm

ANSWER

MCQ	VSA	SA	LA	C B Q
1.14 **π**	175 CM^2	C=26.4 CM, A=55.44 CM^2	75.56 M^2	$32\sqrt{3}$ CM^2 , 48 CM ,378 CM^2
2.4658.5 CM^2	121 CM^2	1142 CM^2	33 CM	200 MM ,77 MM ,4
3.4:9	2618 CM^2	**Π:2**	898 CM^2	11 CM, 380.28 CM^2 ,21.5 CM
4.96%	4935 CM^2	RS. 1925	44 CM	

5.9:16			51.33 CM^2	
6.7000			1372 CM^2	
7.154 CM^2			11 CM & 3 CM	
8.70 CM			4 CM & 10 CM	
9.250 REVOLUTIONS			1909.12	
10.264 CM^2				
11.6 CM				
12.123.2 CM				
13.7 M				
14.2 r^2				
15. 5 CM^2				

Chapter : 12 SURFACE AREA AND VOLUMES

1. GIST OF THE LESSON

1. **The Surface area and Volume for different solid shapes such as the Cube, Cuboid, Cone, Cylinder, Sphere,Hemisphere and so on**
2. **The surface area can be generally classified into Lateral Surface Area (LSA), Total Surface Area (TSA), and Curved Surface Area (CSA).**
   The Lateral surface of an object is all of the sides of the object ,excluding its base and top
   The curved surface area is the area of only curved surface, leaving the circular top and base.
   The total surface area includes the area of all the surfaces of the object including the bases.
3. **The surface area formulas and volume formulas for different three-dimensional shapes in detail**
4. **The combination of different solid shapes. Also, the procedure to find the volume and its surface area in detail**

2. MAIN CONCEPTS AND RESULTS

3. QUESTIONS

4.ANSWERS

S.NO	CONCEPT	FORMULAS	UNITS
1	Curved surface area of a cylinder	$2\pi rh$	Square units
	Base Area	πr^2	Square units
	Total surface area of a cylinder	$2\pi rh + \pi r^2 = 2\pi r(r + h)$	Square units
	Volume of a cylinder	$\pi r^2 h$	Cubic units
2	Curved surface area of a cone	Πrl	Square units
	Base Area	πr^2	Square units
	Total surface area of a right circular cone	$\pi rl + \pi r^2 = \pi r (l + r)$	Square units
	Volume of a cone	$\frac{1}{3}\pi r^2 h$	Cubic units
3	Total Surface area of a sphere (CSA , BA)	$4 \pi r^2$	Square units
	Volume of a sphere of radius r	$\frac{4}{3}\pi r^3$	Cubic units
4	Curved surface area of a hemisphere	$2\pi r^2$	Square units
	Base Area	πr^2	Square units
	Total surface area of a hemisphere	$3\pi r^2$	Square units
	Volume of a hemisphere	$\frac{2}{3}\pi r^3$	Cubic units
5	Base area of a cuboid	l b	Square units

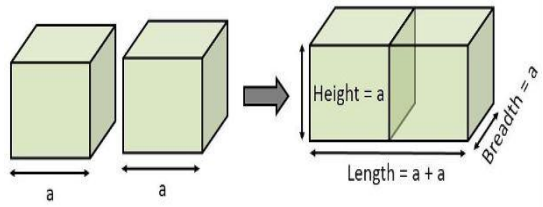
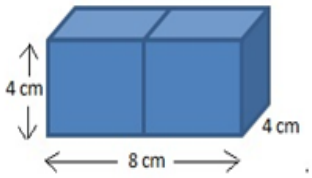
	Surface area of a cuboid	2 (lb + bh + hl)	Square units
	Volume of a cuboid	l × b × h	Cubic units
6	Base area of a cube	a^2	Square units
	Surface area of a cube	6 a^2	Square units
	Volume of a cube	a^3	Square units
7	Area of Circular ring	$\pi(R^2 - r^2)$	Square units
8	Volume of a Circular ring	$\pi(R^3 - r^3)h$	Cubic units
9	Volume	Area x height	Cubic units

	SECTION A MULTIPLE QUESTIONS (10 X 1)	
1	**. If r is the radius of the sphere, then the surface area of the sphere is given by;** **a) $4\pi r^2$ b) $2\pi r^2$ c) πr^2 d) $4/3\pi r^2$**	
2	**The number of shots each having diameter 3 cm can be made from a cuboidal lead solid of dimensions 9 cm × 11 cm × 12 cm is approximately equal to** **a) 84 b) 90 c) 92 d) 80**	
3	**If we change the shape of an object from a sphere to a cylinder, then the volume of cylinder will** **a) Increase b) Decrease c) Remains unchanged d) Doubles**	
4	**The radii of two cylinders are in the ratio 2 : 3 and their heights are in the ratio 5 : 3. The ratio of their volumes is:** **a) 27 : 20 b) 20 : 27 c) 9 : 4 d) 4 : 9**	
5	**Surface area of a right circular cone of height 28 cm and base radius 21 cm(in sq. cm) is:** **a) 2310 b) 2110 c) 1055 d) 1155**	
6	**The volumes of a cube is 1728 cm^3, the length of its edge is equal to:** **a) 7 cm b) 12 cm c) 18 cm d) 19 cm**	
7	**The total surface area of a hemispherical solid having radius 7 cm is** **a) 462 cm^2 b) 294 cm^2 c) 588 cm^2 d) 154 cm^2**	
8	**If we join two hemispheres of same radius along their bases, then we get a;** **a) Cone b) Cylinder c) Sphere d) Cuboid**	
9	**A cylindrical pencil sharpened at one edge is the combination of** **a) a cone and a cylinder b) frustum of a cone and a cylinder** **c) a hemisphere and a cylinder d) two cylinders**	
10	**The surface area of a sphere is 616 cm2. Its radius is** **a) 7 cm b) 14 cm c) 21 cm d) 28 cm**	
	SECTION B **(5 X 2 Marks)**	
11	**2 cubes each of volume 64 cm^3 are joined end to end. Find the surface area of the resulting cuboid.**	
12	**A solid is in the shape of a cone surmounted on a hemisphere, the radius of each of them being 3.5 cm and the total height of the solid is 9.5 cm. Find the volume of the solid.**	
13	**A cone of height 20 cm and radius of base 5 cm is made up to modelling clay.** **A child reshapes it in the form of a sphere. Find the diameter of the sphere.**	
14	**A right circular cylinder and a cone have equal bases and equal heights. If their curved surface areas are in the ratio 8:5, show that the ratio between the radius of their bases to their height is 3:4.**	
15	**The volume of a hemisphere is 2425 1/2 cm3. Find its curved surface area?**	
	SECTION C **(5 X 3 = 15)**	
16	**From a solid cylinder whose height is 2.4 cm and diameter 1.4 cm, a conical cavity of the same height and same diameter is hollowed out. Find the total surface area of the remaining solid to the**	

	nearest cm^2 .	
17	**A wooden article was made by scooping out a hemisphere from each end of a solid cylinder, as shown in Fig. 13.11. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article**	
18	**A solid is in the shape of a cone standing on a hemisphere with both their radii being equal to 1 cm and the height of the cone is equal to its radius. Find the volume of the solid in terms of π.**	
19	**A cubical block of side 7 cm is surmounted by a hemisphere. What is the greatest diameter the hemisphere can have? Find the surface area of the solid.**	
20	**A metallic sphere of radius 10.5cm is melted and then recast into smaller cones, each of radius 3.5cm and height 3cm. How many cones are obtained?**	
	SECTION D **CASE BASED STUDY QUESTIONS (2 X 4 Marks)**	
21	**On a Sunday, your Parents took you to a fair. You could see lot of toys displayed, and you wanted them to buy a RUBIK's cube and strawberry ice-cream for you. Observe the figures and answer the questions-:**   a) **Find the total surface area of cone with hemispherical ice cream ?** b) **What is the curved surface area of hemisphere (ice cream) if the base radius is 7cm?** c) **Find the length of the diagonal if each edge measures 6cm**	
22	**Mathematics teacher of a school took her class 9th students to show Red fort. It was a part of Their educational trip. The teacher has interest in history as well. She narrated the facts of Red Fort to students. Then the teacher said in this monument one can find combination of solid figures. There are 2 pillars which are cylindrical in shape. Also 2 domes at the corners,which are hemispherical. Seven smaller domes at the centre. Flag hoisting ceremony on Independence Day takes place** **(Take π = 22/7)** **a) How much cloth material will be required to cover 2 big domes each of radius 2.5metres?** **a) $75m^2$ b) $78.57m^2$ c) $87.47m^2$ d) $25.8m^2$** **b) Find the lateral surface area of two pillars if height of the pillar is 7m and radius of the base is 1.4m.** **a) $112.3cm^2$ b) $123.2m^2$ c)$90m^2$ d)$345.2cm^2$** **c) What is the ratio of sum of volumes of two hemispheres of radius 1cm each to the volume of a sphere of radius 2cm?** **a) 1:1 b) 1:8 c) 8:1 d) 1:16**	
	SECTION E	

	LONG ANSWER QUESTIONS (3 X 5 Marks)	
23	**A tent is in the shape of a cylinder surmounted by a conical top. If the height and diameter of the cylindrical part are 2.1 m and 4 m respectively, and the slant height of the top is 2.8 m, find the area of the canvas used for making the tent. Also, find the cost of the canvas of the tent at the rate of □500 per m^2.**	
24	**Rachel, an engineering student, was asked to make a model shaped like a cylinder with two cones attached at its two ends by using a thin aluminium sheet. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model that Rachel made. (Assume the outer and inner dimensions of the model to be nearly the same.)**	
25	**A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.**	

	SECTION A (MULTIPLE CHOICE QUESTIONS)	
1	**$4\pi r^2$**	
2	Given: d=3 cm $\therefore$r=1.5cm Volume of cuboid = n × Volume of 1 spherical shot $L \times b \times h = n \times 3/4\ \pi r^3$ $9 * 11 * 12 = n \times 3/4\pi \times (1.5)^3$ n = 84	
3	**Remains unchanged**	
4	Given:Ratio of Radii of two Cylinder is 2:3 $\Rightarrow$Radius of 1st cylinder be 2r $\Rightarrow$ Radius of 2nd Cylinder=3r Given:Ratio of Heights of Two Cylinder is 5:3. $\Rightarrow$Height of 1st Cylinder = 5h $\Rightarrow$Height of 2nd Cylinder = 3h $\therefore$Ratio of volume= Volume of 2nd Cylinder/ Volume of 1st Cylinder = 20/27	
5	**Given, h = 28 cm; r = 21 cm** **Therefore, slant height (l) = $\sqrt{282+212}$** **= 35 cm** **Lateral surface area = πrl** **= 227 × 21 × 35** **= 2310 cm2**	
6	Given, volume of cube = $1728cm^3$. Let l be the side of the cube. $\therefore$ Volume of the cube = l^3 $\Longrightarrow l^3 = 1728cm^3$ $\Longrightarrow l = \sqrt[3]{1728}$ $\Longrightarrow l = 12$ cm.	
7	Surface area of the hemisphere $=2\pi r^2$ $=2\times722\times7^2$ =308cm	
8	**Sphere**	

9	**a cone and a cylinder**	
10	**The surface area of sphere =616cm^2** **Since, the surface area of sphere =4πr^2** **Therefore,** **4π r^2 = 616** **πr^2 = 154** **r^2 = 49** **r = 7cm** **Hence, the radius of the sphere is 7cm.**	
	SECTION B **(5 X 2 Marks)**	
11	  **Let the length of the edge of each cube be 'a'** **Therefore, volume of the cube = a^3** **Volume of the cube, a^3 = 64 cm^3** **a^3 = 64 cm^3** **a = $\sqrt[3]{(64\ cm^3)}$** **a = 4 cm** **Therefore,** **Length of the resulting cuboid, l = 2a = 8 cm** **Breadth of the resulting cuboid, b = a = 4 cm**	

Height of the resulting cuboid, h = a = 4 cm

Surface area of the cuboid = 2(lb + bh + lh), where l, b, and h are length, breadth, and height respectively.

= 2 (lb + bh + lh)

= 2 (8 cm × 4 cm + 4 cm × 4 cm + 8cm × 4 cm)

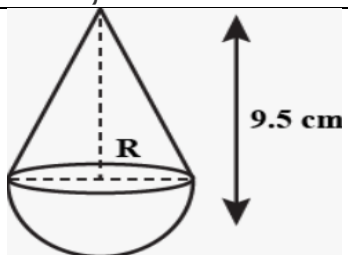
= 2 (32 cm^2 + 16 cm^2 + 32 cm^2)

= 2 × 80 cm^2

= 160 cm^2

Thus, the surface area of the resulting cuboid is 160 cm

12



cone

Total height of the solid = 9.5 cm

Height of cone,(h) = Total height of the solid - height of hemisphere

= 9.5- 3.5 cm = 6 cm

Radius of the cone = r = 3.5 cm

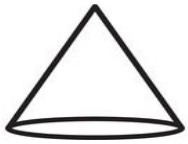
Radius of the hemisphere = height of hemisphere = 3.5 cm

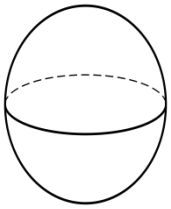
Volume of solid = volume of cone + volume of hemisphere

= 1/3 π r^2 h + 2/3 π r^3
= 1/3πr^2 (h + 2r)
= 1/3×22/7×3.5×3.5× (6+2×3.5)
= 1/3×22/7×3.5×3.5×(6+7)
= 1/3×22/7×3.5×3.5×(13)
= 1/3×22×.5×3.5×(13)
= 500.5/3
= 166.83 cm^3

Hence, the volume of the solid is 166.83 cm

13





Radius of the cone = r = 5 cm and
Height of the cone = h = 20 cm

Let the radius of the sphere = R
Height of the sphere = ?

As per given statement,

Volume of sphere = volume of cone

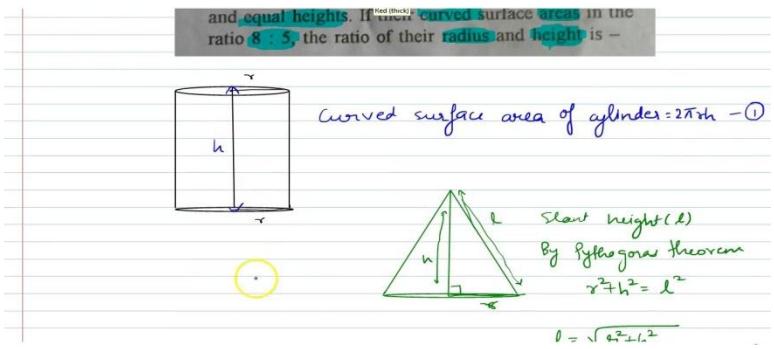
$$4/3\ \pi\ R^3 = 1/3\ \pi\ r^2\ h$$

$$4R^3 = 5\times5\times20$$

$$R = 5\ \text{cm}$$

Diameter of the sphere = $2\ R = 2 \times 5 = 10\text{cm}$

14



Radius of the cylinder = r
Height of the cylinder = h

Radius of the cone = r
Height of the cone = h
Slant height of the cone l = $\sqrt{r^2+h^2}$

CSA of the cylinder =2πrh

CSA OF THE CONE = π r l

Given CSA of cone and Cylinder are in the ratio = 8 : 5

$\frac{2\pi rh}{\pi r l}$

$$= \frac{8}{5}$$

$$\frac{2h}{l} = \frac{8}{5}$$

$$\frac{4h^2}{l^2} = \frac{64}{25}$$

$$64\, l^2 = 100\, h^2$$

.

$$l^2 = \frac{100}{64} h^2 = \frac{25\, h^2}{16}$$

$$16l^2 = 25\, h^2$$

$$16(h^2 + r^2) = 25\, h^2$$

$$16h^2 + 16r^2 = 25\, h^2$$

$$16\, r^2 = 9h^2$$

$$\frac{r^2}{h^2} = \frac{9}{16}$$

$$\frac{r}{h} = \frac{3}{4}$$

So, the ratio between the radius of their bases to their height is 3:4.

15

Volume of a hemisphere $= \frac{2}{3}\pi r^3$

$$\Rightarrow \frac{2}{3}\pi r^3 = 2425\frac{1}{2}$$

$$\Rightarrow \frac{2}{3}\pi r^3 = \frac{4841}{2}$$

$$\Rightarrow r^3 = \frac{4851 \times 3}{2 \times 2 \times \pi}$$

$$\Rightarrow r^3 = \frac{4851 \times 3}{4\pi}$$

$$r = 10 \cdot 50cm$$

Radius of hemisphere = 10.5cm

Curved surface area of hemisphere = $2\pi r^2$
curved surface area of hemisphere = 2 x 22/7 x 10.5 x 10.5 = 693 cm^2

SECTION C
(5 X 3 = 15)

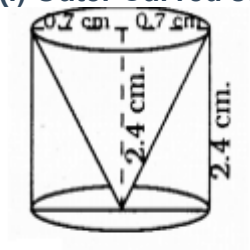
16

Height of the cylinder, h = 2.4 m.

Diameter of the cylinder, d = 1.4 m. ∴

Radius, r = 0.7 m.

(i) Outer Curved surface area of cylinder = 2πrh



$= 2 \times \frac{22}{7} \times (0.7) \times 2.4$

= 44. × 0.24 = 10.56 cm^2 .

ii) Inner surface area of cylinder, = π rl

$$= \frac{22}{7} \times 0.7 \times \sqrt{(0.7)^2 + (2.4)^2}$$

$$= \frac{22}{7} \times 0.7 \times 2.5$$

= 5.5 cm^2

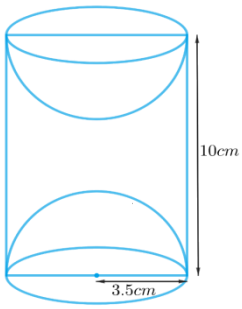
iii) Area of base = π r^2

$$= \frac{22}{7} \times (0.7)^2$$

$$= \frac{22}{7} \times 0.49$$

Total surface area of newly formed cube = 10.56 + 1.54 + 5.5 = 17.6 cm^2 .

17



From the figure, it can be seen that the radius of the hemispheres scooped out is the same as the radius of the base of the cylinder since both the hemispheres are of equal radius.

Therefore, the total surface area of the article only includes the CSA of both the hemispheres and the cylinder.

TSA of the article = 2 × CSA of the hemispherical part + CSA of the cylindrical part.

We will find the TSA of the article by using formulae;

CSA of the hemisphere = $2\pi r^2$, where r is the radius of the hemisphere.

CSA of the cylinder = $2\pi rh$, where r and h are the radius and height of the cylinder respectively.

Height of the cylinder = h = 10 cm

Radius of the cylinder = radius of the hemisphere = r = 3.5 cm

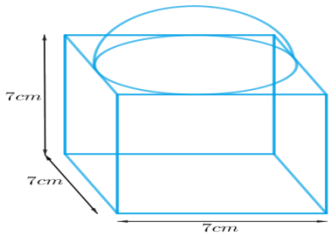
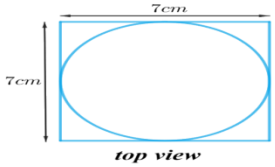
TSA of the article = 2 × CSA of the hemispherical part + CSA of the cylindrical part

$$= 2 \times 2\pi r^2 + 2\pi rh$$

$$= 2\pi r (2r + h)$$

$$= 2 \times 22/7 \times 3.5 \text{ cm} \times (2 \times 3.5 \text{ cm} + 10 \text{ cm})$$

$$= 22 \text{ cm} \times 17 \text{ cm}$$

	= 374 cm^2 Thus, the total surface area of the article is 374 cm^2	
18	The volume of a solid is the space occupied inside it or the capacity that an object holds. As the solid is made up of a conical part and a hemispherical part, Volume of the solid = volume of the conical part + volume of the hemispherical part Let us find the volume of the solid by using formulae; Volume of the hemisphere = 2/3 πr^3 where r is the radius of the hemisphere Volume of the cone = 1/3 $\pi r^2 h$ where r and h are the radius and height of the cone respectively. Radius of hemispherical part = Radius of conical part = r = 1 cm Height of conical part = h = r = 1 cm Volume of the solid = volume of the conical part + volume of the hemispherical part = 1/3 $\pi r^2 h$ + 2/3 πr^3 = 1/3 πr^3 + 2/3 πr^3 [Since, h = r] = πr^3 = π $(1cm)^3$ = π cm^3 Thus, the volume of the solid is π cm^3.	
19	 	

From the figure, it's clear that the greatest diameter the hemisphere can have is equal to the cube's edge. Otherwise, a part of the hemisphere's rim (circumference of its circular base) will lie outside the top part of the cube.

As it's clear from the top view of the figure that the top part of the cube is partially covered by the hemispherical region.

Total surface area of the solid = Surface area of the cubical part - Area of the base of the hemispherical part + CSA of the hemispherical part

We will find the total area of the solid by using the formulae;

CSA of the hemisphere = $2\pi r^2$

Area of the base of the hemisphere = πr^2, where r is the radius of the hemisphere

Surface area of the cube = $6l^2$, where l is the length of the edge of the cube

Length of the edge of the cube, l = 7 cm

From the figure, it's clear that the greatest diameter the hemisphere can have is equal to the cube's edge

Diameter of the hemisphere, d = l = 7 cm

Radius of the hemisphere, r = d/2 = 7/2 cm

Total surface area of the solid = Surface area of the cubical part - Area of the base of the hemispherical part + CSA of the hemispherical part

= $6l^2 - \pi r^2 + 2\pi r^2$

= $6l^2 + \pi r^2$

= $6 \times (7\text{ cm})^2 + 22/7 \times (7/2\text{ cm})^2$

= $6 \times 49\text{ cm}^2 + 22/7 \times 49/4\text{ cm}^2$

= $294\text{ cm}^2 + 38.5\text{ cm}^2$

= 332.5 cm^2

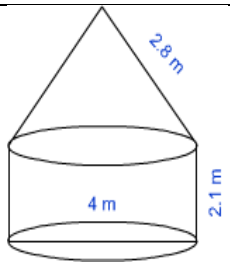
	Thus, the greatest diameter the hemisphere can have is 7 cm and the surface area of the solid is 332.5 cm^2	
20	**It is given that** **Radius of the sphere = 10.5cm** **Radius of smaller cone = 3.5cm** **Height = 3cm** **We know that** **Number of cones = Volume of the sphere/ Volume of one small cone** **So we get** **Number of cones = (4/3 × (22/7) × 10.53)/ (1/3 × (22/7) × 3.52 × 3)** **Number of cones = 4851/ 38.5 = 126** **Therefore, 126 cones are obtained from the metallic sphere.**	
	SECTION D **CASE BASED STUDY QUESTIONS (2 X 4 Marks)**	
21	**a) 858 b) 308 c) $6\sqrt{3}$**	
22	**a) Cloth material required = 2 × S A of hemispherical dome** **= 2 × 2π r^2= 2 × 2 × $\frac{22}{7}$ × $(2.5)^2$ m^2** **= 78.57 m^2** **b) Lateral surface area = 2 × 2πrh** **= 4 × $\frac{22}{7}$ x 1.4 x 7 m^2** **= 123.2 m^2** **c) Sum of the volumes of two hemispheres of radius 1 cm each = 2 × $\frac{2}{3}$ π1^3**	

Volume of sphere of radius 2cm $= 4/3\ \pi\ 2^3$

So, required ratio = $\frac{2\times\frac{2}{3}\pi 1^3}{\frac{4}{3}\pi 2^3} = \frac{1}{8}$ **= 1 : 8**

SECTION E
LONG ANSWER QUESTIONS (3 X 5 Marks)

23



From the question we know that

Diameter of the cylinder = 4 m **Diameter of the cone = 4 m**

Radius of the cone r = 2m **Radius of the cone r = 2m**

Height of the cylinder (h) = 2.1 m **Slant height of the cone (l) = 2.8 m**

So, the required surface area of tent = Surface area of cone + Surface area of cylinder

$= \pi rl + 2\pi rh$

$= \pi r (l + 2h)$

$= (22/7) \times 2 (2.8 + 2 \times 2.1)$

$= (44/7) (2.8 + 4.2)$

$= (44 / 7) \times 7 = 44\ m^2$

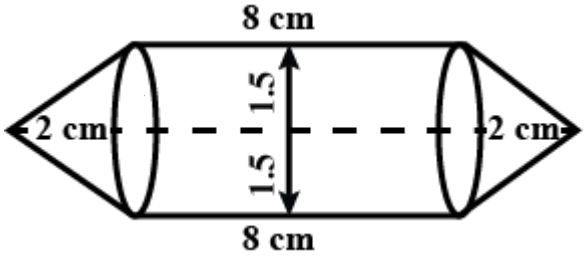
∴ The cost of the canvas of the tent at the rate of □500 per m^2 will be

= Surface area × Cost per m^2

= 44 × 500 = □ 22000

So, Rs. 22000 will be the total cost of the canvas

24



From the figure, it can be seen that the volume of the model includes the volume of the cylindrical part and both the identical conical parts.

The volume of a solid is the space occupied inside the solid or the capacity a solid can hold.

Volume of the model = Volume of the 2 conical parts + Volume of the cylindrical part

As the length of the model includes the height of the cylindrical part and the height of both the identical conical parts,

Length of the model = Height of the cylindrical part + 2 × Height of the conical part

We will find the volume of the model by using formulae;

Volume of the cylinder = $\pi r^2 h_1$, where r and h_1 are the radius and height of the cylinder respectively.

Volume of the cone = $1/3\ \pi r^2 h_2$, where r and h_2 are the radius and height of the cone respectively.

Height of each conical part, h_2 = 2 cm

Height of cylindrical part = Length of the model - 2 × Height of the conical part

h_1 = 12 cm - 2 × 2 cm = 8 cm

Diameter of the model, d = 3 cm

Radius of cylindrical part = radius of conical part = r = 3/2 cm = 1.5 cm

Volume of the model = 2 × Volume of the conical part + Volume of the cylindrical part

= 2 × 1/3 $\pi r^2 h_2 + \pi r^2 h_1$

= πr^2 (2/3 h_2 + h_1)

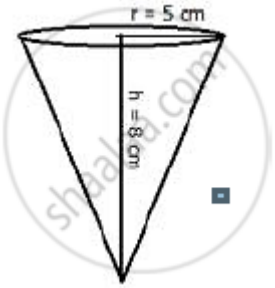
= 22/7 × 1.5 cm × 1.5 cm × (2/3 × 2 cm + 8 cm)

= 22/7 × 1.5 cm × 1.5 cm × 28/3 cm

= 66 cm^3

Thus, the volume of air in the model is 66 cm^3.

25



Radius of cone = 5cm

Height of cone = 8cm

Volume of cone = 1/3$\pi r^2 h$

= 1/3 $\pi \times 5^2 \times$ 8

= 200π /3 cm^3

Radius of sphere=0.5cm

Volume of lead shot = 4/3 πr^3

= 4/3$\pi \times 0.5^3$

== .16π cm^3

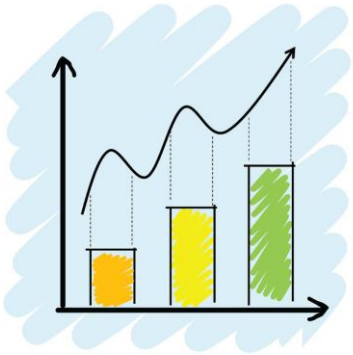
Volume of water flows out

= ¼ of 200π /3

= 1/12 x 200π =16 π

∴ number of lead shots = 16 π/ .16π = 100

STATISTICS



Basic Concepts in **Statistics.**

UNGROUPED DATA

Ungrouped data is data in its original or raw form. The observations are not classified into groups.

Example: The scores of a batsman in the last 10 matches are given as 45 , 34 , 28 , 77 , 26 , 48 , 43 , 79 , 32 and 80.
This data shows that there is one the scores are of varied range.

Ungrouped data is easy to work with if the data set is small.

GROUPED DATA

In grouped data, observations are organised in groups.
For example: A class of students got different marks in a school exam. The data is tabulated as follows:

MARKS INTERVAL	NO OF STUDENTS
0 - 20	17
21 - 40	3
41 - 60	25
61 - 80	28
81 - 100	18

This shows how many students got the particular mark range.

Grouped data is easier to work with when a large amount of data is present.

FREQUENCY

The frequency of an event is the number of times the observation occurred / recorded in an experiment or study.

CLASS INTERVAL

Class interval is a term that is used to denote the numerical width of a class in a frequency distribution. In a grouped frequency distribution, data is arranged in the form of a class. The difference between the **upper-class limit** and the **lower-class limit** gives the class interval.

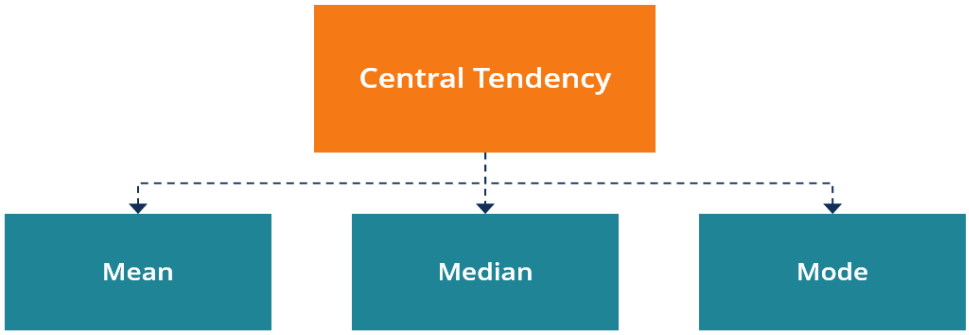
Suppose there is a class given by (11 - 21).
11 will be known as the lower class limit while 21 is the upper limit.
The class interval is given by 21 - 11 = 10.

Class interval = (Upper Class Limit - Lower Class Limit)

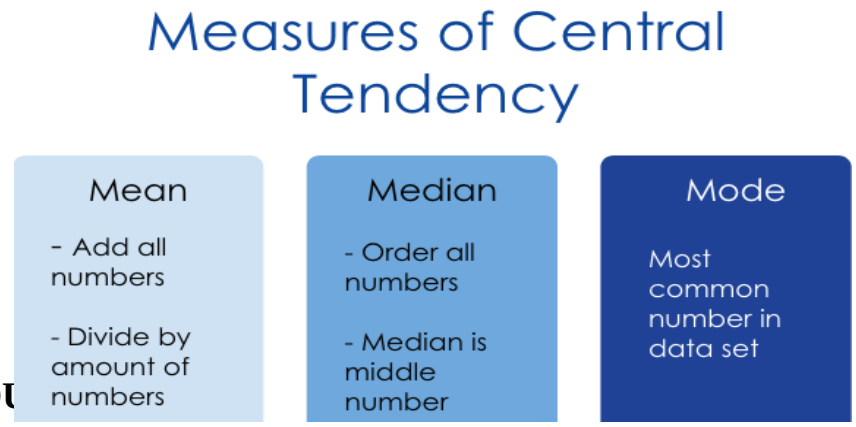
CENTRAL TENDENCY

The central tendency is the statistical measure that represents the single value of the entire distribution a dataset.
It aims to provide an accurate description of the entire data.

Measures of central tendency help you find the middle, or the average, of a data set.
The 3 most common measures of central tendency are the **mean, median and mode**.



FOR UNGROUPED DATA:



FOR GROU
MEAN:

(i) Finding mean for grouped data when class intervals are not given

$$\text{Mean (or } \overline{X})^* = \frac{\sum X_i}{n} = \frac{X_1 + X_2 + \ldots + X_n}{n}$$

where $\overline{X}$ = The symbol we use for mean (pronounced as X bar)

$\sum$ = Symbol for summation

X_i = Value of the ith item X, $i = 1, 2, \ldots, n$

n = total number of items

In case of a frequency distribution, we can work out mean in this way:

$$\overline{X} = \frac{\sum f_i X_i}{\sum f_i} = \frac{f_1 X_1 + f_2 X_2 + \ldots + f_n X_n}{f_1 + f_2 + \ldots + f_n = n}$$

(ii) Finding mean for grouped data when class intervals are given

$$\overline{X} = \frac{\sum f_i x_i}{\sum f_i}$$

Where $x_i$is the frequency of the i^{th} class whose class mark x_i is

Class mark = $\frac{Upper\ class\ limit\ + Lower\ class\ limit}{2}$

Note: Frequency of a class is centred at its mid-point called class mark.

(iii) Direct method of finding mean

Step 1: Classify the data into intervals and find the corresponding frequency of each class.

Step 2: Find the class mark by taking the midpoint of the upper and lower class limits.

Step 3: Tabulate the product of the class mark and its corresponding frequency for each class. Calculate their sum ($\sum x_i f_i$).

Step 4: Divide the above sum by the sum of frequencies ($\sum f_i$) to get the mean.

The formula to find the mean using the direct method is:

$$\overline{X} = \frac{\sum f_i x_i}{\sum f_i}$$

(iv) Assumed mean method of finding mean

Step 1: Classify the data into intervals and find the corresponding frequency of each class.

Step 2: Find the class mark by taking the midpoint of the upper and lower class limits.

Step 3: Take one of the x_i's (usually one in the middle) as the assumed mean and denote it by 'a'.

Step 4: Find the deviation of 'a' from each of the x_i's

$d_i = x_i - a$

Step 5: Find the mean of the deviations $\frac{\sum_{i=1}^{n} f_i d_i}{\sum_{i=1}^{n} f_i}$

Step 6: Calculate the mean as

$$\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$$

(v) Step-Deviation method of finding mean

Step 1: Classify the data into intervals and find the corresponding frequency of each class.
Step 2: Find the class mark by taking the midpoint of the upper and lower class limits.
Step 3: Take one of the x_i's (usually one in the middle) as assumed mean and denote it by 'a'.
Step 4: Find the deviation of a from each of the x_i's
$d_i = x_i - a$

Step 5: Divide all deviations d_i by the class width (h) to get u_i's.
$u_i = \frac{x_i - a}{h}$
Step 6: Find the mean of as

$$\overline{X} = a + \left[\frac{\sum f_i u_i}{\sum f_i}\right] \times h$$

Important relations between methods of finding mean

- All three methods of finding mean yield the **same** result.
- **Step deviation method** is easier to apply if all the deviations have a common factor.
- Assumed mean method and step deviation method are simplified versions of the direct method.

MEDIAN

Finding the Median of Grouped Data when class Intervals are not given

Step 1: Tabulate the observations and the corresponding frequency in ascending or descending order.
Step 2: Add the cumulative frequency column to the table by finding the cumulative frequency up to each observation.
Step 3: If the number of observations is odd, the median is the observation whose cumulative frequency is just greater than or equal to $\frac{n+1}{2}$
If the number of observations is even, the median is the average of observations whose cumulative frequency is just greater than or equal to $\frac{n}{2}$ and $\frac{n+1}{2}$.

Cumulative Frequency

Cumulative frequency is obtained by adding all the frequencies up to a certain point.

Finding median for Grouped Data when class Intervals are given

Step 1: find the cumulative frequency for all class intervals.

Step 2: the median class is the class whose cumulative frequency is greater than or nearest to n2, where n is the number of observations.

Step 3: Median = $l + \frac{\frac{n}{2} - cf}{f}$ x h

Where,

l = lower limit of median class,

n = number of observations,

cf = cumulative frequency of class preceding the median class,

f = frequency of median class,

h = class size (assuming class size to be equal).

MODE

In statistics, the mode is the most repeated value in the given data set. In other words, the data with the highest frequency is called the mode.

For example, 4, 12, 5, 6, 5, 8, 5 is the given set of data.

Here, the data with the highest frequency is 5, which is repeated thrice.

Therefore, the mode of the given data is 5.

i) Finding mode for Grouped Data when class intervals are not given

In grouped data without class intervals, the observation having the largest frequency is the mode.

(ii) Finding mode for Ungrouped Data

For ungrouped data, the mode can be found out by counting the observations and using tally marks to construct a frequency table.

The observation having the largest frequency is the **mode**

(iii) Finding mode for Grouped Data when class intervals are given

For, grouped data, the class having the highest frequency is called the modal class.

The mode can be calculated using the following formula. (The formula is valid for equal class intervals and when the modal class is unique.)

Mode = $l + \frac{f_1 - f_0}{2f_1 - f_0 - f_2} \times h$

Where,

l = lower limit of modal class

h = class width

f_1 = frequency of the modal class
f_0 = frequency of the class preceding the modal class
f_2 = frequency of the class succeeding the modal class.

Empirical Relationship between Mean, Median and Mode

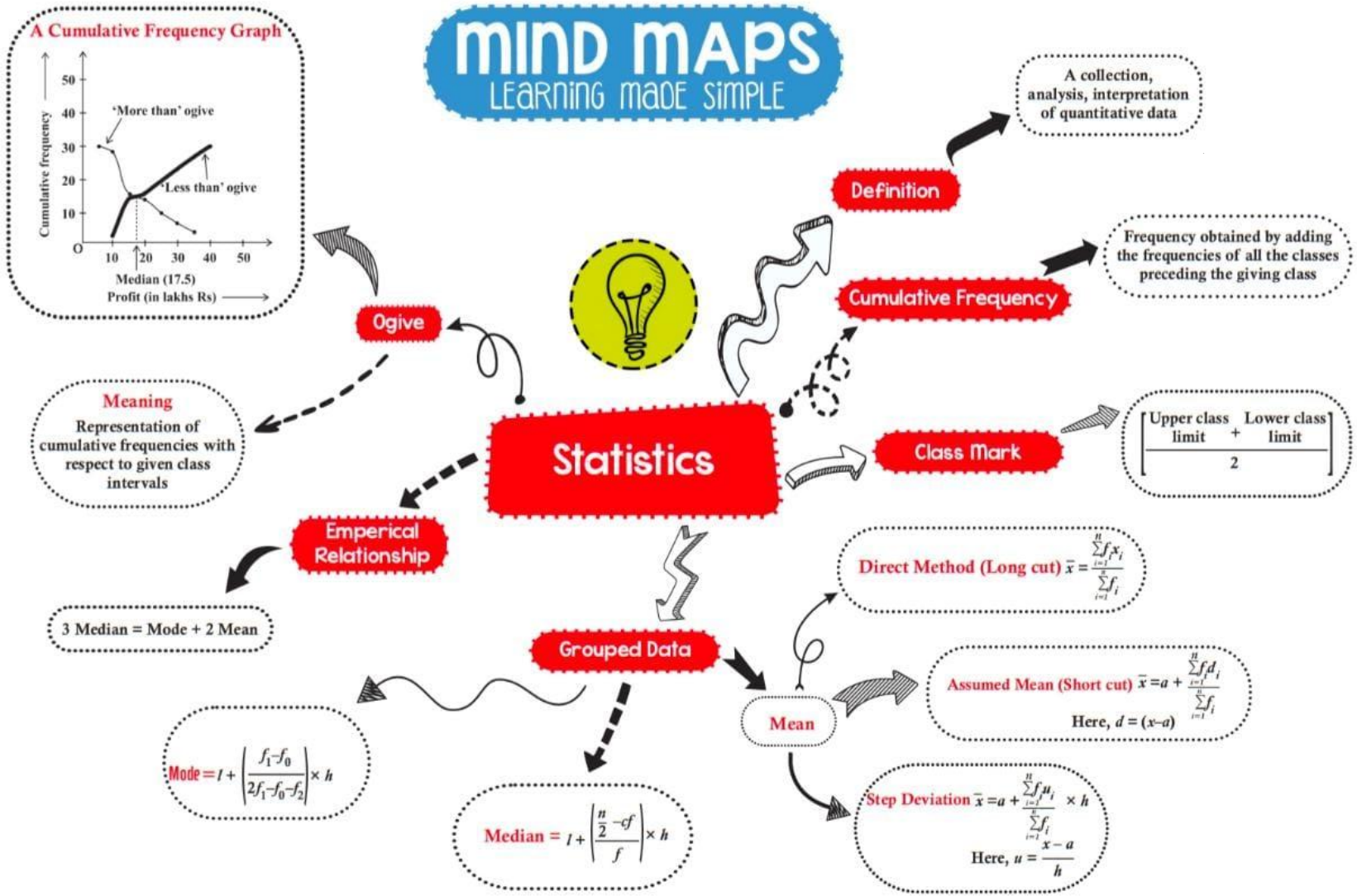
i) The **mean** takes into account all the observations and lies between the extremes. It enables us to compare distributions.

ii) In problems where individual observations are not important, and we wish to find out a 'typical' observation where half the observations are below and half the observations are above, the median is more appropriate. **Median** disregards extreme values.

iii) In situations that require establishing the most frequent value or most popular item, the **mode** is the best choice.

Mean, mode and median are connected by the empirical relationship

Mode = 3 Median – 2 Mean


MIND MAPS
LEARNING MADE SIMPLE
Statistics
Definition
A collection, analysis, interpretation of quantitative data
Cumulative Frequency
Frequency obtained by adding the frequencies of all the classes preceding the giving class
Class Mark
[Upper class limit + Lower class limit / 2]
Ogive
A Cumulative Frequency Graph
'More than' ogive
'Less than' ogive
Median (17.5)
Profit (in lakhs Rs)
Cumulative frequency
Meaning
Representation of cumulative frequencies with respect to given class intervals
Emperical Relationship
3 Median = Mode + 2 Mean
Grouped Data
Mode = $l + \left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h$
Median = $l + \left(\frac{\frac{n}{2} - cf}{f}\right) \times h$
Mean
Direct Method (Long cut) $\bar{x} = \frac{\sum_{i=1}^{n} f_i x_i}{\sum_{i=1}^{n} f_i}$
Assumed Mean (Short cut) $\bar{x} = a + \frac{\sum_{i=1}^{n} f_i d_i}{\sum_{i=1}^{n} f_i}$
Here, $d = (x - a)$
Step Deviation $\bar{x} = a + \frac{\sum_{i=1}^{n} f_i u_i}{\sum_{i=1}^{n} f_i} \times h$
Here, $u = \frac{x - a}{h}$

SOME IMPORTANT QUESTIONS TO PRACTICE
MULTIPLE CHOICE QUESTIONS

1. Mean of 100 items is 49. It was discovered that three items which should have been 60, 70, 80 were wrongly read as 40, 20, 50 respectively. The correct mean is

   A. 48 B. 49 C. 50 D. 60

2. While computing mean of grouped data, we assume that the frequencies are

   A. Evenly distributed over all the classes
   B. Centred at the class mark of the classes
   C. Centred at the upper limits of the classes
   D. Centred at the lower limits of the classes

3. Mode is the value of the variable which has :

   A.Maximum frequency B. Minimum frequency
   C. Mean frequency D. Middle most frequency

4. 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 median class and modal class is

   A. 15 B. 25 C. 30 D. 35

5. For the following distribution :

MARKS	Number of students
Below 10	3
Below 20	12
Below 30	27
Below 40	57
Below 50	75
Below 60	80

   The modal class is :

   A.10 – 20 B. 20 – 30 C. 30 – 40 D. 50 - 60

6. Find the value of x, if the mode of the following data is 25.

   15, 20, 25, 18, 14, 15, 25, 15, 18, 16, 20, 25, 20, x, 18

   A.25 B. 20 C. 18 D. 15

7. Consider the following frequency distribution of the heights of 60 students of a class

Heights (in cm)	No. of students
150 - 155	15
155 - 160	13
160 - 165	10
165 - 170	8
170 - 175	9
175 - 180	5

The upper limit of the median class in the given data is

A.165 B. 155 C. 160 D. 170

8. The times , in seconds, taken by 150 athletes to run a 110 m hurdle race are tabulated below :

Class	Frequency
13.8 - 14.0	2
14.0 - 14.2	4
14.2 - 14.4	5
14.4 - 14.6	71
14.6 - 14.8	48
14.8 - 15.0	20

The number of athletes who completed the race in less than 14.6 seconds is :

A.11 B. 71 C. 82 D. 130

9. d_i is the deviation of x_i from assumed mean a. If mean = $x + \frac{\Sigma f_i d_i}{\Sigma f_i}$, then x is

A.Class size B. Number of observations

C. Assumed mean D. None of these

10. Mode and mean of the data are 12k and 15k. Median of the data is

A. 12k B. 14k C. 15k D. 16k

VERY SHORT QUESTIONS (2 MARKS)

11. The mean and median of 100 observations are 50 and 52 respectively. The value of the largest observation is 100. It was later found that it is 110 not 100. Find the true mean and median.
12. Find the unknown values in the following table :

Class interval	Frequency	Cumulative Frequency
0 - 10	5	5
10 - 20	7	x_1
20 - 30	x_2	18
30 - 40	5	x_3
40 - 50	x_4	30

13. The mean of the following frequency distribution is 25. Find the value of p.

Class interval	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50
Frequency	4	6	10	6	p

14. Median of a data is 52.5 and its mean is 54, use empirical relationship between three measures of central tendency to find its mode.
15. Write the median class of the following distribution:

Classes	0-10	10-20	20-30	30-40	40-50	50-60	60-70
Frequency	4	4	8	10	12	8	4

SHORT QUESTIONS (3 MARKS)

16. Find the median of the following data :

Height (in cm)	Less than 120	Less than 140	Less than 160	Less than 180	Less than 200
Number of students	12	26	34	40	50

17. If the median for the following frequency distribution is 28.5, find the value of x and y:

Class	Frequencies
0 - 10	5
10 - 20	x
20 - 30	20
30 - 40	15
40 - 50	y
50 - 60	5
Total	**60**

18. If mode of the following frequency distribution is 55, then find the value of x

Class	Frequency
0 - 15	10
15 - 30	7
30 - 45	x
45 - 60	15
60 - 75	10
75 - 90	12

19. If the mean of the following data is 14.7, find the values of p and q.

Class	0-6	6-12	12-18	18-24	24-30	30-36	36-42	**Total**
Frequency	10	p	4	7	q	4	1	**40**

20. The following table shows the age distribution of cases of a certain disease admitted during a year in a particular hospital:

Class	5 - 14	15 - 24	25 - 34	35 - 44	45 - 54	55 - 64
Frequency	6	11	21	23	14	5

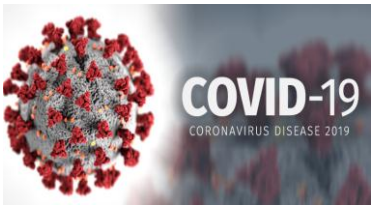
(i) Find the average age for which maximum cases occurred.

(ii) Which mathematical concept is used in this problem?

CASE STUDY BASED QUESTIONS (4 MARKS)

COVID- 19 Pandemic

21. 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.

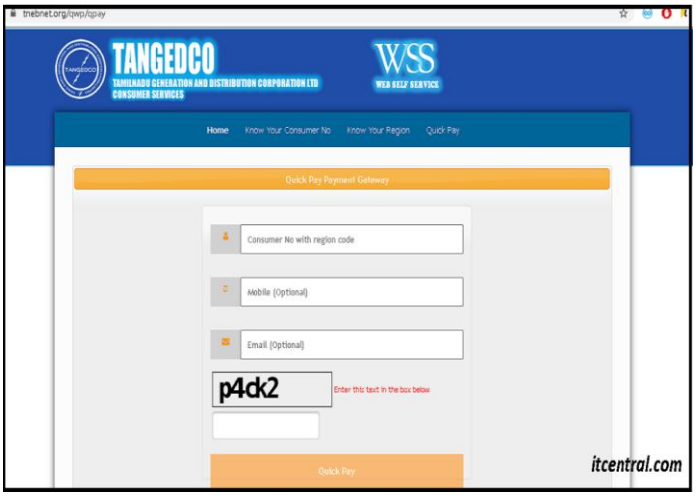


The following table shows the age distribution of case admitted during a day in a hospital

Age (in years)	No. of cases
5 - 15	6
15 - 25	11
25 - 35	21
35 - 45	23
45 - 55	14
55 - 65	5

(i) The average age for which maximum cases occurred is?
(ii) The upper limit of modal class is?
(iii) The mean of the given data is?

22. Electricity energy consumption is the form of energy consumption that uses electric energy. Global electricity consumption continues to increase faster than the world population, leading to an increase in the average amount of electricity consumed per person (per capita electricity consumption).



A survey is conducted for 56 families of a Colony A. The following table gives the weekly consumption of electricity of these families.

Weekly consumption (in units)	No. of families
0 - 10	16
10 - 20	12
20 - 30	18
30 - 40	6
40 - 50	4
50 - 60	0

(i) The median weekly consumption is?
(ii) The mean weekly consumption is?
(iii) The modal class of the above data is?

LONG QUESTIONS (5 MARKS)

23. On annual day of a school, 400 students participated in the function. Frequency distribution showing their ages is as shown in the following table.

Ages (in years)	05-07	07-09	09-11	11-13	13-15	15-17	17-19
Number of students	70	120	32	100	45	28	5

Find mean and median of the above data.

24. Daily wages of 110 workers, obtained in a survey, are tabulated below:

Daily Wages(in	100-120	120-140	140-160	160-180	180-200	200-220	220-240

□)							
Numbers of Workers	10	15	20	22	18	12	13

Compute the mean daily wages and modal daily wages of these workers.

25. If the median of the following frequency distribution is 32.5. Find the values of f_1 and f_2.

Class	0-10	10-20	20-30	30-40	40-50	50-60	60-70	**Total**
Frequency	f_1	5	9	12	f_2	3	2	**40**

ANSWERS

1.(C) 50	7. (A) 165	13. p = 4	19. p = 11, q = 3
2. (B)	8. (C) 82	14. Mode = 49.5	20. (i) Average age is 36.31 (ii) Mode of grouped data.
3. (A) Maximum frequency	9. (C) Assumed mean	15. Median class = 30 - 40	21. (i) 36.82 (ii) 45 (iii) 35.4
4. (B) 25	10. (B)14k	16. Median = 138.57	22. (i) 20 units (ii) 19.64 units (iii) 20 - 30 units
5. (C) 30 - 40	11. Mean = 50.1 and Median = 52	17. x = 8, y = 7	23. Mean = 10.17 Median = 9.625
6. (A) 25	12. $x_1 = 12$ $x_2 = 6$ $x_3 = 23$ $x_4 = 7$	18. x = 5	24. Mean = 170.182 Mode = 166.67
			25. $f_1 = 3$ $f_2 = 6$

CHAPTER 15: PROBABILITY

PROBABILITY

Probability is a measure of uncertainty of various phenomenon.
We can find the probability on the basis of observations and collected data. This is called statistical approach of probability.

Introduction To Probability

What is Probability?

Probability is the measure of how likely an event is.

the ratio of the number of favourable cases to the number of all the case or

P(E) = Number of outcomes favourable to E

Number of all possible outcomes of the experiment

Generally the word probability is used in our day to day conversations by coming across following statements such as :-

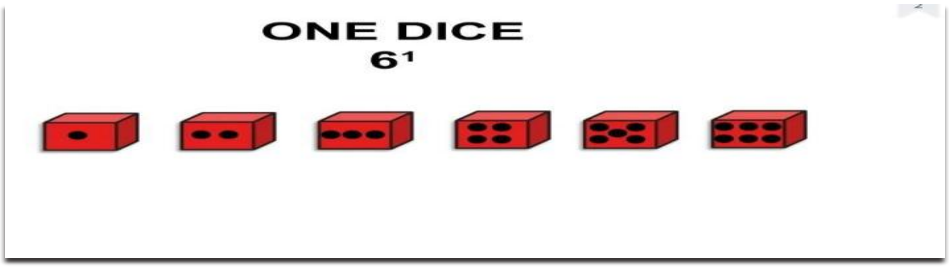
Probably it may rain today.

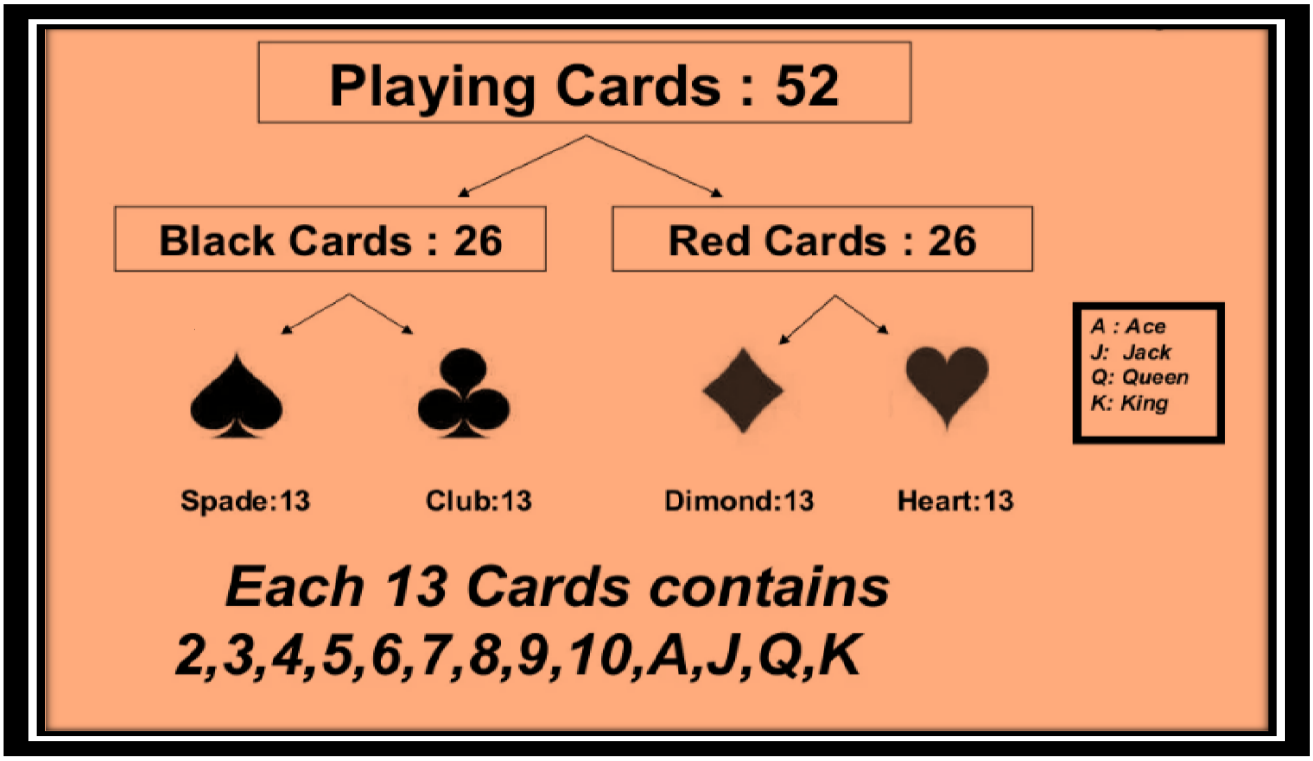
He may possibly join politics .

Indian Cricket Team has good chances of winning World –Cup.

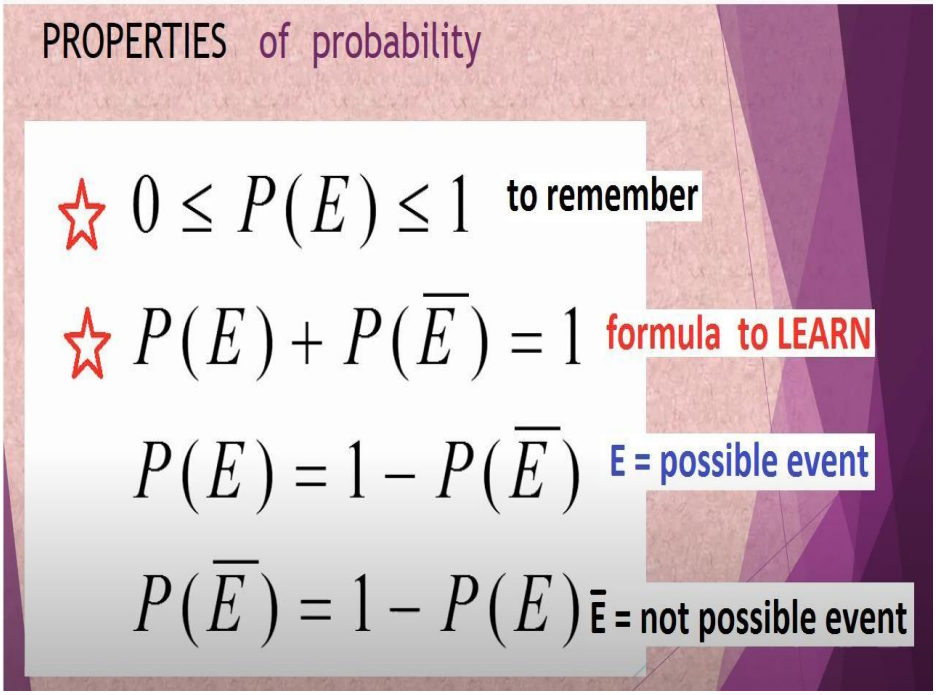
In this all statements, the terms probably , possibly & chance are used by me , which conveys the sense that there is uncertainity about what has happened and what is going to happen. Therefore , the term probability can substitute the word uncertainity.

Head Tail





IMPORTANT FORMULAS



MULTIPLE CHOICE QUESTIONS

(1 MARK EACH)

Q.1) Find the probability of getting a head when a coin is tossed once

(a) ½ (b) 1/3 (c) 2/3 (d) 1

Q.2) One card is drawn from a well-shuffled deck of 52 cards. Calculate the probability that the card will be an ace

(a) 1/52 (b) 1/26 (c) 1/13 (d) 0

Q.3) If an event cannot occur, then its probability is

(a) 1 (b) 2 (c) -1 (d) 0

Q.4) Which of the following cannot be the probability of an event?

(a) 1/3 (b) 0.9 (c) 5% (d) 17/16

Q.5) If P(A) denotes the probability of an event A, then

(a) $P(A) < 0$ (b) $P(A) > 1$ (c) $0 \leq P(A) \leq 1$ (d) $-1 \leq P(A) \leq 1$

Q.6) When a die is thrown, the probability of getting an odd number less than 3 is

(a) 1/3 (b) ½ (c) 1/6 (d) 5/6

Q.7) 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/p

Q.8) One ticket is drawn at random from a bag containing tickets numbered 1 to 40. The probability that the selected ticket has a number which is a multiple of 5 is.

(a) ¼ (b) 1/5 (c) 1/40 (d) None of these

Q.9) The probability of an event is 1 .Such an event is called_____(sure event/impossible event).

Q.10) The sum of the probabilities of all the elementary events of an experiment is_____ (1/0).

VERY SHORT ANSWER TYPE QUESTIONS2 MARKS EACH

Q.11) A bag contains lemon flavoured candies only. Malini takes out one candy without looking into the bag. What is the probability that she takes out

(i) an orange flavoured candy?

(ii) a lemon flavoured candy?

Q.12) 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 (see Fig. 15.4). What is the probability that the fish takenout is a male fish?

Q.13) Two players, Sangeeta and Reshma, play a tennis match. It is known that the probability of Sangeeta winning the match is 0.62. What is the probability ofReshma winning the match?

Q.14) A die is thrown once. Find the probability of getting a) A prime number b) a number lying between 2 and 6

Q.15) When we toss a coin, there are two possible outcomes - Head or Tail. Therefore, the probability of each outcome is ½ . justify your answer .

SHORT ANSWER TYPE QUESTIONS(3 MARKS EACH)

Q.16) A carton consists of 100 shirts of which 88 are good, 8 have minor defects and 4 have major defects. Jimmy, a trader, will only accept the shirts which are good, but Sujatha, another trader, will only reject the shirts which have major defects. One shirt is drawn at random from the carton. What is the probability that

(i) it is acceptable to Jimmy?

(ii) it is acceptable to Sujatha?

Q.17) There are 40 students in Class X of a school of whom 25 are girls and 15 are boys. The class teacher has to select one student as a class representative. She writes the name of each

student on a separate card, the cards being identical. Then she puts cards in a bag and stirs them thoroughly. She then draws one card from the bag. What is the probability that the name written on the card is the name of (i) a girl?

(ii) a boy?

Q 18) One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting

(i) a king of red colour (ii) a face card (iii) a red face card

(iv) the jack of hearts (v) a spade (vi) the queen of diamonds

Q.19) An integer is chosen between 0 and 100. What is the probability that it is

(i) divisible by 7? (ii) not divisible by 7?

Q.20) A letter of English alphabets is chosen at random. Determine the probability that the letter is a consonant.

LONG ANSWER TYPE QUESTIONS(5 MARKS EACH)

Q.21) Two dice, one blue and one grey, are thrown at the same time. Write

down all the possible outcomes. What is the probability that the sum of the two numbersappearing on the top of the dice is

(i) 8 (ii) 13 (iii) less than or equal to 12

Q.22) A child has a die whose six faces show the letters as given below:

A BC D E A

The die is thrown once. What is the probability of getting (i) A? (ii) D? (iii) F

Q.23) Which of the following arguments are correct and which are not correct? Give reasonsfor your answer.

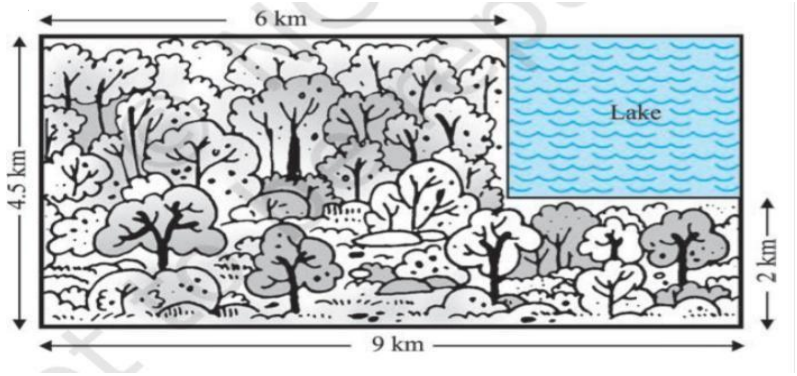
(i) If two coins are tossed simultaneously there are three possible outcomes—two heads, two tails or one of each. Therefore, for each of these outcomes, the probability is 1/3 .

(ii) If a die is thrown, there are two possible outcomes—an odd number or an even number. Therefore, the probability of getting an odd number is ½ .

CREATIVE AND CRITICAL THINKING(4 MARKS EACH)

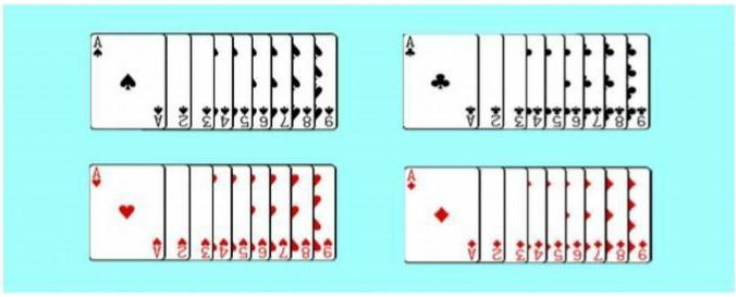
A missing helicopter is reported to have crashed somewhere in

therectangular region shown in Fig.

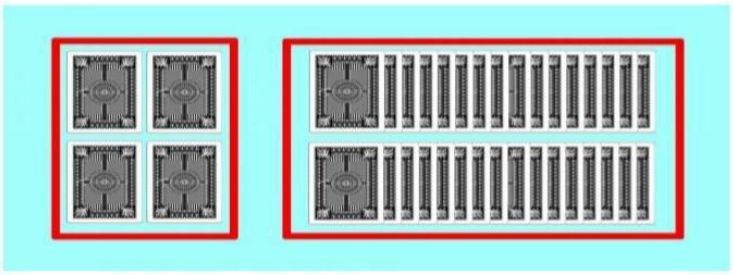


I What is the probability that it crashed inside the lake shown in the figure?II What is probability that it will not crash inside the lake
III If area of lake is 8.1 square km then what is the probability that it will crash in the lakeIV If area if lake is doubled then find the probability that helicopter will not crash in lake .

At Keshav's birthday party, he and his friends played card games.
In one of the games, they used the following 36 cards.



They divided the 36 cards in to two groups with the 4 Aces in one group and the remaining cards in the other group.



I Find the winning probability if Ace of

diamond is chosena) ½ b)

1/3 c) ¼ d) 1/5

II Find the winning probability if ace of spade is chosen

a) 0.5 b) 0.6 c) 0 d) None of these

III If a black ace is chosen in 1st group what is the probability that an odd number card can bechosen from 2nd group .

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

IV If card chosen in 2nd group is multiple of 2 then winning probability is

a) 10% b) 50% c) 100% None of these

SAMPLE PAPERS FOR PRACTICE

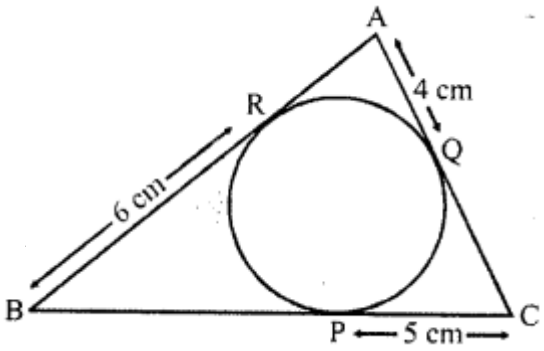
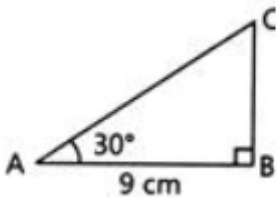
Sample Question Paper – 1
Mathematics (Standard)

Time Allowed: 3 Hrs. **Maximum Marks: 80**

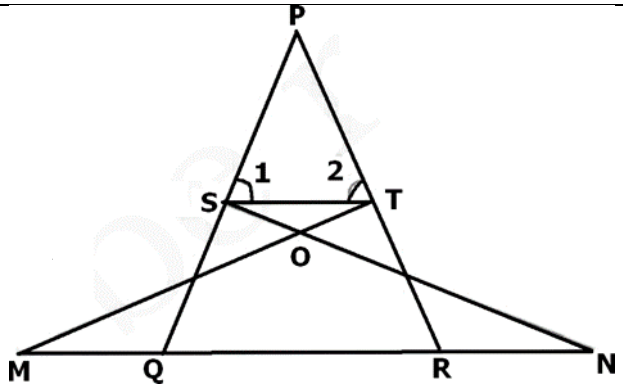
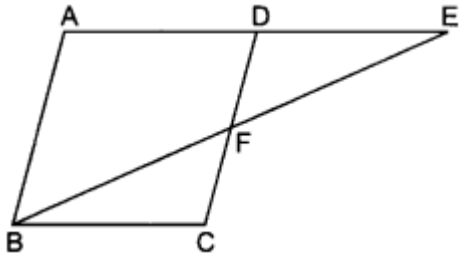
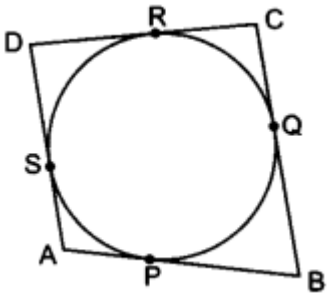
General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take $\pi = \frac{22}{7}$ wherever required if not stated.

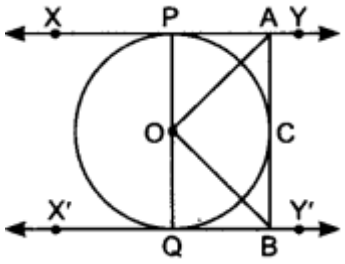
	Section A	
	Section A consists of 20 questions of 1 mark each.	
S.NO		**MARKS**
1.	If the LCM of a and 18 is 36 and the HCF of a and 18 is 2, then a = (a) 2 (b) 3 (c) 4 (d) 1	1
2.	The largest number which divides 70 and 125, leaving remainders 5 and 8, respectively, is (a) 13 (b) 65 (c) 875 (d) 1750	1
3.	If one root of the polynomial $f(x) = 5x^2 + 13x + k$ is reciprocal of the other, then the value of k is (a) 0 (b) 5 (c) 16 (d) 6	1
4.	If the system of equations $2x + 3y = 7$ $2ax + (a + b)y = 28$ has infinitely many solutions, then (a) a = 2b (b) b = 2a (c) a + 2b = 0 (d) 2a + b = 0	1
5.	The line segment joining points (-3, -4) and (1, -2) is divided by y-axis in the ratio (a) 1: 3 (b) 2 : 3 (c) 3 : 1 (d) 2 : 3	1
6.	If A (4, 9), B (2, 3) and C (6, 5) are the vertices of ΔABC, then the length of median through C is (a) 5 units (b) √10 units (c) 25 units (d) 10 units	1
7.	If x = 1 is a common root of $ax^2 + ax + 2 = 0$ and $x^2 + x + b = 0$ then, ab = (a) 1 (b) 2 (c) 4 (d) 3	1
8.	In ΔABC, D and E are points on side AB and AC respectively such that DE ‖ BC and AD: DB = 3 : 1. If EA = 3.3 cm, then AC = (a) 1.1 cm (b) 4 cm (c) 4.4 cm (d) 5.5 cm	1
9.	In the figure, the perimeter of ΔABC is (a) 30 cm (b) 60 cm (c) 45 cm (d) 15 cm	1

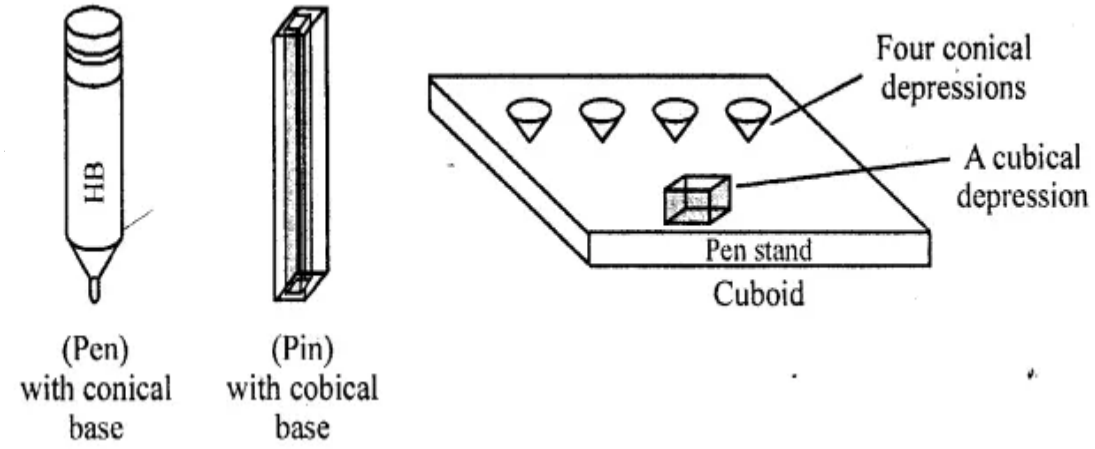
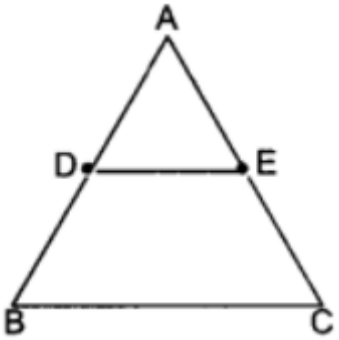
		
10	**If the perimeter of a semi-circular protractor is 36 cm, then its diameter is** **(a) 10 cm (b) 12 cm (c) 14 cm (d) 16 cm**	1
11.	In ΔABC , $\angle B = 90^0, \angle A = 30^0$ and AB = 9 cm then BC = (a) 3 cm (b) $3\sqrt{3}$ cm (c) $2\sqrt{3}$ cm (d) 2 cm 	1
12.	If $8\ tanx = 15$, then, $sinx - cosx$ is equal to (a) $\frac{8}{17}$ (b) $\frac{17}{7}$ (c) $\frac{1}{17}$ (d) $\frac{7}{17}$	1
13.	$\frac{\sin\theta}{1+\cos\theta}$ is equal to (a) $\frac{1+\cos\theta}{\sin\theta}$ (b) $\frac{1-\cos\theta}{\cos\theta}$ (c) $\frac{1-\cos\theta}{\sin\theta}$ (d) $\frac{1-\sin\theta}{\cos\theta}$	1
14	**If the area of a sector of a circle is $\frac{5}{18}$ of the area of the circle, then the sector angle is equal to** **(a) 60° (b) 90° (c) 100° (d) 120°**	1
15.	Two cubes each of volume 8 cm³ are joined end to end, then the surface area of the resulting cuboid is: (a) 80 cm² (b) 64 cm² (c) 40 cm² (d) 8 cm²	1
16.	**Consider the following frequency distribution:** **Class** 65-85 | 85-105 | 105-125 | 125-145 | 145-165 | 165-185 | 185-205 **Frequency:** 4 | 5 | 13 | 20 | 14 | 7 | 4 **The difference of the upper limit of the median class and the lower limit of the modal class is** **(a) 0 (b) 19 (c) 20 (d) 38**	1
17.	**The arithmetic mean and mode of a data are 24 and 12 respectively, then its median is**	1

	(a) 25 (b) 18 (c) 20 (d) 22	
18.	**The probability of guessing the correct answer to a certain test question** **is $\frac{x}{12}$. If the probability of not guessing the correct answer to this question** **is $\frac{2}{3}$, then x =** **(a) 2 (b) 3 (c) 6 (d) 4**	1
	Direction for questions 19 & 20: In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.	
19.	**Assertion**: The value of y is 6, for which the distance between the points P(2,_3) and Q(10,y) is 10. **Reason:** Distance between two given points A (x_1, y_1) and B (x_2, y_2) is given, AB = $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ (a)Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). (b)Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A). (c) Assertion (A) is true but reason (R) is false. (d) Assertion (A) is false but reason (R) is true.	1
20.	**Assertion:** Denominator of 12.145 when expressed in the form $\frac{p}{q}$, q≠ 0 is of the form $2^m \times 5^n$ where m and n are non-negative integers. **Reason:** 12.145 is a terminating decimal expansion (a) Both assertion (A) and (R)are true and reason (R)is the correct explanation of assertion (A) (b) Both assertion (A) and (R)are true but reason (R)is not the correct explanation of assertion (A) (c) Assertion (A) is true but reason (R)is false (d) Assertion (A) is false but reason (R)is true	1
	Section B	
	Section B consists of 5 questions of 2 marks each.	
21	For which values of a and b does the following pai of linear equation have an infinite number of solutions□ 2x + 3y =7 (a – b) x + (a + b) y = 3a + b – 2	2
22	Prove that: $\frac{\cos A}{1+\sin A} + \frac{1+\sin A}{\cos A} = 2 \sec A.$	2
23	In the given Figure, if ∠1 =∠2 and ΔNSQ ~ ΔMTR, then prove that Δ PTS ~ ΔPRQ.	2

	 **(OR)** E is a point on the side AD produced of a parallelogram ABCD and BE intersects CD at F. Show that ΔABE ~ ΔCFB. 	
24	A quadrilateral ABCD is drawn to circumscribe a circle (see figure). Prove that AB + CD = AD + BC 	2
25	In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre. Find: (i) length of the arc. (ii) area of the sector formed by the arc. **(OR)** **A steel wire when bent in the form of a square encloses an area of 121 cm^2. If the same wire is bent in the form of a circle, find the area of the circle.**	2

	Section C	
	Section C consists of 6 questions of 3 marks each.	
26	Prove that √5 is an irrational number.	3
27	**Find the zeroes of the following quadratic polynomial $3x^2 – x – 4$ and verify the relationship between the zeroes and the coefficients.**	3
28	Yash scored 40 marks in a test, getting 3 marks for each right answer and losing 1 mark for	3

	each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks been deduced for each incorrect answer, then Yash would have scored 50 marks. How many questions were there in the test? **(OR)** A train covered a certain distance at a uniform speed. If the train would have been 10 km/h faster, it would have taken 2 hours less than the scheduled time. And, if the train were slower by 10 km/h it would have taken 3 hours more than the scheduled time. Find distance covered by the train.	
29	In figure, XY and X'Y' are two parallel tangents to a circle, x with centre O and another tangent AB with point of contact C intersecting XY at A and X'Y' at B. Prove that ∠AOB = 90°.  	3
30	**Prove that:** $\frac{1}{\cos A + \sin A - 1} + \frac{1}{\cos A + \sin A + 1} = \text{cosec } A + \sec A$ **(OR)** $\frac{\cos A - \sin A + 1}{\cos A + \sin A - 1} = \text{cosec A} + \cot \text{A, using the identity cosec}^2 \text{A} = 1 + \cot^2 \text{A.}$	3
31	**Cards marked with numbers 13, 14, 15,……. 60 are placed in a box and mixed thoroughly. One card is drawn at random from the box. Find the probability that, number on the card drawn is** **(i) divisible by 5** **(ii) a number is a perfect square** **(iii) a prime number**	3
	Section D	
	Section D consists of 4 questions of 5 marks each.	
32	In a class test, the sum of Shefali's marks in Mathematics and English is 30. Had she got 2 marks more in Mathematics and 3 marks less in English, the product of her marks would have been 210. Find her marks in two subjects. **(OR)** Two water taps together can fill a tank in $9\frac{3}{8}$ 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 tank.	5
33	Rachel, an engineering student, was asked to make a model shaped like a cylinder with two cones attached at its two ends by using a thin aluminium sheet. The diameter of the model is 3 cm and its length is 12 cm. If each cone has a height of 2 cm, find the volume of air contained in the model that Rachel made. (Assume the outer and inner dimensions of the model to be nearly the same.) **(OR)** **A pen stand made of wood is in the shape of a cuboid with four conical depressions and a cubical depression to hold the pens and pins, respectively. The dimension of the cuboid are 10 cm x 5 cm x 4 cm. The radius of each of the conical depression is 0.5 cm**	5

	and the depth is 2.1 cm. The edge of the cubical depression is 3 cm. Find the volume of the wood in the entire stand. [NCERT Exemplar]  	
34.	Prove 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. Using the above result, do the following: In Fig. if DE || BC and BD = CE, prove that ΔABC is an isosceles triangle.  	5
35	The following frequency distribution gives the monthly consumption of electricity of 68 consumers of a locality. Find the median, mean and mode of the data and compare them. **Monthly consumption (in units) / Number of consumers** 65 – 85: 4 85 – 105: 5 105 – 125: 13 125 – 145: 20 145 – 165: 14 165 – 185: 8 185 – 205: 4	5
	Section E	
	Case study-based questions are compulsory.	
36	Satellite Images: Satellite images are images of Earth collected by imaging satellites operated by governments and businesses around the world. Satellite imaging companies sell images by	

licensing them to governments and businesses such as Apple Maps and Google Maps. It should not be confused for astronomy images collected by space telescope. Barun lives in Jaipur in Vaishali. Satellite image of his colony is shown in given figure. In this view, his house is pointed out by a flag, which is situated at the point of intersection of x and y - axes. If he goes 2 cm east and 3 cm north from the house, then he reaches to a grocery store, If he goes 4 cm west and 6 cm south from the house, then he reaches to his office. If he goes 6 cm east and 8 cm south from the house, then he reaches to a food court. If he goes 6 cm west and 8 cm north from the house, he reaches to his kid's school.

Based on the above information, answer the following questions. 1

(i) What is the distance between grocery store and food court?

(ii) If the grocery store and office lie on a line, what is the ratio of distance of house from grocery store to that from office? 2

(OR)

What is the ratio of distances of house from school to food court.

(iii) What shape is formed by the coordinates of positions of school, grocery store, food court and office? 1

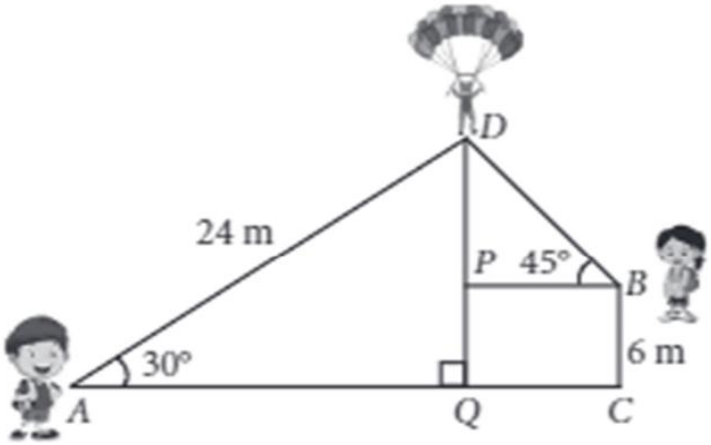
37 In Annual Sports Day of International School Hyderabad, Aditya wants to participate in a 200 m race. Presently, he can run 200 m in 51 seconds and during each day practice it takes him 2 seconds less. He wants to do in 31 seconds.

Based on the above information, answer the following questions

(i) Write an AP for the given situation? Also, write its first term and the common difference

(ii) What is the minimum number of days he needs to practice till his goal is achieved?

(iii) If nth term of an AP is given by an = 2n + 3 then, find the AP and also find the sum of 15 terms of this AP 1

	(OR) Three numbers are in A.P. If the sum of these numbers be 27 and the product 648, find the numbers.		1 2
38	**HOT AIR BALLOON** Karan and his sister Ridhima visited at their uncle's place, Himachal Pradesh. During day time Karan, who is standing on the ground spots a paraglider at a distance of 24 m from him at an elevation of 30^0. His sister Ridhima is also standing on the roof of a 6 m high building, observes elevation of the same paraglider as 45^0 . Karan and Ridhima are on the opposite sides of the paraglider  **Based on the above information, answer the following questions**		
	(i) Find the distance of the paraglider from the ground (ii) Find the value of PD (iii) Find the distance between the paraglider and Ridhima & distance between the paraglider and Karan. **(OR)** Find AQ and PB distance.		1 1 2

Model question paper - 2

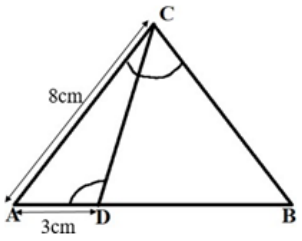
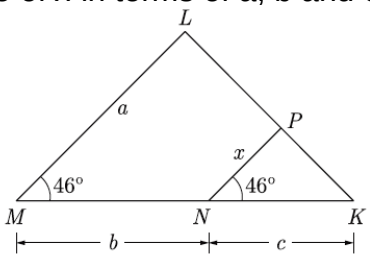
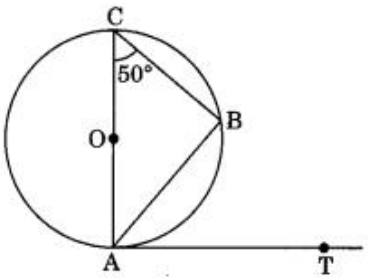
Class – X - Subject- Mathematics (Standard-041)

Time Allowed: **3 Hours** Maximum Marks: **80**

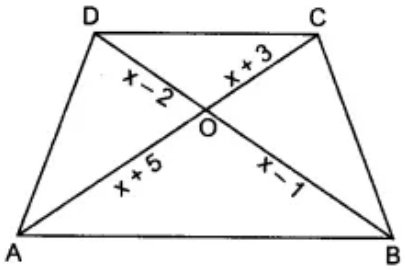
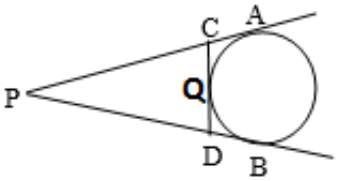
General Instructions:

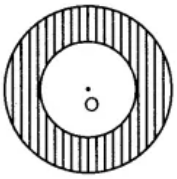
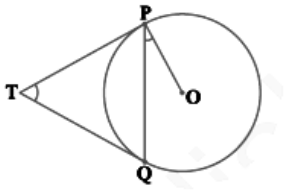
1. This Question Paper has 5 Sections A-E.
2. Section **A** has 20 MCQs carrying 1 mark each
3. Section **B** has 5 questions carrying 02 marks each.
4. Section **C** has 6 questions carrying 03 marks each.
5. Section **D** has 4 questions carrying 05 marks each.
6. Section **E** has 3 case based integrated units of assessment (04 marks each).
7. All Questions are compulsory. However, an internal choice in 2 Questions of 2 marks, 2 Questions of 3 marks, 2 Questions of 5 marks and 1 question in Section E have been provided.

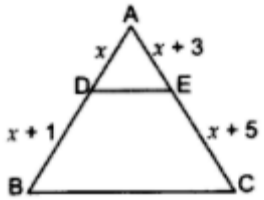
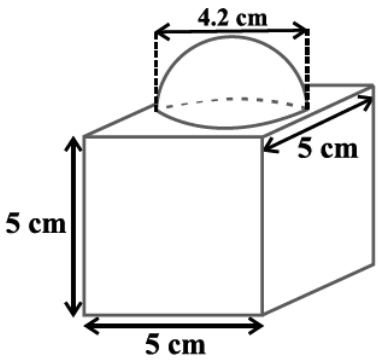
SECTION-A		
(Section A consists of 20 questions of 1 mark each.)		
Q.N		MARK
01	If two positive integers p and q can be expressed as $p = ab^2$ and $q = a^3b$; where a,b being prime numbers, then LCM (p,q) is equal to (a) ab (b) a^2b^2 (c) a^3b^2 (d) a^3b^3	1
02	Which of the following is not a quadratic equation? (a) $2(x-1)^2 = 4x^2 - 2x + 1$ (b) $2x - x^2 = x^2 + 5$ (c) $(\sqrt{2}x + \sqrt{3})^2 + x^2 = 3x^2 - 5x$ (d) $(x^2 + 2x)^2 = x^4 + 3 + 4x^3$	1
03	If the zeroes of the polynomial $x^2 + px + q$ are double in value to the zeroes of $2x^2 - 5x - 3$, the value of p and q will be (a) –2 and –3 (b) –6 and –5 (c) –5 and –6 (d) –3 and –2	1
04	One equation of a pair of dependent linear equation is -5x + 7y = 2. The second equation can be (a) 10x + 14y + 4 = 0 (b) -10x – 14y + 4 = 0 (c) -10x + 14y + 4 = 0 (d) 10x – 14y = -4	1
05	The vertices of a parallelogram in order are A(1,2), B(4, y), C(x, 6) and D(3,5). Then (x, y) is (a) (6, 3) (b) (3, 6) (c) (5, 6) (d) (1, 4)	1

06	In the given figure, ∠ACB = ∠CDA, AC = 8cm, AD = 3cm, then BD is  (a) 22/3 cm (b) 26/3 cm (c) 55/3 cm (d) 64/3 cm	1
07	In the given figure , the value of *x* in terms of a, b and c is  (a) $\frac{ab}{a+b}$ (b) $\frac{bc}{b+c}$ (c) $\frac{ac}{c+b}$ (d) $\frac{ac}{a+c}$	1
08	If sin α + cos α = $\sqrt{2}$ cos α , (α ≠ 90^0) then the value of tan α is (a) $\sqrt{2}$ - 1 (b) $\sqrt{2}$ + 1 (c) $\sqrt{2}$ (d) $-\sqrt{2}$	1
09	If tan(*A* + *B*) = $\sqrt{3}$ and tan(*A* - *B*)= $\frac{1}{\sqrt{3}}$, *A* > *B*, then the value of *A* is ..... . (a) 45° (b) 60° (c) 90° (d) 30°	1
10	The areas of two similar triangles are 81cm^2 and 49cm^2 respectively, then the ratio of their corresponding medians is (a) 7 : 9 (b) 9 : 81 (c) 9 : 7 (d) 81 : 7	1
11	If Fig., AB is a chord of the circle and AOC is its diameter such that ∠ACB = 50°. If AT is the tangent to the circle at the point A, the ∠BAT is equal to  (a) 65° (b) 60° (c) 50° (d) 40°	1
12	The area of a circle that can be inscribed in a square of side 10 cm is (a) 40π cm² (b) 30π cm² (c) 100π cm² (d) 25π cm²	1
13	If the perimeter of a semicircular protractor is 72 cm where π = 22/7, then the	1

	diameter of protractor is (a) 14 cm (b) 33 cm (c) 28 cm (d) 42 cm	
14	The relationship between mean, median and mode is (a) mode = median – 2 mean (b) mode = 3 median – 2 mean (c) mode = 2 median – 3 mean (d) mode = median – mean	1
15	If the perimeter of a semicircular protractor is 72 cm where π = 22/7, then the diameter of protractor is (a) 14 cm (b) 33 cm (c) 28 cm (d) 42 cm	1
16	For the following distribution <table><tr><td>C.I.</td><td>0-10</td><td>10-20</td><td>20-30</td><td>30-40</td><td>40-50</td></tr><tr><td>f</td><td>20</td><td>30</td><td>24</td><td>40</td><td>18</td></tr></table> the sum of lower limits of the modal class and the median class is (a) 20 (b) 30 (c) 40 (d) 50	1
17	Two fair dice are rolled simultaneously. The probability that 5 will come up at least once is (a) 5/36 (b) 11/36 (c) 12/36 (d) 23/36	1
18	If 4 tan θ = 3, then $\frac{4\sin\theta-\cos\theta}{4\sin\theta+\cos\theta}$ is equal to (a) $\frac{1}{2}$ (b) $\frac{1}{3}$ (c) $\frac{2}{3}$ (d) $\frac{3}{4}$	1
	Direction: In the question number 19 and 20,a statement of assertion (A) is followed by a statement of Reason(R). **Choose the correct option:**	
19	**Assertion (A):** The HCF of two numbers is 5 and their product is 150, then their LCM is 30. **Reason (R):** For any two positive integers *a* and *b*, HCF (*a*,*b*) + LCM(*a*,*b*) = *a*+*b*. (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A). (c) Assertion (A) is true but reason (R) is false (d) Assertion (A) is false but reason (R) is true.	1

20	**Assertion (A):** The value of y is 6, for which the distance between the points P(2, –3) and Q(10, y) is 10. **Reason (R):** Distance between two given points A (x_1, y_1) and B (x_2, y_2) is given by $$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$ (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A). (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A). (c) Assertion (A) is true but reason (R) is false (d) Assertion (A) is false but reason (R) is true.	1
	SECTION-B	
	(Section B consists of 5 questions of 2 marks each.)	
21	Solve for x and y : 37x + 43y=123 ; 43x + 37y=117	2
22	In the given figure, ABCD is a trapezium with DC||AB. If OD = x-2, OB = x – 1, OA = x + 5 and OC = x +3, find the value of x. 	2
23	PA and PB are tangents to the circle drawn from an external point P and CD is a third tangent touching the circle at Q. If PB =10cm, what is the perimeter of ∆PCD? 	2

24	In the given figure, the area of the shaded region between two concentric circles is 286 cm^2.If the difference of the radii of the two circles is 7 cm, find the sum of their radii.  **OR** What is the angle subtended at the centre of a circle of radius 7 cm, by an arc of length $\frac{7}{4}$ π cm?	2
25	If √3 sinΘ - cosΘ=0 and 0°<Θ <90°, find the value of Θ. **OR** Evaluate: $3\sin^2 30^0 + 2\tan^2 60^0 - 5\cos^2 45^0$	2
	SECTION-C	
	(Section C consists of 6 questions of 3 marks each.)	
26	Prove that 7+2√3 is irrational, given that √3 is irrational.	3
27	If one of the zeros of the quadratic polynomial f(x) = $4x^2$ – 8kx – 9 is equal in magnitude but opposite in sign of the other, find the value of k.	3
28	The sum of the squares of two consecutive odd numbers is 394. Find the numbers. **OR** The 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.	3
29	Prove that : $\frac{\cos\theta - \sin\theta + 1}{\cos\theta + \sin\theta - 1} = \cos ec\,\theta + \cot\theta$ **OR** If $\cos\theta + \sin\theta = \sqrt{2}\cos\theta$, Prove that $\cos\theta - \sin\theta = \sqrt{2}\sin\theta$	3
30	Two tangents TP and TQ are drawn to a circle with centre O from an external point T. Prove that ∠PTQ = 2 ∠OPQ.  	3

31	Three different coins are tossed together. Find the probability of getting a)exactly two heads b)at least two heads	3
	SECTION-D	
	(Section D consists of 4 questions of 5 marks each.)	
32	A boat covers a distance of 30km upstream and 44km downstream in 10 hours. Also, it covers 40km upstream and 55km downstream in 13 hours. Find the speed of the boat in still water and the speed of the stream. **OR** A train covers a distance of 90km at an uniform speed. Had the speed been 15 km/hr more, it would have taken 30 minutes less for the journey. Find the original speed of the train.	5
33	Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio. Using the above theorem, Find the value of x if in ∆ABC, DE || BC.  	5
34	A cylindrical vessel with diameter 16 cm and height 10.5 cm is full of water. A solid cone of base radius 7cm and height 9 cm is completely immersed in It. Find the volume of (a) water displaced from the cylindrical vessel and (b) water left in the vessel. **OR** The decorative wooden block as shown in figure is made of two solids - a cube and a hemisphere. The base of the block is a cube with edge 5 cm, and the hemisphere fixed on the top has a diameter of 4.2 cm.  a) Find the total surface area of the block. b) Find the volume of wood contained in the block.	5

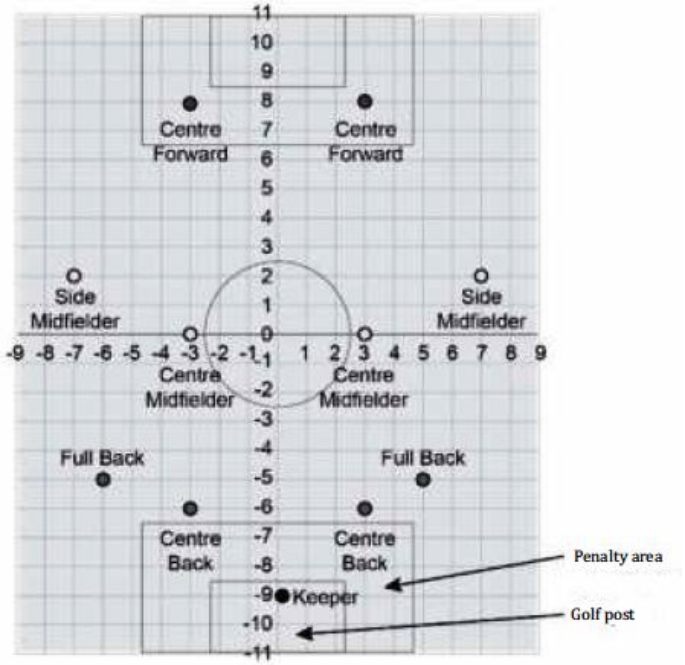
35 | Find the missing frequencies f_1 and f_2, if the mean of the following distribution is 21.4 and the total frequency is 40. | 5

Class Interval	0-8	8-16	16-24	24-32	32-40
Frequency	6	f_1	10	f_2	9

SECTION-E

(Section E consists of 03 case based questions of 4 marks each.)

36 | Ronit is the captain of his school football team. He has decided to use a 4-4-2-1 formation in the next match. The figure below shows the positions of the players in a 4-4-2-1 formation on a coordinate grid. | 4



One square box represents 1 square unit.

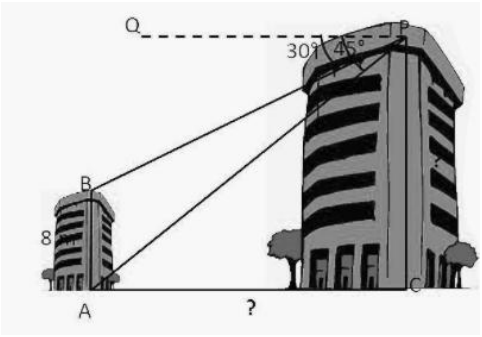
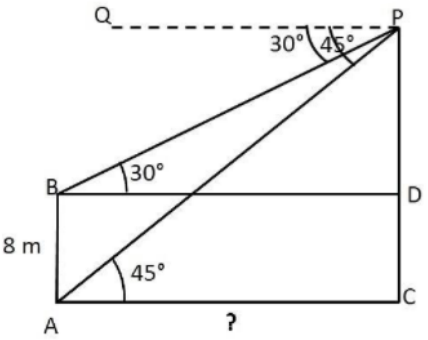
a) Write the coordinates which represents the position of the goalkeeper? (1mark)

b) What is the distance between the two centre forward positions in Ronit's plan? (1mark)

c) What are the coordinates of the point on the y-axis which is equidistant from the left centre forward and the right centre midfielder positions? (2marks)

OR

What is the distance between the two centre forward positions in Ronit's plan?

37	India is a competitive manufacturing location due to the low cost of manpower and strong technical and engineering capabilities contributing to higher quality production runs. The production of TV sets in a factory increases uniformly by a fixed number every year. It produced 16000 sets in 6th year and 22600 in 9th year. **Based on the above information, answer the following questions:** a) What was the production in the 1st year?(1 mark) b) What is the increase in production every year?(1 mark) c) In which year,will the production be 29,200.(2 marks) **OR** Find the difference of the production during 7th year and 4th year.	4
38	Rashmi lives in a multistoreyed building.From the top of the multistoreyed building the angle of depression of the top and bottom of a 8m tall building are 30^0 and 45^0 respectively. [use $\sqrt{3}$ =1.732]   a) Find the length PD ?(1mark) b) What is the height (PC) of the multistoreyed building?(2marks) c) What is the distance between the two buildings?(1 mark)	4

~~All the Best~~

Question Paper – 3

Mathematics (Standard)Sample

Time Allowed: 3 Hrs. **Maximum Marks : 80**

General Instructions:

1. This Question Paper has 5 Sections A-E.
2. Section A has 20 MCQs carrying 1 mark each
3. Section B has 5 questions carrying 02 marks each.
4. Section C has 6 questions carrying 03 marks each.
5. Section D has 4 questions carrying 05 marks each.
6. Section E has 3 case based integrated units of assessment (04 marks each) with subparts of thevalues of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 5 marks, 2 Qs of 3 marks and 2 Questions of 2 marks has been provided. An internal choice has been provided in the 2marks questions of Section E
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

SECTION A

Section A consists of 20 questions of 1 mark each.

1. The LCM of smallest two digit composite number and smallest composite number

   is(a) 12 (b)10 (c) 20 (d) 12

2. The arithmetic mean of two numbers a and b is 8 and ab= 9 then the quadratic equation whoseroots are a and b is

   (a) $x^2 + 16x + 9 = 0$ (b) $x^2 - 16x + 9 = 0$ (c) $x^2 + 16x - 9 = 0$ (d) $x^2 + 9x - 16 = 0$

3. If the sum of the zeroes of the quadratic polynomial $ky^2 + 2y – 3k$ is equal to twice theirproduct , then the value of k is

   (a) 6 (b) 3 (c) 1/3 (d) – 1 /3

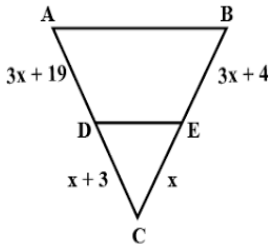
4. If the system of equations $3x + 2y = 1$ and $(2k + 1)x + (k + 2)y = k – 2$ have an infinite number of solutions , then the values of k are

   (a) k = 4 , k = - 6 (b) k = - 4 , k = 6 (c) k = 4 , k = 6 (d) k = - 4 , k = - 6

5. If the points A (1, -2) , B(2, 3) C (a , 2) D (-4 , - 3) , form a parallelogram then the value of ais

   (a) (-1 , 0) (b) (1 , 0) (c) (0 , 1) (d) (0 , -1)

6. The value of x for which DE ‖ AB in the given figure is



(a) x = - 2 (b) x = 2 (c) x = 4 (d) x = - 4

7.If Sin θ – Cos θ = 3/5 then , Sin θ Cos θ is

(a) 8 /25 (b) 3 /25 (c) 2 /25 (d) 1 /25

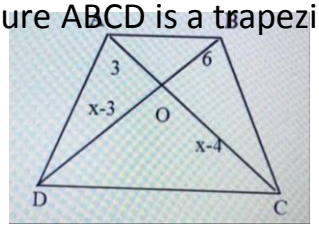
8.If 2 Cos 3 θ = $\sqrt{3}$, then the value of θ is

(a)10^0 (b) 20^0 (c) 30^0 (d) 40^0

9. Δ ABC ~ Δ DEF . If AB = 4 cm , BC = 3.5 cm , CA = 2.5 cm and DF = 7.5 cm then perimeter of the Δ DEF is

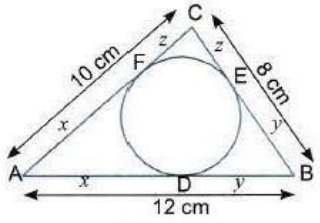
(a) 10 cm (b) 20 cm (c) 30 cm (d) 40

cm10.In the given figure ABCD is a trapezium with AD ‖ BC , then value of x is



(a) 3 (b) 4 (c) 5 (d) 6

11.A circle is inscribed in a triangle having sides 8 cm , 10 cm , 12 cm as shown in the figure . The measure of AD is



(a) 6 cm (b) 7 cm (c) 8 cm (d) 11 cm

12.All the vertices of a rhombus lie on a circle if the area of the circle is 1256 cm^2. Then the area of rhombus will be (use π = 3.14)

(a) 200 cm^2 (b) 400 cm^2 (c) 800 cm^2 (d) 1000 cm^2

13. A cylinder , cone, and hemisphere are of equal base and same height. The ratio their volume is(a) 1:2:3
(b) 2:3:1 (c) 2:1:3 (d) 3:1:2

14. If the median of a serial exceeds the mean by 3 , then the number by which mode exceeds itsmean is

(a) 3 (b) 6 (c) 9 (d)

remains same 15.If the perimeter of a circle is half to that of a square then the ratio of the

area of the circle to the area of the square is

(a) 22: 7 (b) 11 : 7 (c) 7 : 11 (d) 7: 22

16. The mean of 25 observations is 36 . If mean of first 13 is 32 and for the last 13 is 39 , then the13^{th} observation is

(a) 23 (b) 36 (c) 35.5 (d) 37

17. In a family of three children , the probability of having atleast one girl is

(a) 1/8 (b) 1/2 (c) 7/8 (d) ¾

18.If Sec θ + tan θ = p, then tan θ is

(a)$\frac{P^2+1}{2p}$ (b) $\frac{P^2-1}{2p}$ (c) $\frac{p^2-1}{p^2+1}$ (d) $\frac{p^2+1}{p^2-1}$

19. DIRECTION: In the question number 19 and 20, a statement of assertion (A) is followed by a statement of Reason (R).
Choose the correct option
Statement A (Assertion) : $(2 - \sqrt{5})$ is an irrational number.
Statement R(Reason) : The sum or difference of a rational and an irrational number isirrational.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanationof assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correctexplanation of assertion (A)
(c) Assertion (A) is true but reason (R) is false.
(d) Assertion (A) is false but reason (R) is true.

20. Statement A (Assertion): The point (-1 , 6) divides the line segment joining the points (-3 ,10) and (6, - 8) in the ratio 2 : 7 internally .
Statement R(Reason) : Given three points i.e A , B, C form an equilateral triangle , then AB =BC = AC.

(a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanationof assertion (A)
(b) Both assertion (A) and reason (R) are true and reason (R) is not the correctexplanation of assertion (A)
(c) Assertion (A) is true but reason(R) is false.
(d) Assertion (A) is false but reason(R) is true.

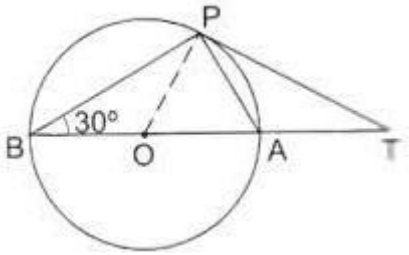
SECTION B

Section B consists of 5 questions of 2 marks each.

21. In Δ ABC $\angle A = x^0$, $\angle B = (3x - 2)^0$, $\angle C = y^0$. Also $\angle C - \angle B = 9^0$. Find the sum of the greatest and the smallest angles.

22. In the given figure $\angle D = \angle E$ and $\frac{AD}{DB} = \frac{AE}{EC}$,prove that BAC is an isosceles triangle.

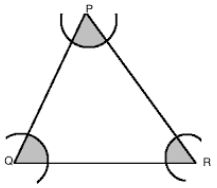
23. In the given figure , BOA is a diameter of a circle and the tangent at point P meets BA at T. If ∠PBO = 30^0 , What is the measure of ∠PTA?



24. ABC is a right triangle in which ∠B = 90^0 , if AB = 8cm and BC = 6cm , find the diameter of the circle inscribed in the triangle.

OR

In the given figure ,arcs have been drawn with radii 14 cm each with centres p , q and r . Findthe area of the shaded region.



25.Find A and B , if Sin (A + 2B) = $\frac{\sqrt{3}}{2}$ and Cos (A + 2B) =0 , where A and B are acute angles .

OR

Cos θ + Sin θ = $\sqrt{2}$ Cos θ , Show that Cos θ − Sin θ = $\sqrt{2}$ Sin θ

SECTION C

Section C consists of 6 questions of 3 marks each.

26.Given that $\sqrt{5}$ is irrational , prove that 3 + $\sqrt{5}$ is irrational.

27. If each zero of the polynomial x^2 + 2 mx + n is 3 times the zero of 3 x^2 – 5 x + 2 , find the values of m and n .

28. Places A and B are 160 km apart on a highway .One car starts from A and another car fromB at the same time. If they travel in the same direction , they meet in 8 hours. But , if they travel towards each other , they meet in two hours .Find the speed of each car.

OR

The sum of a two digit number and the number obtained by reversing the digits is 66.If thedigits differ by 2 ,find the number.

29. Prove that :

$$\frac{sin\theta - \cos\theta + 1}{\sin\theta + cos\theta - 1} = \frac{1}{\sec A - \tan A}$$

30. If a circle touches the side BC of a ΔABC at P and extended sides AB and AC at Q and R respectively .Prove that AQ = $\frac{1}{2}$ (BC + CA+ AB)

OR

Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementary angles at the centre of the circle.

OR

Prove that opposite sides of a quadrilateral circumscribing a circle subtend supplementaryangles at the centre of the circle.

31. Two different dice are thrown together , find the probability that the number obtained
(i) have a sum less than 7
(ii) have a product less than 16
(iii) is a doublet of odd numbers

SECTION D

Section D consists of 4 questions of 5 marks each

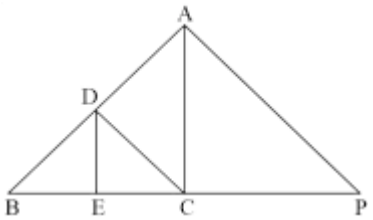
32. A person on tour has Rs 4200 for his expenses. If he extends his tour for 3 days , he has tocut down his daily expenses by Rs 70. Find the original duration of the tour.

OR

A train travels at a certain average speed for a distance of 63 km and then travels a distance of 72 km at an average speed of 6km per hour more than its original speed. If it takes 3 hoursto complete the total journey , what is the original speed of the train?

33. Prove that if a line is drawn parallel to one side of a triangle intersecting the other two sides in distinct points, then the other two sides are divided in the same ratio.

Using the above theorem prove that $\frac{BE}{EC} = \frac{BC}{CP}$ if DE ∥ AC and DC ∥ AP in the given figure



34. Ramesh had a field of length 20m and width 14 m. During lockdown , he had ample amount of free time, so he decided to do some tree plantation on the field. For doing so first of all he want to make a deep pit , he will put all the fruit and vegetable waste and biodegradable waste to make it compost , used in farming. For this he dug a deep well of diameter 7m in the corner

of the field .The earth taken out from the pit is spread uniformly on the remaining field.

Find:
(i) How much earth is taken out from deep pit?
(ii) Upto what height the field is raised when earth taken out from pit is spread on the field?(Use π = 22/7)

OR

Students of class X decided to visit some nearby old age home .They want to spend their whole day with the old age people there and want to rejuvenate them.They also decided to prepare some handmade gifts for the inmates .There are a total of 50 students. Each one of them will prepare a cylindrical flower vase using cardboard to gift the inmates .The radius ofthe cylinder is 4.2 cm and the height is 11.2 cm.

Find:
(i) The capacity of each cylindrical vase .
(ii) The total area of cardboard sheet required for making a vase.

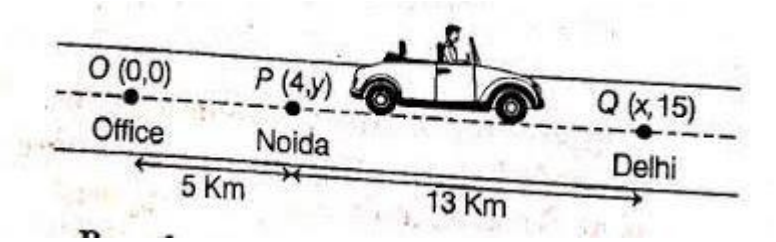
35. The mean of the following distribution is 145, find the value of f_1 and f_2.

CLASS INTERVAL	FREQUENCY
0-50	8
50-100	$\mathbf{f_1}$
100-150	32
150-200	26
200-250	$\mathbf{f_2}$
250-300	7
TOTAL	100

SECTION E

Case Study based questions are compulsory.

36.Anmol is driving his car on a straight road towards east from his office to Noida and next toDelhi. At some point in between Noida and Delhi, 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 question.(i)What is the value of y?

(ii) What is the value of x?

(iii) Find the ratio in which Noida divides the line segment joining the office and Delhi.

OR

If M is any point exactly in between Noida and Delhi then find the coordinates of M.

37.Kanika was given her pocket money on Jan 1st 2008.She puts Rs1 on day 1 , Rs 2 on day 2 , Rs 3 on day 3 and continued doing so till the end of the month .From this money into her piggy bank she also spent Rs 204 of her pocket money and found that at the end of the monthshe still has Rs 100 with her.

(i) What is the amount saved by Kanika till January 20th , 2008?

(ii) How much Kanika take till the end of the month from pocket money?

OR

How much was pocket money for the month?

(iii) What is the amount saved by Kanika till January 13th 2008?

38.A group of students of class X visited India Gate on an educational trip. The teacher narratedthat the India Gate officially named Delhi memorial was originally called as All India War Memorial which is dedicated to the troops of British India who died in wars fought between 1914 and 1919.The teacher also said that India Gate which is located at the eastern end of theRajpat (formerly called the Kingsway) is about 42 m in height.

Use the above information to answer the following questions:

(i) What is the angle of elevation if they are standing at a distance of 42 m away from themonument ?

(ii) They want to see the tower at an angle of 60^0 so they want to know the distance wherethey should stand.

OR

If the altitude of the sun is at 60^0 .What is the height of the vertical tower that will cast ashadow of length 20m?

(iii) The ratio of height of the monument and to its shadow is 1 : 1, then find the angle ofelevation of the sun.

MODEL QUESTION PAPER - 4

SUBJECT:-MATHEMATICS BASIC (241)

Class X Marks 80

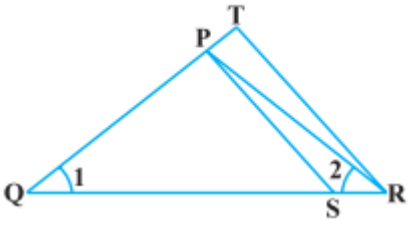
Time 3 Hrs

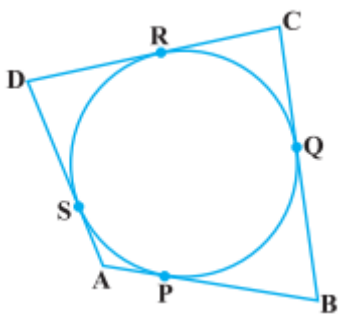
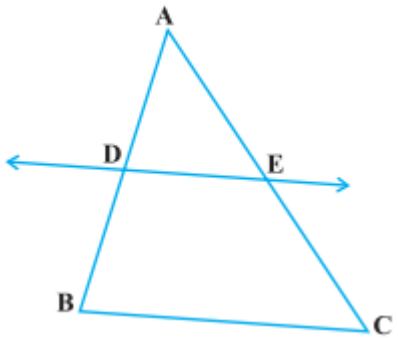
General Instructions:

1. This Question Paper has 5 Sections A, B, C, D, and E.
2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.
5. Section D has 4 Long Answer (LA) type questions carrying 5 marks each.
6. Section E has 3 Case Based integrated units of assessment (4 marks each) with sub-parts respectively for 1, 1 and 2 marks each.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 2 marks, 2 Qs of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

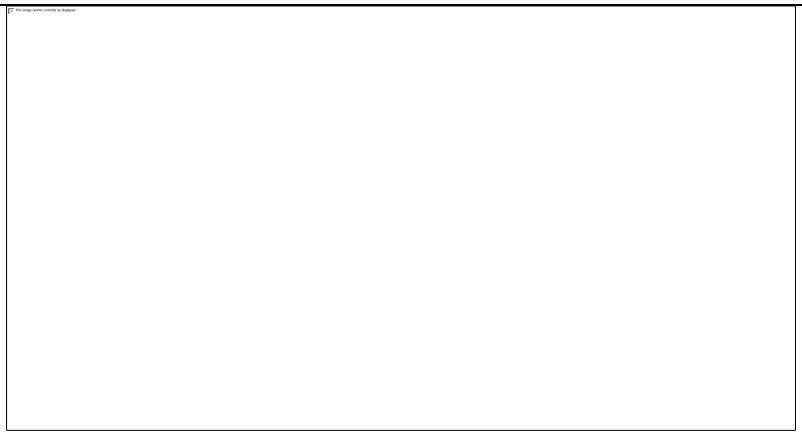
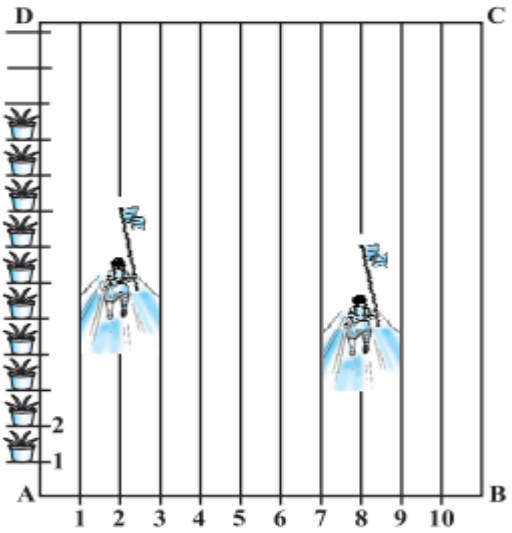
	SECTION A	
	Questions from 01 to 20 carry ONE mark each.	
SL.NO		Marks
1	If p and q are two positive integers such that $p = 2a^3b^2$ and $q = 3a^3b$ and a, b are prime numbers, then LCM (p, q) is a . 2ab b.6ab c. 6a3b d. $6a^3b^2$	1
2	The longest pole that can measure 450 cm and 375 cm in exact number of times is a.25 cm b. 50 cm c. 75 cm d. 100 cm	1
3	If one of the zeroes of the quadratic polynomial $x^2 + 3x + k$ is the reciprocal of another zero then the value of k is a.1 b. 2 c.3 d.4	1
4	The lines represented by the given equations 4x+2y=16 and 3x - y = 8 are a. Parallel b.Intersecting c.coincident d. perpendicular	1
5	The quadratic equation $2x^2-4x+ M =0$ has two equal zeroes.Then the value of M is a.1 b.2 c.3 d.4	1
6	The type of triangle with vertices (-6, 0), (0, 6) and (6, 0) is a. Equilateral b.Isosceles c.right angled d. scalene	1
7	When triangles ABC and PQR are similar and $\angle A = 50^0, \angle Q=30^0$, then $\angle C$ is a. 80^0 b.100^0 c.120^0 d. 150^0	1
8	The line joining the points P(0,8) and Q(0,-8) is divided by the x axis in the ratio a. 1:1 b.1:2 c.1:3 d.2:3	1
9	PQ and PR are the two tangents to a circle of centre o at the points Q and R on the circle if $\angle QPR = 40^0$,then $\angle QRO$ is a. 10^0 b.20^0 c.40^0 d.140^0	1
10	If $\sin A = \frac{1}{2}$ then the value of sec A is a. $\frac{1}{\sqrt{3}}$ b. $\frac{2}{\sqrt{3}}$ c. $\sqrt{3}$ d. 1	1
11	$\sqrt{2}\sin^2 A+\sqrt{2}\cos^2 A$ is equal to	1

	a. $\sqrt{2}$ b. $\sqrt{3}$ c. $\sqrt{5}$ d. 2	
12	If sin(A-B)=$\frac{1}{2}$ and cos(A+B)=$\frac{1}{2}$ where A>B and 0^0<A+B<90^0 then A and B are a. 45^0 , 15^0 b. 30^0 , 60^0 c. 45^0 , 60^0 d. 60^0 , 30^0	1
13	The perimeters of a circular field and a square field are equal if the area of the square field is 484 m^2 then the diameter of the circular field is a. 18 cm b. 48 cm c. 28 cm d. 25 cm	1
14	The wheel of a car of radius 7 cm makes 100 revolutions in 5 seconds.then the speed of the car is a. 29.4 km/h b.31.68 km/h c. 36.25 km/h d. 32.72 km/h	1
15	The total surface area of a hemisphere of radius 7 cm is a. 462 cm^2 b.49 cm^2 c.262 cm^2 d. 64 cm^2	1
16	In the distribution the lower limit of the modal class is Daily wages: 100-120 | 120-140 | 140-160 | 160-180 | 180-200 No.of workers: 12 | 14 | 8 | 6 | 10 a. 14 b. 120 c. 140 d.12	1
17	The mean of the following distribution is 2.5 then the value of y in the distribution is Variable (x): 1 | 2 | 3 | 4 | 5 Frequency: 4 | 5 | y | 1 | 2 a. 2 b.4 c.5 d.6	1
18	A card is drawn from a pack of cards numbered from 1 to 52 .The probability that the number on the card is a perfect square is a. $\frac{1}{13}$ b. $\frac{3}{13}$ c. $\frac{5}{13}$ d. $\frac{7}{52}$	1
	In question numbers 19 and 20, a statement of Assertion (A) is followed by a statement of Reason (R). Choose the correct option.	
	AR Based Questions	
19	Assertion: If HCF of the numbers 139 and1547 is 7, then the LCM of 139 and1547 is 30719 Reason: as HCF(a,b) x LCM(a,b) = a x b (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A). (c) Assertion (A) is true but Reason (R) is false. (d) Assertion (A) is false but Reason (R) is true.	1
20	Assertion: The line segment joining (6,6) and (6,-6) is divided by the x axis in the ratio 1:1 Reason: The Formula for the co-ordinates of division of a line segment by mid point "P" is P(x,y)=P$\left(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right)$ (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A). (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A). (c).Assertion (A) is true but Reason (R) is false.	1

	(d) Assertion (A) is false but Reason (R) is true.	
	SECTION B	
	Section B consists of 5 questions of 2 marks each. 5 x 2 =10	
21	For which value of k will the following pair of linear equations have no solution? 3x + y = 1 (2k – 1) x + (k – 1) y = 2k + 1	2
22	D is a point on the side BC of a triangle ABC such that ∠ ADC = ∠ BAC. Show that CA^2 = CB.CD. **OR** In the given diagram $\frac{QR}{QS}=\frac{QT}{PR}$ and ∠ 1 = ∠ 2.  Show that ΔPQS ≈Δ TQR.	2
23	The length of a tangent from a point A at distance 5 cm from the centre of the circle is 4 cm. Find the radius of the circle.	2
24	If sin A=$\frac{3}{4}$ Find the value of cos A and tan A	2
25	The radii of two circles are 19 cm and 9 cm respectively. Find the radius of the circle which has circumference equal to the sum of the circumferences of the two circles. **OR** Find the area of a sector of a circle with radius 6 cm if angle of the sector is 60°.	2
	Section C	
	Section C consists of 6 questions of 3 marks each. 6 x 3 = 18	
26	Prove that $\sqrt{2}$ is an irrational number.	3
27	Find the zeroes of the polynomial $4x^2-4x+1$ and verify the relationship between the zeroes and the coefficients.	3
28	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? **OR** Solve the following pair of equations hence find the value of m if y = mx+3 2x+3y=11 and 2x - 4y = -24	3
29	A quadrilateral ABCD is drawn to circumscribe a circle. Prove that AB + CD = AD + BC	3

		
30	Prove that $\frac{\cos A}{1+\sin A}+\frac{1+\sin A}{\cos A}=2\sec A$ **OR** Prove that $\sqrt{\frac{1+\sin A}{1-\sin A}}=\sec A+\tan A$	3
31	One card is drawn from a well-shuffled deck of 52 cards. Find the probability of getting (i) a king of red colour (ii) a face card (iii) a red face card (iv) the jack of hearts (v) a spade (vi) the queen of diamonds	3
	Section D	
	Section D consists of 4 questions of 5 marks each. 4x5=20	
32	A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 km upstream than to return downstream to the same spot. Find the speed of the stream. OR A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it would have taken 1 hour less for the same journey. Find the speed of the train.	5
33	Prove Basic Proportionality Theorem,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.. Using this theorem find in the figure the value of AD if DEIIBC , DB=14 cm, AE=16 cm and EC=28cm. 	5
34	A wooden article was made by scooping out a hemisphere from each end of a solid cylinder. If the height of the cylinder is 10 cm, and its base is of radius 3.5 cm, find the total surface area of the article.Also find the cost of painting the curved surfaces of the article at the rate of Rs.20 per sq.cm **OR** A vessel is in the form of an inverted cone. Its height is 8 cm and the radius of its	5

	top, which is open, is 5 cm. It is filled with water up to the brim. When lead shots, each of which is a sphere of radius 0.5 cm are dropped into the vessel, one-fourth of the water flows out. Find the number of lead shots dropped in the vessel.	
35	A survey regarding the heights (in cm) of 51 students of Class X of a school was conducted and the following data was obtained.Find the median height of the students of the class. Height in cm / Number of students Less than 140 — 4 Less than 145 — 11 Less than 150 — 29 Less than 155 — 40 Less than 160 — 46 Less than 165 — 51	5
	Section E	
	Case study based questions are compulsory. 3 x 4 = 12	
36	Case Study I Mr.Suresh was observing a beautiful design on a wall while watching Cricket in a stadium.He observed that the square shaped tiles had been painted with bright.Surprisingly the tiles were in some pattern.Each colour dad started with 3 at the bottom and increased by 2 as it progressed with the rows.  (i) How many tiles were there in the 7^{th} row from the bottom? (ii) How many tiles would have been used to complete 50 row from the bottom? (iii) Find what would it have costed for the completion of 100 rows at Rs.24 per tile. OR How much area would it have covered with 25 rows with the size of tile 20cmx20cm.	1 1 2

37	 A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919.The teacher also said that India Gate, which is located at the eastern end of the Kartavya path (formerly called the Rajpath), is about 138 feet (42 metres) in height. 1. What is the angle of elevation if they are standing at a distance of 42m away from the monument? 2. The ratio of the length of a rod and its shadow is 1:1 . Find the angle of elevation of the Sun. 3. If the altitude of the Sun is at 60 , then find the height of the vertical tower that will cast a shadow of length 20 m. **OR** The angle of elevation of the top of a lamp post from a point on the path, which is 30 m away from the foot of the post is 30°. Find the height of the lamp post.	1 1 2
38	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 flowerpots 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 1/5 th distance AD on the eighth line and posts a red flag.  1. What is the distance between both the flags?	1

	2. What is the position of the red Flag? 3. Find the distance of a point A(4,3) from the origin and from B(6,5). OR Find the ratio in which the line segment joining (-2,0) and (1,4) is divided by the x axis.	 1 2

Sample Question Paper - 5
MATHEMATICS BASIC (241)

BLUE PRINT FOR BOARD EXAM 2023 : CLASS X

Unit	Chapter	MCQ (1 mark)	AR Based (1 mark)	SA–I (2 marks)	SA–II (3 marks)	LA (5 marks)	Case Study Based Questions	Total	Unit Total
Number system	Real Numbers	2(2)	1(1)	--	3(1)	--	--	6(4)	6(4)
Algebra	Pair of Linear Equations in two variables	1(1)	--	2(1)	**3(1)***	--	--	6(3)	20(8)
	Polynomials	1(1)	--	--	3(1)	--	--	4(2)	
	Quadratic Equations	1(1)	--	--	--	**5(1)***		6(2)	
	Arithmetic progression	-1(1)	--	--	--	--	**4(1)#**	4(1)	
Coordinate Geometry	Coordinate Geometry	1(1)	1(1)	--	--	--	**4(1)#**	6(3)	6(3)
Trigonometry	Introduction to Trigonometry	3(3)	--	2(1)	**3(1)***	--	--	8(5)	12(6)
	Some Applicationsof Trigonometry	--	--	--	--	--	**4(1)#**	4(1)	
Geometry	Triangles	2(2)	--	**2(1)***	--	5(1)	--	9(4)	15(7)
	Circles	1(1)	--	2(1)	3(1)	--	--	6(3)	
Mensuration	Areas Related to Circles	1(2)	--	**2(1)***	--	--	--	4(3)	10(5)
	Surface Areas and Volumes	1(1)	--	--	--	**5(1)***	--	6(2)	
Statistics & probability	Statistics	2(2)	--	--	--	5(1)	--	7(3)	11(5)
	Probability	1(1)	--	--	3(1)	--	--	4(2)	
	Total	18(18)	2(2)	10(5)	18(6)	20(4)	12(3)	80(38)	80(38)

Note: * - Internal Choice Questions (Attempt any one question) # - Internal Choice is given for 2marks question in Case Study Question

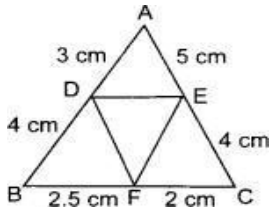
Time Allowed: 3 Hours **Maximum Marks: 80**

General Instructions: **1. This Question Paper has 5 Sections A, B, C, D, and E.**
2. Section A has 20 Multiple Choice Questions (MCQs) carrying 1 mark each.
3. Section B has 5 Short Answer-I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 Short Answer-II (SA-II) type questions carrying 3 marks each.
5. Section D has 4 Long Answer (LA) type questions carrying 5 marks each.
6. Section E has 3 Case Based integrated units of assessment (4 marks each) with sub-parts of the values of 1, 1 and 2 marks each respectively.
7. All Questions are compulsory. However, an internal choice in 2 Qs of 2 marks, 2 Qs of 3 marks and 2 Questions of 5 marks has been provided. An internal choice has been provided in the 2 marks questions of Section E.
8. Draw neat figures wherever required. Take π =22/7 wherever required if not stated.

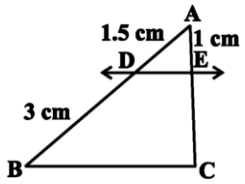
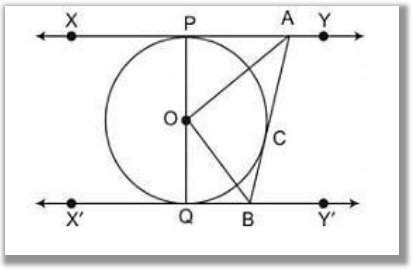
Section A

Section A consists of 20 questions of 1 mark each.

1	**If one root of equation $4x^2-2x+k-4=0$ is reciprocal of the other. Then the value of k is:** (a) -8 (b) 8 (c) -4 (d) 4	1
2	**In an Arithmetic Progression, if a = 28, d = -4, n = 7, then a_n is:** (a) 4 (b) 5 (c) 3 (d) 7	1
3	ΔABC~ΔPQR. If AM and PN are altitudes of ΔABC and ΔPQR respectively andAB^2 : PQ^2 = 4 : 9, then AM: PN = (a) 3:2 (b) 16:81 (c) 4:9 (d) 2:3	1
4	If a and b are positive integers, then HCF (a, b) x LCM (a, b) = (a) a x b (b) a + b (c) a – b (d) a ÷ b	1

5	A quadratic polynomial whose sum and product of zeroes are –3 and 2 is (a) $x^2 – 3x + 2$ (b) $x^2 + 3x + 2$ (c) $x^2 + 2x – 3$. (d) $x^2 + 2x + 3$.	1
6	Value If $\sin 2\theta = 1$, *where* $0^\circ < \theta < 90^\circ$ then the value of θ is , **(a) 30^0 (b) 60^0 (c) 45^0 (d) 90^0**	1
7	**If origin is the midpoint of the line segment joining A (2,3), B (x, y) then thevalue of (x ,y) is** (a) **(2,3)** (b) **(-2,3)** (c) **(-2, -3)** (d) **(2, -3)**	1
8	Number of tangents that can be drawn through the point that lies inside the circle is (a) 0 (b) 1 (c) 2 (d) infinite	1
9	If $\sin\theta + \cos\theta = \sqrt{2}$, then the value of $\tan\theta + \cot\theta$ is (a) 1 (b) 2 (c) 3 (d) 4	1
10	**In given figure, AD = 3 cm, AE = 5 cm, BD = 4 cm, CE = 4 cm, CF= 2 cm, BF = 2.5 cm, then**  (a) DE || BC (b) DF || AC (c) EF || AB (d) none of these	1
11	**Graphically, the pair of equations given by 6x – 3y + 10 = 0 ,2x – y + 9 = 0 represents two lines which are** **(a) intersecting at exactly one point. (b) parallel.** **(c) coincident. (d) intersecting at exactly two points.**	1
12	**5 + 2**$\sqrt{2}$ gives (a) **Terminating decimal (b) Non- terminating repeating decimal** **(c) Non- terminating repeating decimal (d)Cannot represent in decimal form**	1
13	**If the radius of the sphere becomes 3 times, then its volume will become** **(a) 3 times (b) Six times (b)Nine times (b) 27 times**	1

14	**The value of cos1° cos2° cos3° cos4°… ..... cos90° is** **(a) 1 (b) 0 (c) – 1 (d) 2**	1
15	**A box contains 3 blue,2 white and 4 red marbles. If a marble is drawn at random from the box, what is the probability that it is a white marble?** **(a)** $\frac{1}{3}$ **(b)** $\frac{2}{9}$ **(c)** $\frac{7}{9}$ **(d)** $\frac{2}{3}$	1
16	**Find the area of circle that can be inscribed in a square of 6cm is** **(a)** 36π **cm²** **(b)** 18π **cm²** **(c)** 12π **cm²** **(d)** 9π **cm²**	1
17	**For the following distribution the upper limit of the modal class is** **class | 40 -50 | 50 - 60 | 60 - 70 | 70 – 80 | 80 - 90** **frequency | 5 | 8 | 15 | 12 | 7** **(a) 90 (b) 60 (c) 70 (d) 80**	1
18	**Mean of the following distribution is** **class | 10 | 30 | 50 | 70 | 90** **frequency | 6 | 7 | 8 | 5 | 4** **(a) 45 (b) 46 (c) 50 (d) 48**	
19	**ASSERTION**: $\sqrt{2}$ **is a rational number.** **REASON: The square roots of all positive integers are irrational.** **A. Both assertion and reason are correct but and the reason is the correct explanation for the assertion.** **B. Both assertion and reason are correct but the reason is not the correct explanation for the assertion.** **C. Assertion is correct but the reason is incorrect.** **D. Assertion is incorrect but the reason is correct.**	
20	**Assertion : Mid-point of a line segment divides line in the ratio 1 : 1.** **Reason :** The ratio in which the point (–3, k) divides the line segment joining the points (–5, 4) and (–2, 3) is 1 : 2 **A. Both assertion and reason are correct but and the reason is the correct explanation for the assertion.** **B. Both assertion and reason are correct but the reason is not the correct explanation for the assertion.** **C. Assertion is correct but the reason is incorrect.** **D. Assertion is incorrect but the reason is correct.**	
	SECTION B	
21	If sinA = $\frac{1}{2}$, find the value of $\frac{2\sec A}{1+\tan^2 A}$. **(OR)** If $\sin\theta = \cos\theta$, then find the value of $2\tan\theta + \cos^2\theta$	2

22	**Prove that the tangents drawn from an external point are equal in length**	2
23	Find the value of k for which the system of equations 2x + 3y = 5 and 4x + ky = 10 has infinite many solution .	2
24	Find the area of a quadrant of a circle whose circumference is 22 cm.	2
25	In the given fig DE || BC then find the value of EC  	2
	SECTION C	
26	**In the figure XY and X'Y' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C interesting XY at A and X'Y' at B, what is the measure of ∠AOB.**  	3
27	Prove that $\sqrt{3}$ is an irrational number	3
28	Solve $2x + 3y = 11$ and $2x – 4y = – 24$ and hence find the value of '*m*' for which $Y = mx + 3$.	3
29	Find the zeroes of the quadratic polynomial $x^2 – 2x – 8$, and verify the relationship between the zeroes and the coefficients	3
30	Prove that: $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$ **(OR)** Prove that: $\sqrt{\frac{1+\sin A}{1-\sin A}} = \sec A + \tan A$.	3
31	A box contains cards numbered 11 to 123. A card is drawn at random from thebox. Find the probability that the number on the drawn card is (i) a square number (j) (ii) a multiple of 7 **(OR)** A bag contains 3 red balls and 5 black balls. A ball is drawn at random from the bag. What is the probability that the ball drawn is (i) red ? (ii) not red?	3

SECTION D

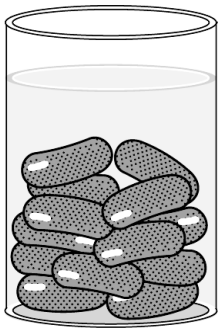
32 A motor boat whose speed is 18 km/h in still water takes 1 hour more to go 24 kmupstream than to return downstream to the same spot. Find the speed of the stream — 5

(OR)

A train travels 360 km at a uniform speed. If the speed had been 5 km/h more, it wouldhave taken 1 hour less for the same journey. Find the speed of the train.

33 State and prove Basic proportionality theorem. — 5

34 A gulab jamun, contains sugar syrup up to about 30% of its volume. Find approximately how much syrup would be found in 45 gulab jamuns, each shaped likea cylinder with two hemispherical ends with length 5 cm and diameter 2.8 cm (see below figure). — 5



(OR)

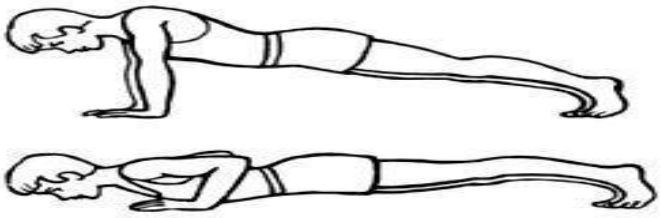
A toy is in the form of a cone of radius 3.5 cm mounted on a hemisphere of same radius. The total height of the toy is 15.5 cm. Find the total surface area of the toy.

35 A life insurance agent found the following data for distribution of ages of 100 policy holders. Calculate the median age, if policies are given only to persons having age 18years onwards but less than 60 years. — 5

Age (in years	**Below 20**	20 - 25	25 - 30	30 - 35	35 – 40	40 - 45	45 - 50	50 – 55	55 – 60
Number of policy holders	**2**	4	18	21	33	11	3	6	2

SECTION E

36 **CASE STUDY : 1**



Nitesh wants to participate in the push-up challenge. He can currently make 3000 push-ups in one hour. But he wants to achieve a target of 3900 push-ups in 1 hour for which he practices regularly. With each day of practice, he is able to make 5

	more push-ups in one hour as compared to the previous day. If on first day of practice he makes 3000 push-ups and continues to practice regularly till his target is achieved. Keeping the above situation in mind answer the following questions: **(i) Form an A.P representing the number of push-ups per day and hence find the minimum number of days he needs to practice before the day his goal is accomplished?** **(ii) Find the total number of push-ups performed by Nitesh up to the day his goal is achieved.**	2 2
37	**CASE STUDY : 2** A group of students of class X visited India Gate on an education trip. The teacher and students had interest in history as well. The teacher narrated that India Gate, official name Delhi Memorial, originally called All-India War Memorial, monumental sandstone arch in New Delhi, dedicated to the troops of British India who died in wars fought between 1914 and 1919. The teacher also said that India Gate, which is located at the eastern end of the Rajpath (formerly called the Kingsway), is about 138 feet (42 metres) in height.  **(i) Find the angle of elevation if they are standing at a distance of 42m away from the monument?** **(ii)Find the distance from the point where they should stand and see the tower if the angle of elevation is 60^o .** **(iii) If the altitude of the Sun is at 60^o, then find the height of the vertical tower that will cast a shadow of length 20 m is** (iv)**The ratio of the length of a rod and its shadow is 1:1. Then what will be the angle** **Of elevation of the sun ?**	1 1 1 1
38	**CASE STUDY : 3** In an examination hall, students are seated at a distance of 2 m from each other, to maintain the social distance due to pandemic. Let three students sit at points A, B, and C whose coordinates are (4, -3), (7, 3) and (8, 5) respectively.	

Based on above information answer the following questions.(Attempt any four)

I)Find the distance between A and C .

ii) If an invigilator is at the point I, lying on the straight line B and C such that it divides the distance between them in the ratio of 1:2. Then find the coordinates of I

iii) Find the mid-point of the line segment joining A and B

iv) What is the ratio in which B divides the line segment joining A and C

MODEL PAPER - 6
MATHEMATICS-BASIC (241) 2022-23

Class 10 - Mathematics

Time Allowed: 3 hours Maximum Marks: 80 General Instructions:

The question paper has A-E sections.

SECTION A has 20 MCQs carrying 1 mark each.

SECTION B has 5 questions carrying 2 marks each.

SECTION C has 6 questions carrying 3 marks each.

SECTION D has 4 questions carrying 5 marks each.

SECTION E has 3 Case Based Integrated Unit of assessment 4 marks each with sub parts of the value 1,1 and 2 each.

All questions are compulsory. However an internal choice in 2 questions of 5 marks, 2 questions of 3 marks, 2 questions of 2 marks will be provided.

An internal choice has been provided in the 2 marks question of SECTION E.

Draw neat figures wherever required.

Section A

1. _____ is neither prime nor composite. **[1]** a) 4 b) 1

c) 2 d) 3

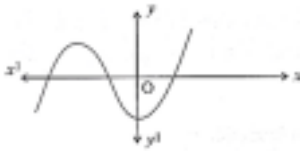
2. $(2 + 2)$ is **[1]** $-\sqrt{}$ a) none of these b) an integer

c) a rational number d) an irrational number

3. If $2x + 3y = 12$ and $3x - 2y = 5$ then **[1]** a) $x = 3, y = 2$ b) $x = 2, y = -3$

c) $x = 2, y = 3$ d) $x = 3, y = -2$

4. The graph of a polynomial is shown in Figure, then the number of its zeroes is: **[1]**



a) 4 b) 3

c) 1 d) 2

5. The perimeter of a rectangle is 82 m and its area is 400 m^2. The breadth of the rectangle is **[1]** a) 25 m b) 9 m

c) 16 m d) 20 m

6. The abscissa of any point on the y-axis is **[1]** a) 0 b) 1

c) y d) -1

7. If $\sin\theta =$ then $\cot =$? **[1]** $\frac{1}{2}\theta$ $\frac{1}{}$

a) b) 1

$\frac{\sqrt{3}}{2}$ $3-\sqrt{}$ $\sqrt{3}$

c) d)

8. = **[1]** $\frac{2\tan 30^\circ}{1+\tan^2 30^\circ}$

$\cos 60^\circ$

a) b) None of these

$\tan 60^\circ \sin 60^\circ$

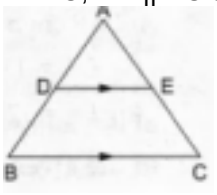
c) d)

9. = **[1]** $\frac{}{1+\tan A}^{2}\ 1+\cot^2 A$

a) 1 b) $\cot^2 A$

c) $\tan^2 A$ d) $\sec^2 A$

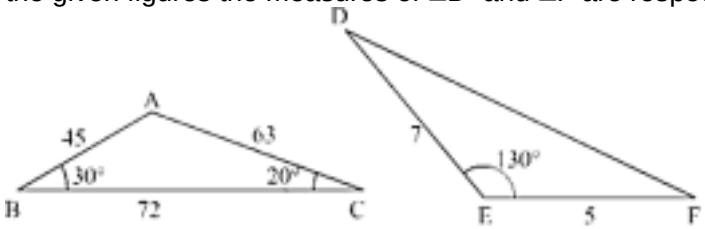
10. In △ABC, DE || BC so that AD = 2.4 cm, AE = 3.2 cm and EC = 4.8 cm. Then, AB = ? **[1]**



a) 6.4 cm b) 7.2 cm

c) 3.6 cm d) 6 cm

11. In the given figures the measures of ∠D and ∠F are respectively **[1]**



a) $20^\circ, 30^\circ$ b) $30^\circ, 20^\circ$.

c) $50^\circ, 40^\circ$ d) $40^\circ, 50^\circ$.

12. 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 = **[1]**

12 cm. Length PQ is :

a) 8.5 cm b) 13 cm c) 12 cm d) 119

13. The length of an arc of a sector of angle θ° of a circle with radius R is **[1]**

$\pi R\theta^2$

a) b) 180

$\frac{2\pi R\theta}{}$

c) d) 360

$\pi R\theta^2 360$

$\frac{2\pi R\theta}{}$ 180

14. The length of the minute hand of a clock is 21 cm. The area swept by the minute hand in 10 minutes is **[1]**

a) 252 cm^2 b) 126 cm^2

c) 231 cm^2 d) 210 cm^2

15. The shape of a gilli in the gilli-danda game is a combination of **[1]**

a) two cylinders b) a cone and a cylinder

c) two cylinders and a cone d) two cones and a cylinder

16. If the arithmetic mean of x, x + 3, x + 6, x + 9 and x + 12 is 10, then x = **[1]** a) 2 b) 1

c) 6 d) 4

17. Mode is: **[1]** a) least frequent value b) None of these

c) middle most value d) most frequent value

18. From a well shuffled pack of 52 cards, one card is drawn at random. The probability of getting a black king is **[1]**

$\frac{1}{2}$

$\frac{1}{13}$

c) d) $\frac{1}{39}$

19. **Assertion (A):** The H.C.F. of two numbers is 16 and their product is 3072. Then their L.C.M. = 162 **[1]**

× ×

Reason: If a, b are two positive integers, then H.C.F. L.C.M. = a b

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

20. **Assertion (A):** The point (0,-3) lies on the y-axis.

[1]

Reason (R): The x - coordinate of the point on y-axis is zero.

a) Both A and R are true and R is the correct explanation of A.
b) Both A and R are true but R is not the correct explanation of A.

c) A is true but R is false. d) A is false but R is true.

Section B

21. Form the pair of linear equations for the problem and find its solution by substitution method: **[2]**
Five year hence, the age of Jacob will be three times that of his son. Five years ago, Jacob's age was seven times that of his son. What are their present ages ?

22. Evaluate: sin 60° cos 30° + sin 30° cos 60° **[2]**

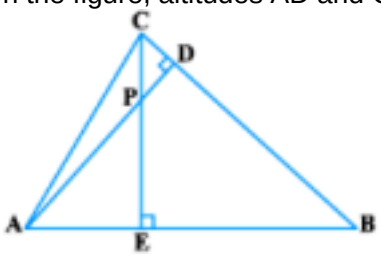
[2]

23. E and F are points on the sides PQ and PR respectively of a PQR. For PQ = 1.28 cm, PR = 2.56 cm, PE = 0.18 ▵ cm and PF = 0.36 cm, state whether EF || QR.

OR

△ △ P DC ~△ BEC

In the figure, altitudes AD and CE of ABC intersect each other at the point P. Show that:



24. Prove that the perpendicular at the point of contact of the tangent to a circle passes through the centre. **[2]**

25. A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope. **[2]**

Find

i. the area of that part of the field in which the horse can graze.

ii. the increase in the grazing area if the rope were 10 m long instead of 5 m (Use $\pi = 3.14$)

OR

Find the area of a sector of a circle with radius 6 cm, if the angle of the sector is 60^{o}.

Section C

26. Prove that $\sqrt{3}$ is an irrational number. **[3]**

27. Check whether the pair of equations $x + 3y = 6$ and $2x - 3y = 12$ is consistent. If so, solve them graphically. **[3]** OR

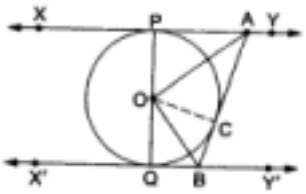
Form the pair of linear equations for the problem and find their solution by substitution method. The coach of a cricket team buys 7 bats and 6 balls for Rs. 3800. later, she buys 3 bats and 5 balls for Rs. 1750. Find the cost of each bat and each ball. **[3]**

28. Find the zeroes of quadratic polynomial $x^2 - 2x - 8$ and verify the relationship between the zeroes and the coefficients.

29. Express the trigonometric ratios sin A, sec A and tan A in terms of cot A. **[3]** OR

Write all the other trigonometric ratios of $\angle A$ in terms of sec A.

30. In the given figure, XY and X 'Y ' are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersects XY at A and X'Y' at B. Prove that $\angle AOB = 90°$. **[3]**



i. a king of red colour

ii. a face card

iii. a red face card

iv. the jack of hearts

v. a spade

vi. the queen of diamonds

Section D

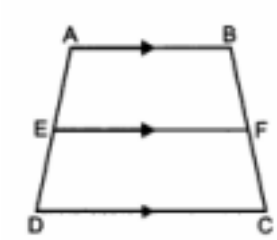
32. A cottage industry produces a certain number of pottery articles in a day. It was observed on a particular day that **[5]**

cost of production of each article (in rupees) was 3 more than twice the number of articles produced on that day. If, the total cost of production on that day was □ 90, find the number of articles produced and the cost of each article.

OR

Find the values of k for which the equation (3k + 1)x + 2(k + 1)x + 1 ,has equal roots. Also find the roots. [2] 33. If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two **[5]**
sides are divided in the same ratio, Prove it. Use this result to prove the following:

In the given figure, if ABCD is a trapezium in which AB || DC || EF, then $\frac{AE}{ED} = \frac{BF}{FC}$



34. A tent is of the shape of a right circular cylinder upto a height of 3 metres and then becomes a right circular cone **[5]**
with a maximum height of 13.5 metres above the ground. Calculate the cost of painting the inner side of the tent at the rate of □2 per square metre, if the radius of the base is 14 metres.

OR

A toy is in the form of a cone mounted on a hemisphere of radius 3.5 cm. The total height of the toy is 15.5 cm; find the total surface area and volume of the toy.

35. If the median of the distribution given below is 28.5, then find the values of x and y.**[5]**

Class Interval	**frequency**
0-10	5
10-20	x
20-30	20
30-40	15
40-50	y
50-60	5
Total	60

Section E

36. **Read the case study carefully.** **[4]**

Part (i) and (ii) carries one mark each.

Internal choice is given b/w (iii) and (iv) part, it carries 2 mark.

Ms. Malini goes to a grocery shop for purchasing some glass jars for gifting at a party. She observed the jars are arranged one above the other in a specific pattern. 3, 6, 9, ... (from top to bottom)

By using the concepts of arithmetic progressions

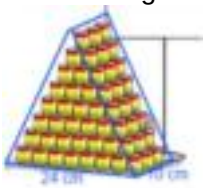
Answer the following:

i. How many total jars are there? (refer the image)

ii. If there are 100 such rows, then how many jars will be in the 56th row?

iii. If on the top the shopkeeper puts two more rows having jars 2 and 1 respectively, will it be an arithmetic progression ? (OR)

iv. Ms. Malini asked the shopkeeper to pack it in the same fashion as it was displayed in the below image. The shopkeeper used a box of dimensions as shown.



The front face of the box is an equilateral triangle. Find the capacity of the box used?

37. **Read the case study based questions carefully.** **[4]**

Part (i) and (ii) carries one mark each.

Internal choice is given b/w (iii) and (iv) part, it carries 2 mark.

The camping alpine tent is usually made using high-quality canvas and it is waterproof. These alpine tents are mostly used in hilly areas, as the snow will not settle on the tent and make it damp. It is easy to layout and one need not use a manual to set it up. One alpine tent is shown in the figure given below, which has two triangular faces and three rectangular faces. Also, the image of canvas on graph paper is shown in the adjacent figure.

Based on the above information, answer the following questions.

i. Find the Distance of point Q from y-axis?

ii. What are the coordinates of U?

iii. Find the distance between the points P and Q? (OR)

iv. Give the equation when point A(x, y) is equidistant from R and T.

38. Read the case study carefully. **[4]**

Part (i) and (ii) carries one mark each.

Internal choice is given b/w (iii) and (iv) part, it carries 2 mark.

Heights and Distances:

From a point 100 m above a lake, the angle of elevation of a stationary helicopter is 30^o and the angle of depression of reflection of the helicopter in the lake is 60^o as shown in the image given below:

i. If the point above the lake where the helicopter is hovering is in height **h** then what is the depth of the reflection of the point in the lake ?

ii. What happens to the angle of elevation when the observer moves away from the perpendicular line(tower / building)?

iii. Find the distance between the helicopter and the given position of the point. (OR)

iv. Find the height of the helicopter?

REFERENCE MATERIAL

I) NCERT – Text Book

ii) NCERT – Exemplar Text book

iii) KVS Study Material