KENDRIYA VIDYALAYA SANGATHAN

BENGALURU REGION

SUPPORT MATERIAL

SESSION: 2024-25

CLASS IX

MATHS

PREFACE

This study material is the culmination of an extensive collaborative effort involving a dedicated team of educators and subject matter experts. With meticulous care, we have meticulously designed this resource to provide students with a succinct yet comprehensive tool for consolidating their knowledge.

Under the diligent guidance of our esteemed subject experts and the unwavering enthusiasm of our team, we have incorporated the entire curriculum and an extensive collection of practice questions spanning all chapters. Our paramount objective has been to ensure perfect alignment with the latest curriculum and examination patterns as set forth by the CBSE.

We firmly believe that this material will prove to be an invaluable resource, serving as a clear and concise repository of essential information for effective subject revision. It encompasses all the critical components necessary to assist in students' preparation and enhance their understanding of the subject matter.

Our aspiration is that this study material will emerge as a dependable aid for swift and efficient revision, instilling confidence in students and ultimately contributing to their academic success. We strongly encourage you to actively engage with the content, pose questions, and fully utilize this resource in your educational journey.

We extend our heartfelt best wishes for your studies and sincerely hope that this material becomes your trusted companion on the path to academic excellence.

KENDRIYA VIDYALAYA SANGATHAN

REGIONAL OFFICE

K. KAMARAJA ROAD

BENGALURU 560042

MESSAGE FROM THE DEPUTY COMMISSIONER

Dear students and teachers!

It is a matter of great pride and delight that KVS Bengaluru Region is putting forward the Students' Support Material (SSM) for class IXth subject MATHS for the session 2024-25. I believe firmly that; the subject experts have left no stone unturned to enable our students to add on more to their quality of performance by deep rooting more towards accessing required understating in the subject. Certainly, use of this SSM will help students in empowering themselves as one of the tools and will lead in bringing success.

With devotion, dedication & persistent hard work the team of experts has crafted out this SSM meticulously to complement the classroom learning experience of the students as well as to cope up with the Competency Based Questions as per the new pattern of examinations aligned with NEP-2020 and NCFSE-2023. This SSM, being well-structured and presented in a manner which makes it to be comprehended easily, will definitely serve as a precious supplement for self-study of students.

I am pleased to place on record my appreciation and commendation for the commitment and dedication of the team comprising of the subject experts in carving out such a useful edition of Students' Support Material for the students.

Wishing all the best!

(DHARMENDRA PATLE)
DEPUTY COMMISSIONER
KVS BENGALURU REGION

Our Patron

SHRI DHARMENDRA PATLE

DEPUTY COMMISSIONER, RO BENGALURU

SHRI P C RAJU

AC, RO BENGALURU

SHRI R PRAMOD

AC, RO BENGALURU

SMT HEMA K

AC, RO BENGALURU

SHRI DAVINDER SINGH

PRINCIPAL,PM SHRI KV CHAMARAJANAGAR

MESSAGE FROM THE COORDINATOR

Dear Student's,

I feel thrilled to commence on the study material for the mathematics for class IX. My sincere appreciation and gratitude to the diligent team for the designing the practice material that caters to the revised pattern of CBSE. Congratulations to the committed team for their vital role in designing the practice material with inclusive competencies, analytical and critical reasoning questions summarizing all concepts.

I feel greatly honoured to be associated as a coordinator of diligent team in bringing out the Support Material for class IX Mathematics for the year 2024-25 and truly convinced that it would definitely help in learning and scoring high in exams.

Wishing success to all in the journey of learning.

Davinder Singh

Principal,

PM SHRI K V Chamarajanagar,

Karnataka.

CONTENT DEVELOPEMENT TEAM FOR CLASS IX 2024-25				
S.NO.	**NAME OF THE CHAPTER**	**NAME OF THE TEACHER**	**NAME OF THE KV**	**REVIEW TEAM**
1	**NUMBER SYSTEM**	**MS. BINDU MENON**	**YELAHANKA CRPF**	**MS.GITANJALI RAJPOOT KV GAURIBIDANUR**
		MR. SAURABH KUMAR	**CHIKKODI**	
2	**POLYNOMIALS**	**MR. AKASH YADAV**	**BIDAR AFS**	**MR. P NAGRAJ KV KALABURAGI**
		MR. MADHU SUDAN SINGH NEGI	**BIDAR AFS**	
3	**COORDINATE GEOMETRY**	**MR. PRAVEEN CHAUDHARY**	**HASSAN**	**MR. PRALHAD SANGNALE KV KALABURAGI**
		MS. RUCHI	**DONIMALAI**	
4	**LINEAR EQUATIONS IN TWO VARIABLES**	**MS. NEETU**	**DAVANGERE**	**MS. VIJAYAVANI KV MANGLORE NO 1**
		MS. MAHIMA NAMBIAR	**MANGALORE NO 1**	
5	**INTRODUCTION TO EUCLID'S GEOMETRY**	**MS. DIVYASHREE H N**	**MYSURU**	**MS. GEETHA UNNIKRISHNAN KV MANGLORE NO 1**
		MS. SIVANI UNIYAL	**MYSURU**	
6	**LINES AND ANGLES**	**MS. TANUJA NEGI**	**MYSURU BRBNMPL**	**SOWMYA GANESH KV RAICHUR**
		LAVI CHAUHAN	**UDUPI**	
7	**TRIANGLES**	**MR. RAMESH KUMAR CHAURASIA**	**MEG & CENTRE**	**MS. ATIYA RIZVI KV SADALAGA**
		MS. HEMLATA	**MEG & CENTRE**	
8	**QUADRILATERALS**	**MS. ANUJA SHARMA**	**MG RLY COLONY**	**MR. KARAN KUMAR KV TUMKUR**

		MS. SHIKHA RAGHUWANSHI	**DRDO**	
9	**CIRCLES**	**MS. ASHIYA SULTANA**	**HOSPETE**	**MS. PURNIMA NAGPAL KV VIJAYAPURA**
		MS. POOJA	**YESHWANTPUR**	
10	**HERONS FORMULA**	**MR. JOHNY DASWANI**	**HUBLI NO 1**	**MR. GIRISH KUMAR KV DHARWAD**
		MS. KUSAM DEVI	**HUBLI NO 1**	
11	**SURFACE AREAS AND VOLUMES**	**MS. SAITEJASREE**	**VIJAYAPURA**	**MR. SURYA PRAKASH METHI KV BELAGAVI NO 1 AFS SAMBRA**
		MS. AKANKSHA	**HUBLI NO 2**	
12	**STATISTICS**	**MR. ASHISH**	**HEBBAL**	**AMIT MEHRA KV SIVAMOGGA**
		MR. RAKESH KUMAR	**HUTTI**	
13	**3 SAMPLE QUESTION PAPER WITH MARKING SCHEME & BLUE PRINT**	**MR. SAGAR MARUTI SHINDE**	**BAGALKOT**	**MR. NARESH KUMAR MEHRA KV HASSAN**
14		**MR. HARIOM MEENA**	**GANGAVATI**	

STUDY MATERIAL COMPILATION TEAM

SL NO	NAME OF THE TEACHER	DESIGNATION	NAME OF THE KV
1.	MS. REENA RANI	TGT MATHS	PM SHRI K V CHAMARAJANAGAR
2.	MR GIRRAJ PRASAD	TGT MATHS	PM SHRI K V CHAMARAJANAGAR

CONTENT INDEX

MATHEMATICS (IX) (CODE NO. 041)
Session 2024-25

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, of basic 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 more than 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 mathematical software's.
- to develop interest in mathematics as a problem-solving tool in various fields for its beautiful structures and patterns, etc.
- to develop reverence and respect towards great Mathematicians for their contributions to the field 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 –IX

Units	Unit Name	Marks
I	NUMBER SYSTEMS	10
II	ALGEBRA	20
III	COORDINATE GEOMETRY	04
IV	GEOMETRY	27
V	MENSURATION	13
VI	STATISTICS	06
	Total	80

UNIT I: NUMBER SYSTEMS

1. REAL NUMBERS (18) Periods

1. Review of representation of natural numbers, integers, and rational numbers on the number line. Rational numbers as recurring/ terminating decimals. Operations on real numbers.

2. Examples of non-recurring/non-terminating decimals. Existence of non-rational numbers (irrational numbers) such as $\sqrt{2}$, $\sqrt{3}$ and their representation on the number line. Explaining that every real number is represented by a unique point on the number line and conversely, viz. every point on the number line represents a unique real number.

3. Definition of nth root of a real number.

4. Rationalization (with precise meaning) of real numbers of the type $\frac{1}{a+b\sqrt{x}}$ and $\frac{1}{\sqrt{x}+\sqrt{y}}$ (and their combinations) where x and y are natural number and a and b are integers.

5. Recall of laws of exponents with integral powers. Rational exponents with positive real bases (to be done by particular cases, allowing learner to arrive at the general laws.)

UNIT II: ALGEBRA

1. POLYNOMIALS (26) Periods

Definition of a polynomial in one variable, with examples and counter examples. Coefficients of a polynomial, terms of a polynomial and zero polynomial. Degree of a polynomial. Constant, linear, quadratic and cubic polynomials. Monomials, binomials, trinomials. Factors and multiples. Zeros of a polynomial. Motivate and State the Remainder Theorem with examples. Statement and proof of the Factor Theorem. Factorization of $ax^2 + bx + c$, $a \neq 0$ where a, b and c are real numbers, and of cubic polynomials using the Factor Theorem.

Recall of algebraic expressions and identities. Verification of identities:

$(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

$(x \pm y)^3 = x^3 \pm y^3 \pm 3xy\,(x \pm y)$

$x^3 \pm y^3 = (x \pm y)\,(x^2 \mp xy + y^2$

$x^3 + y^3 + z^3 - 3xyz = (x + y + z)\,(x^2 + y^2 + z^2 - xy - yz - zx)$

and their use in factorization of polynomials.

2. LINEAR EQUATIONS IN TWO VARIABLES (16) Periods

Recall of linear equations in one variable. Introduction to the equation in two variables. Focus on linear equations of the type $ax + by + c=0$.Explain that a linear equation in two variables has infinitely many solutions and justify their being written as ordered pairs of real numbers, plotting them and showing that they lie on a line.

UNIT III: COORDINATE GEOMETRY

COORDINATE GEOMETRY (7) Periods

The Cartesian plane, coordinates of a point, names and terms associated with the coordinate plane, notations.

UNIT IV: GEOMETRY

1. INTRODUCTION TO EUCLID'S GEOMETRY (7) Periods

History - Geometry in India and Euclid's geometry. Euclid's method of formalizing observed phenomenon into rigorous Mathematics with definitions, common/obvious notions, axioms/postulates and theorems. The five postulates of Euclid. Showing the relationship between axiom and theorem, for example:

(Axiom) 1. Given two distinct points, there exists one and only one line through them.
(Theorem) 2. (Prove) Two distinct lines cannot have more than one point in common.

2. LINES AND ANGLES (15) Periods

1. (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is 180^{O} and the converse.
2. (Prove) If two lines intersect, vertically opposite angles are equal.
3. (Motivate) Lines which are parallel to a given line are parallel.

3. TRIANGLES (22) Periods

1. (Motivate) Two triangles are congruent if any two sides and the included angle of one triangle is equal to any two sides and the included angle of the other triangle (SAS Congruence).
2. (Prove) Two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle (ASA Congruence).

3. (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence).

4. (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are equal (respectively) to the hypotenuse and a side of the other triangle. (RHS Congruence)
5. (Prove) The angles opposite to equal sides of a triangle are equal.
6. (Motivate) The sides opposite to equal angles of a triangle are equal.

4. QUADRILATERALS (13) Periods

1. (Prove) The diagonal divides a parallelogram into two congruent triangles.
2. (Motivate) In a parallelogram opposite sides are equal, and conversely.
3. (Motivate) In a parallelogram opposite angles are equal, and conversely.
4. (Motivate) A quadrilateral is a parallelogram if a pair of its opposite sides is parallel and equal.
5. (Motivate) In a parallelogram, the diagonals bisect each other and conversely.
6. (Motivate) In a triangle, the line segment joining the mid points of any two sides is parallel to the third side and in half of it and (motivate) its converse.

5. CIRCLES (17) Periods

1.(Prove) Equal chords of a circle subtend equal angles at the center and (motivate) its converse.
2.(Motivate) The perpendicular from the center of a circle to a chord bisects the chord and conversely, the line drawn through the center of a circle to bisect a chord is perpendicular to the chord.
3. (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the center (or their respective centers) and conversely.
4.(Prove) The angle subtended by an arc at the center is double the angle subtended by it at any point on the remaining part of the circle.
5.(Motivate) Angles in the same segment of a circle are equal.
6.(Motivate) If a line segment joining two points subtends equal angle at two other points lying on the same side of the line containing the segment, the four points lie on a circle.
7.(Motivate) The sum of either of the pair of the opposite angles of a cyclic quadrilateral is 180° and its converse.

UNIT V: MENSURATION

1. AREAS (5) Periods

Area of a triangle using Heron's formula (without proof)

2. SURFACE AREAS AND VOLUMES (17) Periods

Surface areas and volumes of spheres (including hemispheres) and right circular cones.

UNIT VI: STATISTICS

STATISTICS

(1

5) Periods

Bar graphs, histograms (with varying base lengths), and frequency polygons.

MATHEMATICS QUESTION PAPER DESIGN

CLASS – IX (2024-25)

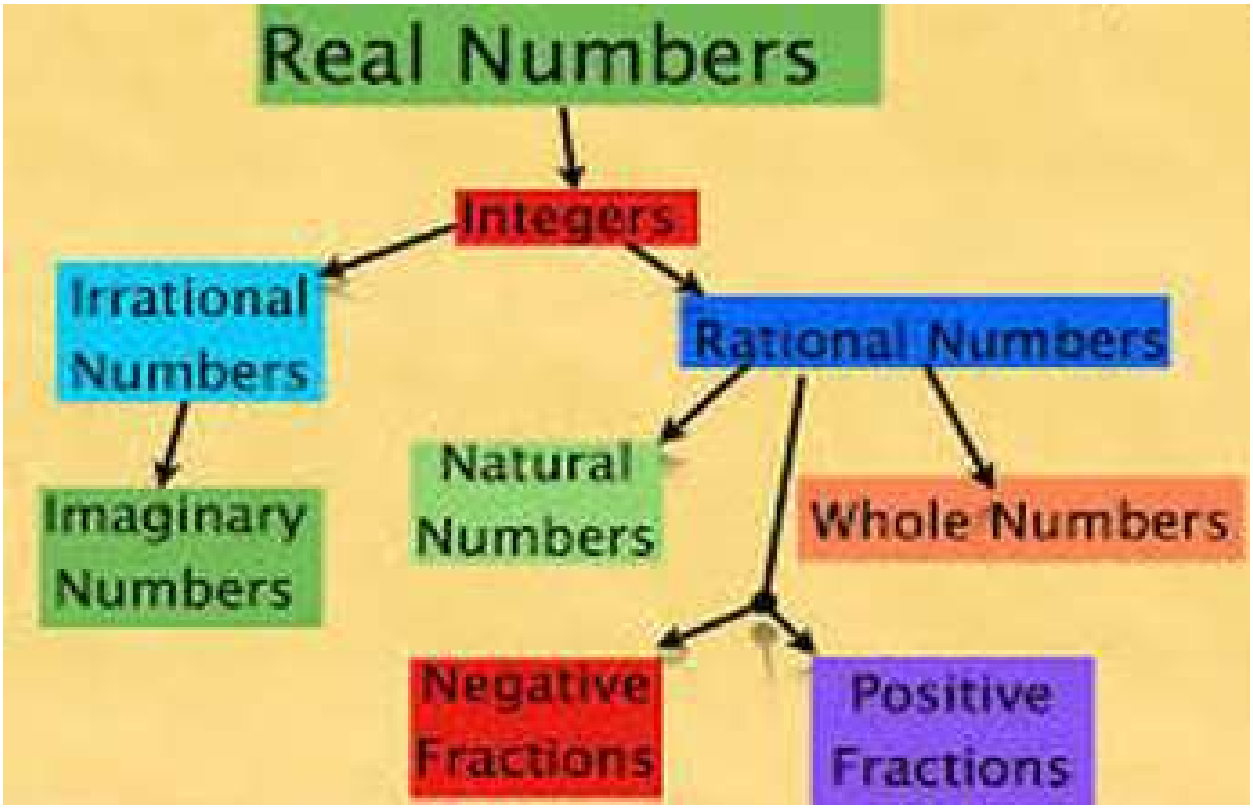
Time: 3 Hrs.

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	43	54
2	**Applying:** Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	19	24
3	**Analysing :** Examine and break information into parts by identifying motives or causes. 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 elements in 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

CHAPTER –1. NUMBER SYSTEM



KEY POINTS-

Introduction to Natural Numbers

Non-negative counting numbers excluding zero are called Natural Numbers.

$$N = \{1, 2, 3, 4, 5\ldots\}$$

Whole Numbers

All natural numbers including zero are called Whole Numbers.

$$W = \{0, 1, 2, 3, 4, 5\ldots\}$$

Integers

All natural numbers, 0 and negatives of natural numbers are called Integers.

$$Z = \{\ldots\ldots, -3, -2, -1, 0, 1, 2, 3, 4\ldots\ldots\}$$

Rational Numbers

The number ‘a’ is called Rational if it can be written in the form of r/s where ‘r’ and ‘s’

are integers and s ≠ 0,

Q = 2/3, 3/5,7 etc. all are rational numbers.

How to find a rational number between two given numbers?

The rational number between two given numbers 'a' and 'b' is

$$\frac{a+b}{2}$$

Example: Find two rational numbers between 4 and 5.

Solution: To find a rational number between 4 and 5.

$$\frac{a+b}{2}=\frac{4+5}{2}=\frac{9}{2}$$

To find another number we will follow the same process again.

$$\frac{1}{2}\left(4+\frac{9}{2}\right)=\left(\frac{1}{2}\right)\frac{17}{2}=\frac{17}{4}$$

Hence the two rational numbers between 4 and 5 are 9/2 and 17/4.

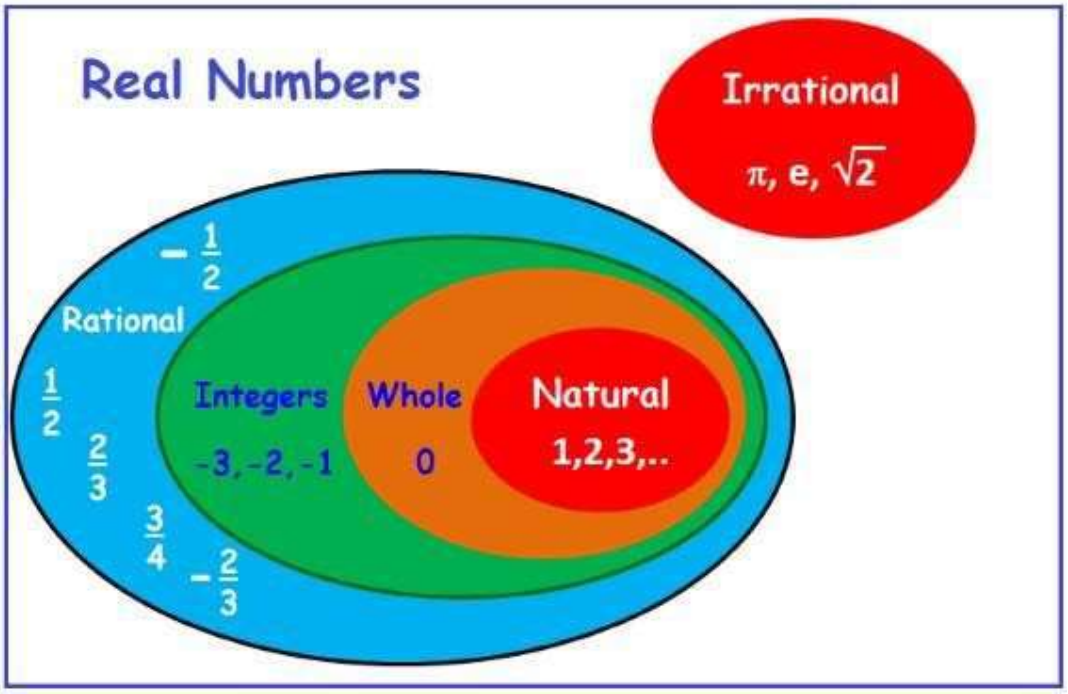
Remarks: There could be unlimited rational numbers between any two rational numbers.

Irrational Numbers

The number 'a' which cannot be written in the form of p/q is called irrational, where p and q are integers and q ≠ 0 or you can say that the numbers which are not rational are called Irrational Numbers.**Example -** √7, √11 etc.

Real Numbers

All numbers including both rational and irrational numbers are called Real Numbers R = –2, (-2/3), 0, 3 and √2 etc.



Real Numbers and their Decimal Expansions

1. Rational Number

If the rational number is in the form of a/b then by dividing a by b we can get two situations.

a. If the remainder becomes zero

While dividing if we get zero as the remainder after some steps then the decimal expansion of such number is called terminating.

Example: 7/8 = 0.875

b. If the remainder does not become zero

While dividing if the decimal expansion continues and a digit or a set of finite number of digits repeats periodically then it is called non terminating recurring or repeating decimal expansion.

Example: 1/3 = 0.3333….

It can be written as $0.\overline{3}$

Hence, the decimal expansion of rational numbers could be terminating or non-

terminating recurring and vice-versa.

2. Irrational Numbers

If we do the decimal expansion of an irrational number then it would be non – terminating non- recurring and vice-versa. i.e the remainder does not become zero and also not repeated.

Example: $\pi = 3.141592653589793238\ldots\ldots$

Operations on Real Numbers

1. The sum, difference, product and quotient of two rational numbers will be

$$\Rightarrow \frac{3}{4}+\frac{7}{4}=\frac{10}{4}=\frac{5}{2}$$

$$\Rightarrow \frac{7}{4}-\frac{3}{4}=\frac{4}{4}=1$$

$$\Rightarrow \frac{7}{4}\times\frac{3}{4}=\frac{21}{16}$$

$$\Rightarrow \frac{7}{4}\div\frac{3}{4}=\frac{7}{3}$$

rational.**Example:**

2. If we add or subtract a rational number with an irrational number then the outcome will be irrational.

Example: If 5 is a rational number and √7 is an irrational number then 5+√7 and 5-√7 are irrational numbers.

3. If we multiply or divide a non-zero rational number with an irrational number then also the outcome will be irrational.

Example: If 7 is a rational number and √5 is an irrational number then 7√7 and 7/√5 are irrational numbers.

4. The sum, difference, product and quotient of two irrational numbers could be rational or irrational.

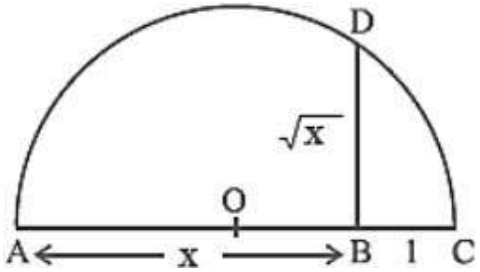
$$\sqrt{3}+\sqrt{3}=2\sqrt{3} \qquad (\text{irrational} + \text{irational} = \text{irrational})$$
$$\sqrt{2}-\sqrt{2}=0 \qquad (\text{irrational} - \text{irrational} = \text{rational})$$
$$(\sqrt{6}).(\sqrt{6})=6 \qquad (\text{irrational} \times \text{irrational} = \text{rational})$$
$$\frac{\sqrt{13}}{\sqrt{13}}=1 \qquad (\text{irrational} \div \text{irrational} = \text{rational})$$

Example:

Finding Roots of a Positive Real Number 'x' geometrically and mark it on the Number Line

To find $\sqrt{x}$ geometrically

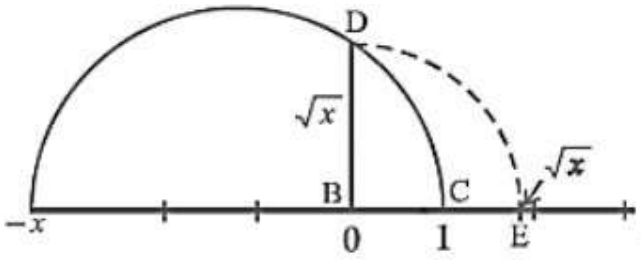
1. First of all, mark the distance x unit from point A on the lines B that AB = x unit.
2. From B mark a point C with the distance of 1unit, so that BC = 1unit.
3. Take the midpoint of AC and mark it as O. Then take OC as the radius and draw a semi circle.
4. From the point B draw a perpendicular BD which intersects the semi circle at point D.



The length of BD = $\sqrt{x}$ unit.

To mark the position of $\sqrt{x}$ on the number line, we will take AC as the number line, with B as zero. So C is point 1 on the number line.

Now we will take B as the centre and BD as the radius, and draw an arc intersecting the number line at point E.



Now E is $\sqrt{x}$ on the number line.

Identities Related to Square Roots

If p and q are two positive real numbers

1. $\sqrt{pq} = \sqrt{p}\sqrt{q}$
2. $\sqrt{\frac{p}{q}} = \frac{\sqrt{p}}{\sqrt{q}}$
3. $(\sqrt{p} + \sqrt{q})(\sqrt{p} - \sqrt{q}) = p - q$
4. $(p + \sqrt{q})(p - \sqrt{q}) = p^2 - q$
5. $(\sqrt{p} + \sqrt{q})(\sqrt{r} + \sqrt{s}) = \sqrt{pr} + \sqrt{ps} + \sqrt{qr} + \sqrt{qs}$
6. $(\sqrt{p} + \sqrt{q})^2 = p + 2\sqrt{pq} + q$

Examples: Simplify

$$(\sqrt{5} + \sqrt{11})(\sqrt{5} - \sqrt{11})$$

We will use the identity

$$(\sqrt{p} + \sqrt{q})(\sqrt{p} - \sqrt{q}) = p - q$$
$$(\sqrt{5} + \sqrt{11})(\sqrt{5} - \sqrt{11}) = 5 - 11 = -6$$

Rationalizing the Denominator

Rationalize the denominator means to convert the denominator containing square root term into a rational number by finding the equivalent fraction of the given fraction.

For which we can use the identities of the real numbers.

To rationalise the denominator of $\frac{1}{\sqrt{a} + b}$, we multiply this by $\frac{\sqrt{a} - b}{\sqrt{a} - b}$, where a and b are integers.

Example: Rationalize the denominator of 7 / (7-√3).

Solution: We will use the identity $(p + \sqrt{q})(p - \sqrt{q}) = p^2 - q$ here.

$$\frac{7}{7 - \sqrt{3}} \times \frac{7 + \sqrt{3}}{7 + \sqrt{3}} = \frac{7(7 + \sqrt{3})}{49 - 3} = \frac{49 + 7\sqrt{3}}{46}$$

Laws of Exponents for Real Numbers

If we have a and b as the base and m and n as the exponents, then

1. $a^m \times a^n = a^{m+n}$

2. $(a^{m})^{n} = a^{mn}$

3. $\frac{a^m}{a^n} = a^{m-n}, m > n$

4. $a^m b^m = (a\,b)^m$

5. $a^0 = 1$

6. $a^1 = a$

7. $1/a^n = a^{-n}$

- Let $a > 0$ be a real number and n a positive integer.

$$\text{Then } \sqrt[n]{a} = b, \text{if } b^n = a \text{ and } b > 0$$

$$\sqrt[n]{a} = a^{\frac{1}{n}}$$

- Let $a > 0$ be a real number. Let m and n be integers such that m and n have no common factors other than 1, and $n > 0$. Then,

$$a^{\frac{m}{n}} = \left(\sqrt[n]{a}\right)^m$$

QUESTION BANK

I Multiple Choice Question (10X1)

1. Every rational number is
(A) A natural number
(B) An integer
(C) A real number
(D) A whole number

2. Between two rational numbers
(A) There is no rational number
(B) There is exactly one rational number
(C) There are infinitely many rational numbers
(D) There are only rational numbers and no irrational numbers .

3. Decimal representation of a rational number cannot be
(A) terminating

(B) non-terminating

(C) non-terminating repeating

(D) non-terminating non-repeating

4. The product of any two irrational numbers is

(A) Always an irrational number

(B) Always a rational number

(C) Always an integer

(D) Some time rational, some time irrational

5. The decimal expansion of the number √2 is

(A) A finite decimal

(B) 1.41421

(C) non-terminating recurring

(D) non-terminating non-recurring

6. Which of the following is irrational?

(a) $\sqrt{\frac{4}{9}}$

(b) $\frac{\sqrt{12}}{\sqrt{3}}$

(c) $\sqrt{7}$

(d) $\sqrt{81}$

7. Which of the following is irrational?

(A) 0

(B) $0.14\overline{16}$

(C) $0.\overline{1416}$

(D) 0.4014001400014...

8. A rational number between √2 and

√3 is

$\frac{\sqrt{2}+\sqrt{3}}{2}$

$\frac{\sqrt{5}-\sqrt{6}}{2}$

(A)

(B)

(C) 1.5

(D) 1.8

9. The value of 1.999….in the form $\frac{p}{q}$, of where p and q are integers and $q \neq 0$, is

(A) $\frac{19}{10}$

(B) $\frac{1999}{1000}$

(C) 2

(E) $\frac{1}{9}$

10. $2\sqrt{3} + \sqrt{3}$ is equal to

(A) $\sqrt{6}$

(B) 6

(C) $3\sqrt{3}$

(D) $3\sqrt{6}$

ANSWERS:

1. **Sol**.(C) A real number

   We know that rational and irrational numbers taken together are known as real numbers. Therefore, every real number is either a rational number or an irrational number. Hence, every rational number is a real number. Therefore, (c) is the correct answer.

2. **Sol.** (C) there are infinitely many rational numbers.

Between two rational numbers there are infinitely many rational number for example

between 4 and 5 there are 4.1,4.2 .4.22,4.223..... Hence, (C) is the correct answer.

3. **Sol.** (D) non-terminating non repeating

The decimal representation of a rational number cannot be non-terminating and non- Repeating.

4 Sol.(D)some time rational,some time irrational

The product of any two irrational numbers is either rational or irrational.

$(2+\sqrt{3})(2-\sqrt{3})$	$(2+\sqrt{3})(1-\sqrt{3})$
$(2)^2-(\sqrt{3})^2$	$2(1-\sqrt{3})+\sqrt{3}(1-\sqrt{3})$
$4-3=1$	$2-2\sqrt{3}+\sqrt{3}-3$
RATIONAL	$-1-\sqrt{3}$
	IRRATIONAL

Hence, (D) is the correct answer. For example:

5. Sol. (D) non-terminating non-recurring

The decimal expansion of the number √2 is 1.41421……

6 Sol. (C) is the correct answer.

$$\sqrt{\frac{4}{9}}=\frac{3}{2},$$

$$\frac{\sqrt{12}}{\sqrt{3}}=\frac{\sqrt{4\times 3}}{\sqrt{3}}=\frac{2\sqrt{3}}{\sqrt{3}}=2,$$

$$\sqrt{7}$$

$$\sqrt{81}=9,$$

7. Sol. (D) 0.4014001400014...

A number is irrational if and only of its decimal representation is non-terminating and

non- recurring.

(a) 0.14 is a terminating decimal and therefore cannot be an irrational number.

(b) $0.14\overline{16}$ is a non-terminating and recurring decimal therefore cannot be irrational.

(c) $0.14\overline{16}$ is a non-terminating and recurring decimal and therefore cannot be irrational.

(d) 0.40140014000014... is a non-terminating and non-recurring decimal and therefore is an

irrational number.

8. **Sol.** (C) is the correct answer.

We know that $\sqrt{2}$ = 1.4142135……. and $\sqrt{3}$ = 1.732050807……..

We see that 1.5 is a rational number which lies between

1.4142135…..and1.732050807…. Hence, (C) is the correct answer.

9. Sol. (C) is the correct answer.

Let $x = 1.999... = 1.\overline{9}$ ….(1)

Then, $10x = 19.999... = 19.\overline{9}$ ….(2)

Subtracting (1) and (2), we get

$$9x = 18 \Rightarrow x = 18 \div 9 = 2$$

∴ The value of 1.999…. in the form of p/q is 2/1 or Hence, (C) is the correct answer.

10 Sol. (C) is the correct answer.

Given

$$2\sqrt{3} + \sqrt{3} = (2+1)\sqrt{3} = 3\sqrt{3}$$

Hence, (C) is the correct answer

II: SHORT ANSWERS TYPE QUESTIONS (2 MARKS)

1. Simplify: $\sqrt{10} \times \sqrt{15}$
2. Rationalizing the Denominator $\frac{1}{\sqrt{7}-2}$

$$\frac{\sqrt{32}+\sqrt{48}}{\sqrt{8}+\sqrt{12}}$$

3. Simplify:

4. If $x^{1/12} = 49^{1/24}$,then find the value of x.

5. Identify a rational number among the following numbers: $2 + \sqrt{2}$, $2\sqrt{2}$, 0 and π.

6. Simplify $\sqrt[4]{\sqrt[3]{2^2}}$

7. Find the value of $(256)^{0.16} \times (256)^{0.09}$

8. Find a rational number and an irrational number between the following:

   (i) 2 and 3

   (ii) 0 and 0.1

9. Represent $\sqrt{5}$ on the number line.

10. Simplify: $(\sqrt{2} + \sqrt{3})(\sqrt{2} - \sqrt{3})$

ANSWERS:

1. $5\sqrt{6}$ **2.** $(\sqrt{7}+2)/3$ **3.** 2 **4.** x= 7 **5.** 0 **6.** $2^{1/6}$ **7.** 4

8. Real numbers lies between given numbers **10.** -1

III: SHORT ANSWER TYPE QUESTIONS (3 MARKS)

Example: Show that 0.00323232……can be expressed in the form of p/q, where p and q are integers

and $q \neq 0$.

Let $x = 0.00323232\ldots$

$\Rightarrow x = 0.00\overline{32}$ ..... (1)

Multiplying both sides by 100 to equation (1), we ge

$100\,x = 0.\overline{32}$ ..... (2)

Multiplying both sides by 10000 to equation (1), we get

$10000\,x = 32.\overline{32}$ ..... (3)

Subtracting equation (2) from equation (3), we get

$10000\,x - 100x = 32.\overline{32} - 0.\overline{32}$

$\Rightarrow 9900x = 32$

$\Rightarrow x = \frac{32}{9900} = \frac{8}{2475}$

$\frac{7}{3\sqrt{3} - 2\sqrt{2}}$,

1. Rationalize:
2. If $\sqrt{2} = 1.4142$, then find the **value of** $\sqrt{\frac{\sqrt{2}-1}{\sqrt{2}+1}}$
3. Evaluate : $(\sqrt{5} + \sqrt{2})^2 + (\sqrt{8} - \sqrt{5})^2$
4. If $x = \frac{\sqrt{2}+1}{\sqrt{2}-1}$ and $y = \frac{\sqrt{2}-1}{\sqrt{2}+1}$, find the value of $(x + y)$.
5. Show that 0.02353535……can be expressed in the form of p/q, where p and q are integers and $q \neq 0$.

ANSWERS:

1. $\frac{7}{19}(3\sqrt{3} + 2\sqrt{2})$ **2.** 0.4142 **3.** $20-3\sqrt{10}$ **4.** 6 **5.** 47/1980

IV: LONG ANSWER TYPE QUESTIONS (5 MARKS)

Example : *If* $\frac{3+\sqrt{2}}{3-\sqrt{2}} = a + b\sqrt{2}$, find the value of a and b.

Sol: We have ,

$$\frac{3+\sqrt{2}}{3-\sqrt{2}} = \frac{3+\sqrt{2}}{3-\sqrt{2}} \times \frac{3+\sqrt{2}}{3+\sqrt{2}} = \frac{9+2+6\sqrt{2}}{9-2} = \frac{11+6\sqrt{2}}{7} = \frac{11}{7} + \frac{6\sqrt{2}}{7} \quad \text{.....(i)}$$

$$\frac{3+\sqrt{2}}{3-\sqrt{2}} = a + b\sqrt{2}$$

$$\frac{11}{7} + \frac{6\sqrt{2}}{7} = a + b\sqrt{2} \qquad \text{[using (i)]}$$

Equating rational and irrational parts, we get

a= 7/11 and b = 6/7

Q1. Prove that:

$$\frac{1}{\sqrt{4}+\sqrt{5}} + \frac{1}{\sqrt{5}+\sqrt{6}} + \frac{1}{\sqrt{6}+\sqrt{7}} + \frac{1}{\sqrt{7}+\sqrt{8}} + \frac{1}{\sqrt{8}+\sqrt{9}} = 1$$

Q2. If $x = 3 + \sqrt{7}$, find the value of $\left(x + \frac{1}{x}\right)$.

Q3. Find the value of a and b in the following

$$\frac{7+\sqrt{5}}{7-\sqrt{5}} - \frac{7-\sqrt{5}}{7+\sqrt{5}} = a + \frac{7}{11}\sqrt{5}\,b.$$

Q4. Show that:

$$\left(\frac{x^a}{x^b}\right)^{a+b} \cdot \left(\frac{x^b}{x^c}\right)^{b+c} \cdot \left(\frac{x^c}{x^a}\right)^{c+a} = 1$$

ANSWERS:

2. **3/2 (3 + √7)** **3. a= 0 and b = 1.**

V: CASE STUDY BASED QUESTIONS. (4 marks)

Example: Two classmates Salma and Anil simplified two different expressions during

the revision hours and explained to each other their simplifications.

Salma explains simplification of $\frac{\sqrt{2}}{\sqrt{5}+\sqrt{3}}$ by rationalizing the denominator and

Anil explains simplifications of $(\sqrt{2}+\sqrt{3})(\sqrt{2}+\sqrt{3})$ by using the identity.

Answer the following question.

a. What is the conjugate of $\sqrt{5}+\sqrt{3}$

a. $\sqrt{5}+\sqrt{3}$ **b.** $\sqrt{5}-\sqrt{3}$ **c.** $\sqrt{5}$ **x** $\sqrt{3}$ **d.** $\sqrt{5}/\sqrt{3}$
Ans. b

b. By rationalizing the denominator of $\frac{\sqrt{2}}{\sqrt{5}+\sqrt{3}}$ Salma got the answer:

a. $\frac{\sqrt{2}}{\sqrt{5}-\sqrt{3}}$ ***b.*** $\frac{\sqrt{2}(\sqrt{5}-\sqrt{3})}{2}$ ***c.*** $\sqrt{5}-\sqrt{3}$ **d.** $\frac{\sqrt{2}(\sqrt{5}+\sqrt{3})}{2}$
Ans. **b**

c. Anil applied …… identity to solve $(\sqrt{2}+\sqrt{3})(\sqrt{2}+\sqrt{3})$

a. (a+b) (a+b) b. (a+b) (a-b) c. (a-b) (a-b) d. (x+a) (x+b)
Ans. **c**

d. $(\sqrt{2}+\sqrt{3})(\sqrt{2}+\sqrt{3})$ = **……**

a. -1 b. 1 c. 5 d. -5
Ans. **a**

Q1). One day Seema went two children's park for waling. She saw many children playing

with sea-saw, swings and other things. All of a sudden, she saw a line drawn on the

ground. There were many tick marks on the line at equal distance. She wrote '0' at the

centre point of the line, negative numbers on one side and positive numbers on the other

side of '0' point.

Sea-saw

Seema called a boy 'Sonu' and asked following questions:

i. In which side, you will write negative numbers to make it a number line?

ii. In which side, you will indicate Natural numbers?

iii. In which side, you will move to get a larger number?

iv. Which of the following irrational?
a.3.4567
b.1.010010001…
c.7.128128128….
d.√841

Q2) Two friends were given a project to tag the numbers given to them as R, IR which are short form for
rational number, irrational number respectively.

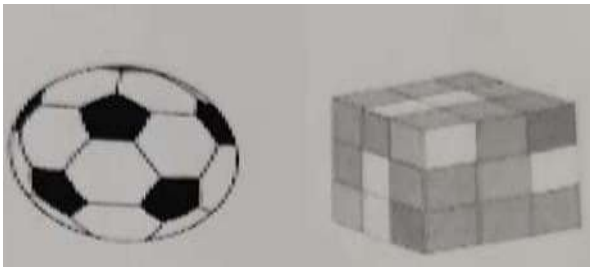
The numbers are: 1.707007000….., 1/5, √49, √2 and √3

$5.020020002\ldots.\ ,3/4,\ \sqrt{7},\ \frac{\sqrt{54}}{\sqrt{6}}\ ,\frac{1}{2\sqrt{3}-\sqrt{11}}$ –

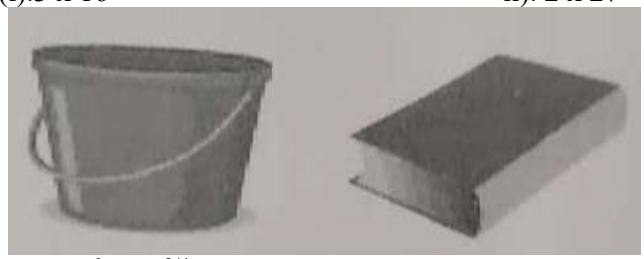
i) Identify rational and irrational numbers from the given numbers.
ii) Find two rational and two irrational number between √2 and √3.

iii) Rationalise: $\frac{1}{2\sqrt{3}-\sqrt{11}}$

Q3) A teacher show 4 articles of different lengths in classroom of standard IX. The difficulty is that the lengths are in exponentials form. The length of the articles are following:



(i).3 x $16^{3/4}$ ii). 2 x $27^{2/3}$



iii). 4^0 x $16^{3/4}$ iv). 2 x $9^{3/2}$ x 3^{-1}

i. The length of the first article is

a) 6 b) 12 c) 24 d) none of these

ii. The product of the lengths of second and third articles is

a) 148 b) 158 c) 144 d) none of these

iii. The product of the lengths of first and third articles is

a) 192 b) 144 c) 324 d) 432

iv. The ratio of the lengths of first and fourth articles is

a). 3:4 b) 4:3 c) 1:1 d) 4:9

v. Select those two articles, whose lengths are equal

a) 1st and 2nd b) 2nd and 3rd c) 2nd and 4th d) 1st and 3rd

ANSWERS:

1.(i) Left side (ii) Right side (iii) Left to right (iv) b

2. Irrational - 1.707007000… , 5.020020002…. ,$\sqrt{7}$, $\frac{1}{2\sqrt{3}-\sqrt{11}}$, $\sqrt{2}$ and $\sqrt{3}$

Rational - 1/5, $\sqrt{49}$, 3/4, $\frac{\sqrt{54}}{\sqrt{6}}$

(ii) real number lies between $\sqrt{2}$ and $\sqrt{3}$.

(iii) $2\sqrt{3}+\sqrt{11}$

3. (i) c (ii) c (iii) a (iv) b (v) c

VI : ASSERTION AND REASONING QUESTIONS

DIRECTION: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:
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. **Assertion:** Rational number lying between two rational numbers *x* and *y* is (x+y)/2.

Reason: There is one rational number lying between any two rational numbers.

2. **Assertion:** 5 is a rational number.
Reason: The square roots of all positive integers are irrationals.

3. **Assertion:** Sum of two irrational numbers $2+\sqrt{3}$ and $4+\sqrt{3}$ is irrational number.

Reason: Sum of two irrational numbers is always an irrational number.

4. **Assertion:** $2+\sqrt{3}$ is an irrational number.
Reason : Sum of a rational number and an irrational numbers is always an irrational number.

5 **Assertion:** $11^3 \times 11^4 = 11^{12}$
Reason: If $a > 0$ be a real number and p and q be rational numbers. Then $a^p \times a^q = a^{p+q}$.

6. **Assertion:** $7^8 \div 7^4 = 7^4$

Reason: If $a > 0$ be a real number and p and q be rational numbers. Then $a^p \times a^q = a^{p+q}$.

7. Assertion: $\sqrt{5}$ is an irrational number.

Reason: A number is called irrational, if it cannot be written in the form of p/q, where p and q are integers and $q \neq 0$.

8. Assertion: 0.329 is a terminating decimal.

Reason: A decimal in which a digit or a set of digits is repeated periodically, is called a

repeating, or a recurring, decimal.

9 Assertion: The rationalizing factor of $3+2\sqrt{5}$ is $3-2\sqrt{5}$.
Reason: If the product of two irrational numbers is rational then each one is called the rationalising factor of the other.

10. **Assertion:** 0.7 and 0.00323232….. are rational numbers**.**
Reason: If the decimal expansion of a real number is either terminating or non - terminating recurring , it is a rational number.

ANSWERS:

1. We know that there are infinitely many rational numbers between any two given rational numbers.
So, Reason is not correct.
One of the rational number lying between two rational numbers x and y is (x+y)/2.

So, Assertion is correct. **Correct option: (C)** Assertion (A) is true but reason (R) is false

2. Here reason is not true. Example $\sqrt{4} = \pm 2$, which is not an irrational number.

Correct option: (C) Assertion (A) is true but reason (R) is false.

3. Here, $(2 + \sqrt{3}) + (4+\sqrt{3}) = 6 + 2\sqrt{3}$ which is an irrational number.

So, Assertion is correct.

Now, $2 + \sqrt{3}$ and $4 - \sqrt{3}$ are two irrational numbers Sum = $(2+\sqrt{3}) + (4-\sqrt{3}) = 6$ which is a rational number. So, Reason is not correct.

Correct option: (C) Assertion (A) is true but reason (R) is false.

4. **Correct option**: **(A)** Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

5. **Correct option: (D)** Assertion (A) is false but reason (R) is true.

6. **Correct option: (B)** Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A)

7.Correct option: (A) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

8.Correct option: (B) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

9.Correct option: **(A)** Both assertion (A)and reason(R) are true and reason (R) is the correct explanation of assertion (A).

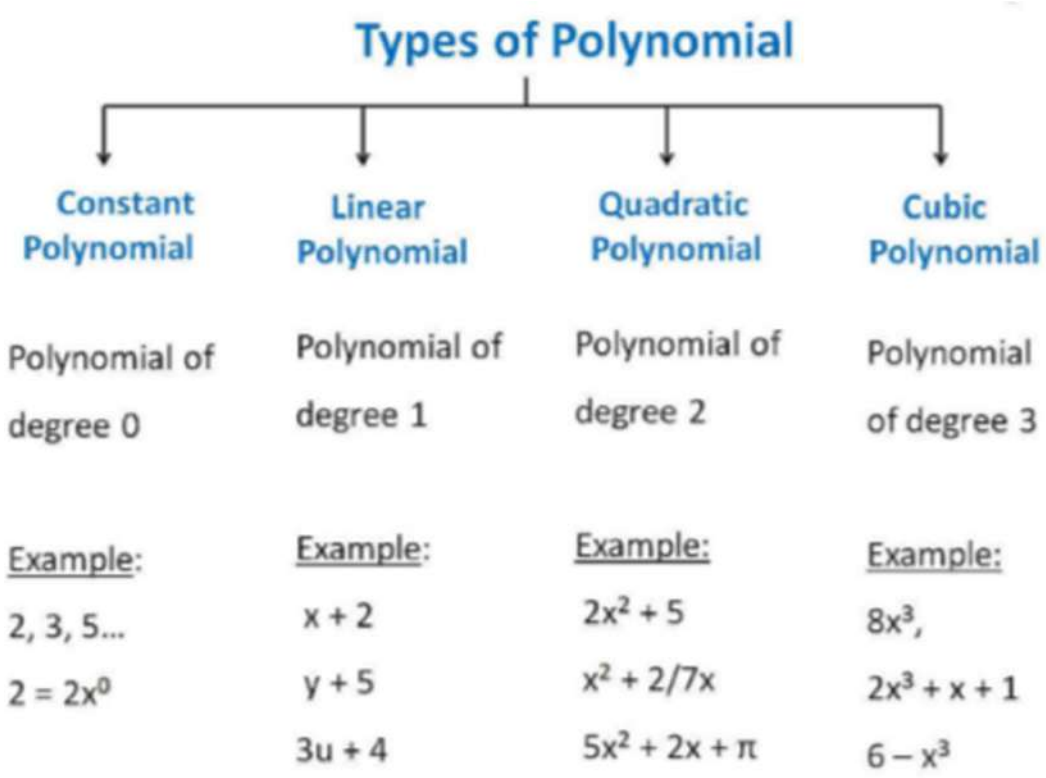
10.Correct option: (A) Both assertion (A) and reason (R) are true and reason (R) is the

correct explanation of assertion (A).

……
……..

CHAPTER-2 POLYNOMIAL

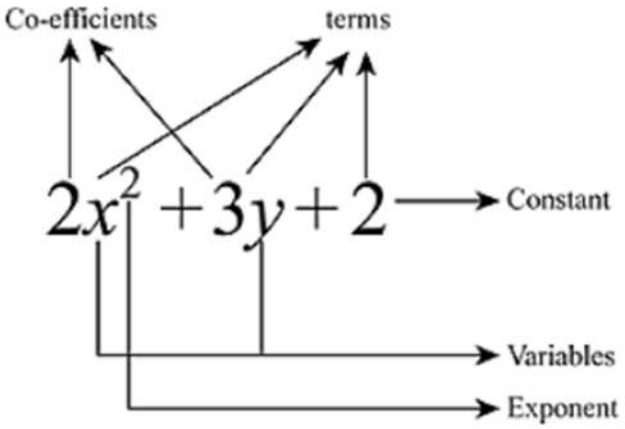
Mind map



Polynomial is an algebraic expression which includes constants, variables and exponents. It is the expression in which the variables have only positive integral powers.

Example

1. $2x^3 + 7x^2 + x + 3$ is a polynomial in variable x.
2. $3x^2 + 3x^{-1} - 4$ is not a polynomial as it has negative power.
3. $x^{3/2} + 5x - 3$ is not a polynomial.



- Polynomials are denoted by p(x), q(x) etc.
- In the above polynomial $2x^2$, 3y and 2 are the terms of the polynomial.
- 2 and 3 are the coefficient of the x^2 and y respectively.
- x and y are the variables.
- 2 is the constant term which has no variable.

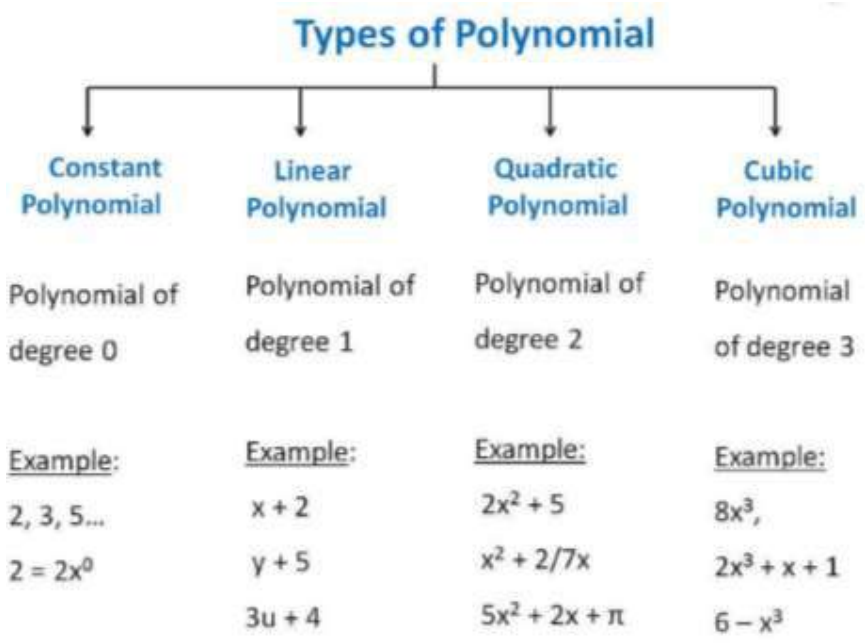
❖ **Types of Polynomials according to no. of terms**

Number of Non-Zero Terms	Name	Example
0	**Zero Polynomial**	**0**
1	**Monomial**	**3x**
2	**Binomial**	$X^2 + y^2$
3	**Trinomial**	$3X^2+Y^2+2$

Degree of Polynomial - The highest value of the power of the variable in the polynomial is

the degree of the polynomial.

- Types of Polynomials according to degree of it.



Zeroes of a Polynomial

If p(x) is a polynomial then the number 'a' will be the zero of the polynomial with p(a) = 0. We can find the zero of the polynomial by **equating it to zero**.

Example: 1

Given polynomial is p(x) = x - 6

To find the zero of the polynomial we will equate it to zero.

x - 6 = 0

x = 6

p(6) = x – 6 = 6 – 6 = 0

This shows that if we place 6 in place of x, we got the value of the polynomial as zero. So 6 is the zero of this polynomial. And also we are getting the value 6 by equating the polynomial by 0.

So 6 is the zero of the polynomial or root of the polynomial.

IMPORTANT POINTS :-

- A zero of a Polynomial need not be 0.
- 0 may be a zero of a Polynomial.
- Every linear polynomial has one and only one zero.
- A polynomial can have more than one zero.

FACTOR THEOREM – If p(x) is a polynomial of degree $n \geq 1$ and a is any real number, then

(i) x-a is a factor of p(x), if p(a) = 0 and
(ii) p(a) = 0, if x-a is a factor of p(x)

PROOF :- By the Remainder Theorem, p(x) = (x-a) q(x) + p(a).

(i) If p(a) = 0, then p(x) = (x – a) q(x), which shows that (x-a) is a factor of p(x).
(ii) Since (x – a) is a factor of p(x), p(x) = (x – a) g(x) for same polynomial g(x), In this case, p(a) = (a – a) g(a) = 0.

ALGEBRAIC IDENTITIES :-

- **Identity I** $(a + b)^2 = a^2 + 2ab + b^2$
- **Identity II** $(a – b)^2 = a^2 – 2ab + b^2$
- **Identity III** $a^2 – b^2 = (a + b)(a – b)$
- **Identity IV** $(x + a)(x + b) = x^2 + (a + b)\,x + ab.$
- **Identity V** $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca.$
- **Identity VI** $(a + b)^3 = a^3 + b^3 + 3ab\,(a + b)$
- **Identity VII** $(a – b)^3 = a^3 – b^3 – 3ab\,(a – b)$
- **Identity VIII** $a^3 + b^3 + c^3 – 3abc = (a + b + c)(a^2 + b^2 + c^2 – ab – bc – ca)$

1 MARK QUESTIONS (MCQ)

Q1. How many terms are in given polynomial $-3x^3 + 7x - 2$

Ans. (a) 1 (b) 2 (c) 3 (c) 0

Q2. Which of the following is the example of Trinomial ?

Ans. (a) -6x

(b) $6x^3$ +5x-3+$2x^2$

(c) 5x+2

(d) -$9x^2$+3x-8

Q3. A binomial of degree 10 in the following is :

Ans (a) 10x+3

(b) $\frac{-5}{20}$x + 10

(c) x^{10} + 10

(d) 10x + 10

Q4. If (x – a) is a factor of p(x) = a-x then which of the following is true ?

Ans. (a) p(a) = 2

(b) p(b) = 0

(c) p(a) = 0

(d) p(c) =2

Q5. Value of k for which x-1 is a factor of the polynomial $3x^2$-2x+k is

Ans. (a) 2 (b) 3 (c) 1 (d) -1

Q6. A polynomial of degree 4 in y has at most

Ans. (a) 3terms (b) 4 terms (c) 5 terms (d) 6 terms

Q7. 8 is a polynomial of degree

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

Q8. Degree of zero polynomial is

Ans. (a) 0 (b) 1 (c) -1 (d) not defined

Q9. The zero of the polynomial p(x) = -2x+2 is

Ans. (a) 0 (b) 1 (c) -1 (d) 2

Q10. The coefficient of x in -$2x^3$+ 7x-15 is

Ans. (a) -2 (b) 15 (c) 7 (d)-15

2 MARKS QUESTIONS

Q1. Give one example each of a binomial of degree 35, and of a monomial of degree100.

Q2. Find the value of polynomial p(x) = $5x^2$-3x+7 at x =1.

Q3. Find the zero of the following polynomial p(x) = 3x-2.

Q4. Find the value of k if x-1 is a factor of $4x^3$+$3x^2$-4x +k.

Q5. Factorise : $2X^2$+7X+3.

Q6. Find the following product using appropriate identity (x+3) (x+3).

Q7. Evaluate the following products without multiplying directly 103 x 107

Q8. Evaluate using suitable identity $(99)^3$.

Q9. Use suitable identity to find the following product (3-2x) (3+ 2x).

Q10.Examine whether x+2 is a factor of x^3+$3x^2$+5x+6.

3 MARKS QUESTIONS:

Q1. Use the Factor Theorem to determine whether g(x)= x+1 is a factor of p(x)= $2x^3$+x^2-2x-1

Q2. Expand using suitable identity $(2x - y + z)^2$.

Q3. Factorise $4x^2$+$9y^2$+$16z^2$+12xy-24yz-16xz.

Q4. If x+y+z = 0, show that x^3+y^3+z^3= 3xyz.

Q5. Give expressions for the length and breadth of the following rectangle $25a^2$ -35a +12.

5 MARKS QUESTIONS

Q1. Factorise x^3+$13x^2$+32x+20.

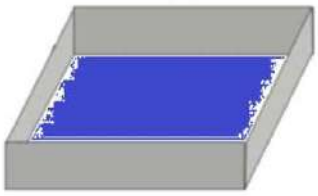
Q2. Verify (a) x^3+y^3 = (x+y) (x^2 – xy + y^2)
(b) x^3-y^3 = (x-y) (x^2+ xy + y^2)

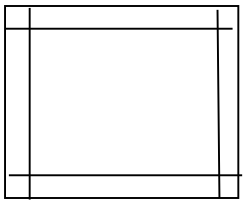
Q3. Verify that $x^3 + y^3 + z^3$-3xy = $\frac{1}{2}$(x + y + z) [$(x - y)^2 + (y - z)^2 + (z - x)^2$]

CASE STUDY QUESTIONS

Q1. Manoj is making a box using a cardboard. He found a cardboard with sides 9cm by 9cm. He cuts out four squares of equal size at corners and folding up the sides to make an open box.

Manoj paints it beautifully and puts all his pens in that.





(a) Suppose the side of the square cut out is x cm, then find the polynomial to find the volume of the cuboid formed.

(b) Identify the degree of the polynomial.
(c) If the side of the square is 1cm then what is volume of the box?
or
(d) If whole box is covered by a paper then what will be area of paper?

Q2. Ritesh lives in Delhi with his family. One day his father told him that we have a property in our village. Ritesh went to village and found that he has a plot as ancestral property. The width of the plot was x m and length was 5 m less than 7 times of its breadth.

(a) Express the length as a polynomial.
(b) represent the perimeter as a polynomial.
(c) Form the polynomial to represent the area of the plot.
Or
(d) Express the perimeter if the length is increased by 2m.

Q3. Simran is an engineer. She has a beautiful house. She made a beautiful rectangular garden and a swimming pool in her house. Area of the garden is $x^2 - 3x - 4$.

(a) What are the dimensions of the garden?
(b) Find the perimeter of the garden.
(c) If length is increased by x units then, what will be total area of the the garden.

Or

(d) What will be total cost of preparing the garden, if the cost per square unit is Rs 50.

ASSERTION QUESTIONS

1) Assertion : The constant polynomial 0 is called zero polynomial.

Reason : $\sqrt{x}+3$ is a polynomial.

a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion

b) Both Assertion and Reason are correct and Reason is not the correct explanation for assertion.

c) assertion is true but the reason is false.

d) both assertion and reason are false.

2) Assertion : 2x-1 is the linear polynomial.
Reason : A polynomial of degree 1 is called linear polynomial.
a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.
c) assertion is true but the reason is false.
d) both assertion and reason are false.

3) Assertion : a polynomial can have more than one zero.
Reason : every real number is zero of zero polynomial.
a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.
c) assertion is true but the reason is false.
d) both assertion and reason are false.

4) Assertion : The polynomial $3x^4-4x^{3/2}+x^2$ is not a polynomial

Reason : because the power in the term $4x^{3/2}$which is not a whole number.

a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.
c) assertion is true but the reason is false.

d) both assertion and reason are false.

5) Assertion : a polynomial of degree 3 is called cubic polynomial.

Reason : $3z^3-2z^2+7z+9$ is a cubic polynomial.

a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.
c) assertion is true but the reason is false.
d) both assertion and reason are false.

6) Assertion : If one zero of polynomial p(x) = $(k^2+4)x^2+13x+4k$ is reciprocal of the other, then k=2.

Reason : If (x-a) is a factor of p(x), then p(a) = 0 i.e., a is a zero of p(x).

a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.
c) assertion is true but the reason is false.
d) both assertion and reason are false.

7) Assertion : If (x-1) is the factor of $4x^3+3x^2-4x+k$ then k=-3

Reason : $(x+y)^2 = x^2+y^2+2xy$

a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.
c) assertion is true but the reason is false.
d) both assertion and reason are false.

8) Assertion : $(3x+4y)^3 = 27x^3+64y^3+36xy(3x+4y)$

Reason : $(x+y)^3 = x^3+y^3+3xy(x+y)$

a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion

b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.
c) assertion is true but the reason is false.

d) both assertion and reason are false.

9) Assertion : if (x+2) is a factor of $x^3 - 2ax^2+16$ the value of a is 7

Reason : if one of the factor of x^2+x-20 is (x+5)and other is (x+4)

a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.
c) assertion is true but the reason is false.

d) both assertion and reason are false.

10) Assertion: A polynomial whose coefficients are all equal to 0 is called zero polynomial.

Reason : a degree of p(x)=7xyz is 3

a) Both Assertion and Reason are correct and Reason is the correct explanation for Assertion
b) Both Assertion and Reason are correct and Reason is not the correct explanation for Assertion.
c) assertion is true but the reason is false.

d) both assertion and reason are false.

ANSWER:

MCQ'S

(1) C (2) D (3) C (4) C (5) D
(6)B (7) A (8) D (9) B (10) C

VERY SHORT ANSWERS

(1) $X^{35} + 2$ AND X^{100} (2) 9 (3) 2/3 (4) -3 (5) (X+3)(2X+1)
(6)X^2+6X+9 (7) 11021 (8) 970299 (9) 9-4X^2 (10) YES

SHORT ANSWERS

(1) YES (2) (3) (2X+3Y-4Z) (2X+3Y-4Z)
(5) (5a-3)(5a-4)

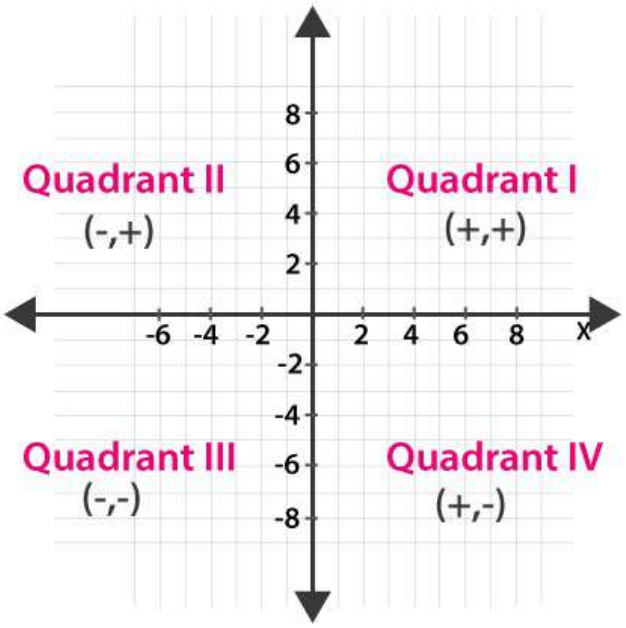
LONG ANSWERS

(1) (X+1)(X+2)(X+10)

ASSERTION

(1) C (2) A (3) C (4) A (5) A
(6)B (7) C (8) A (9) D (10) B

CHAPTER- 3 COORDINATE GEOMETRY



KEY POINTS

1. To locate the position of an object or a point in a plane, we require two perpendicular lines. One of them is horizontal, and the other is vertical.

2. The plane is called the Cartesian, or coordinate plane and the lines are called the coordinate axes. 3. The horizontal line is called the x -axis, and the vertical line is called the y - axis.

4. The coordinate axes divide the plane into four parts called quadrants.

5. The point of intersection of the axes is called the origin.

6. The distance of a point from the y - axis is called its x-coordinate, or abscissa, and the distance of the point from the x-axis is called its y-coordinate, or ordinate.

7. If the abscissa of a point is x and the ordinate is y, then (x, y) are called the coordinates of the point.

8. The coordinates of a point on the x-axis are of the form (x, 0) and that of the point on the y-axis are (0, y).

9. The coordinates of the origin are (0, 0).

10. 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.

MCQs

Q1. If the coordinates of a point are (3, 0), then it lies in:

a) X-axis b) Y-axis c) At origin d) Between x-axis and y-axis

Q2. If the coordinates of a point are (-3,-4), then it lies in:
a) First quadrant b) Second quadrant c) Third quadrant d) Fourth quadrant

Q3. The name of horizontal line in the cartesian plane which determines the position of a point is called: a) Origin b) X-axis c) Y-axis d) Quadrants

Q4.The name of vertical line in the cartesian plane which determines the position of a point is called:
a) Origin b) X-axis c) Y-axis d) Quadrants

Q5.The section formed by horizontal & vertical lines determining the position of point in a cartesian plane is called:
a) Origin b) X-axis c) Y-axis d) Quadrants

Q6.The point of intersection of horizontal & vertical lines determining the position of point in Cartesian plane is called:
a) Origin b) X-axis c) Y-axis d) Quadrants

Q7.Points (1,2), (-2,-3), (2,-3);
a) First quadrant b) Do not lie in the same quadrant c) Third quadrant d) Fourth quadrant

Q8. The point whose ordinate is 8 and lies on *y*-axis:
a) (0, 8) b) (8, 0) c) (5, 8) d) (8, 5)

Q9. The mirror of a point (3, 4) on *y*-axis is:
a) (3, 4) b) (–3, 4) c) (3, –4) d) (–3, –4)

Q10. Signs of the abscissa and ordinate of a point in the second quadrant are respectively

a) +, + b) +, – c) -, + d) -, –

2 MARKS QUESTIONS

Q1. Write the coordinates of the point:
(i)Which lie on x and y axes both
(ii)Whose ordinate is -4 and which lies on y axis.

Q2. In which quadrant or which axis each of the points (-2, 4), (3, -1), (-1,0) and (1,2) lie?

Q.3-Write whether the following statements are True or False?
(i)Point (0, –2) lies on y-axis. (ii) The perpendicular distance of the point (4, 3) from the x-axis is 4

Q.4-In which quadrant do the following points lie?
(i) (4,2) (ii) (-3,5) (iii) (-2,-2) (iv) (4,-3)

Q.5-Find the coordinate of the point
(i) which lies on the x and y axes both. (ii) whose ordinate is -5 and which lies on y-

axis.

Q6.Without plotting the points indicate the quadrant in which they will lie, if
(i) the ordinate is 1 and abscissa is – 1
(ii) the abscissa is – 5 and ordinate is – 2

Q.7-Find the coordinates of the point
(i) whose ordinate is – 4 and which lies on y-axis.
(ii) whose abscissa is 5 and which lies on x-axis.

Q.8-Without plotting the points indicate the quadrant in which they will lie, if
(i) ordinate is 5 and abscissa is – 3
(ii) abscissa is – 5 and ordinate is – 3

Q9. A point lies on the x-axis at a distance of 7 units from the y-axis.
What are its coordinates? What will be the coordinates if itlies on y-axis at a distance of -7 units from x-axis?

Q10. Which of the following points lie on y-axis?
A (1, 1), B (1, 0), C (0, 1), D (0, 0), E (0, – 1), F (– 1, 0), G (0, 5), H (– 7, 0), I (3, 3).

3 MARKS QUESTIONS

Q1. Write the answer of each of the following questions:

(i) What is the name of horizontal and the vertical lines drawn to determine the position of any point in the Cartesian plane?

(ii) What is the name of each part of the plane formed by these two lines?

(iii) Write the name of the point where these two lines intersect.

Q2.Plot the following points and write the name of the figure obtained by joining in order P(-3,2), Q(-7, -3), R(6, -3) and S (2, 2)

Q3.Plot the following ordered pairs of number (x, y) as points in the Cartesian plane. Use the scale 1cm = 1 unit on the axes.

x	-3	0	-1	4	2
y	7	-3.5	-3	4	-3

Q4. On plotting the points O(0, 0) , A (3, 0) , B(3, 4), C (0, 4) and joining OA, AB, BC and CO. Name the figure obtained?

Q5. Without plotting the points indicate the quadrant in which they will lie, if

(i) the ordinate is 2 and abscissa is – 1

(ii) the abscissa is – 2 and ordinate is – 1

(iii) the abscissa is – 1 and ordinate is 8

5 MARKS QUESTIONS

Q1.Plot the following points and check whether they are collinear or not:

(i) (1, 1), (2, – 3), (– 1, – 2) (ii) (0, 0), (2, 2), (5, 5)

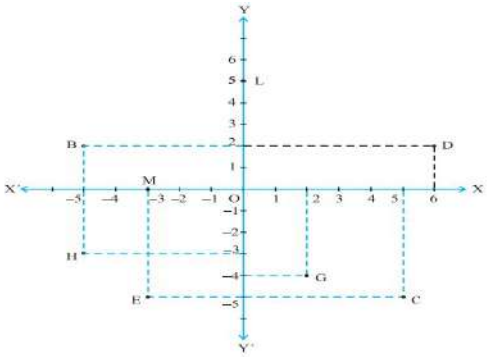
Q2. Without plotting the points indicate the quadrant in which they will lie, if

(i) the ordinate is 5 and abscissa is – 3 (ii) the abscissa is – 5 and ordinate is – 3

(iii) the abscissa is – 5 and ordinate is 3 (iv) the ordinate is 5 and abscissa is 3

(v) the abscissa is 2 and ordinate is -5

Q3. From the figure write the answer of the following:



(i) The coordinates of D.

(ii) The point identified by the coordinates (–5, 2).

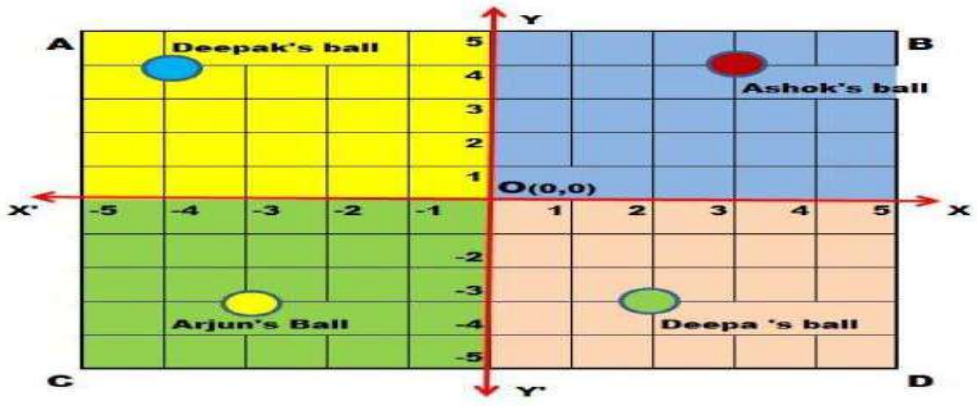
(iii) The abscissa of the point B.

(iv)The ordinate of the point H.

(v) The point identified by the coordinates (2,4).

CASE STUDY QUESTIONS

Q1.There is a square park ABCD. Four children Ashok ,Deepa ,Arjun and Deepak went to play with their balls. The colour of the ball of Ashok ,Deepa ,Arjun and Deepak are Red, green, yellow and blue respectively.



All four children roll their ball from centre point O in the direction of XOY, X'OY, X'OY' and XOY'. Their balls stopped as shown in the above image.

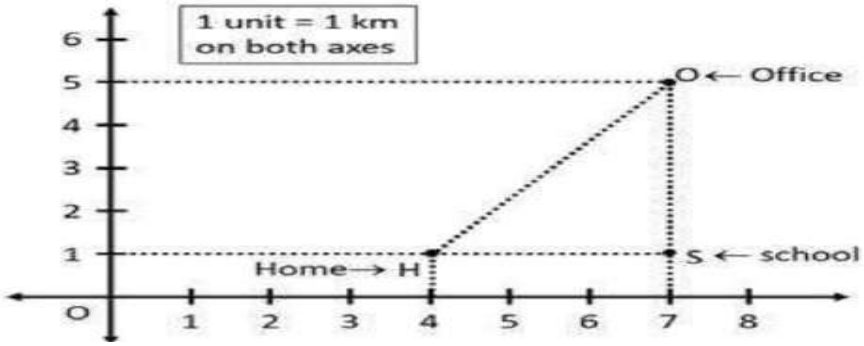
(i)What are the coordinates of the ball of Ashok?

(ii). What are the coordinates of the ball of Deepa ?

(iii)What the line XOX' called?

(iv). What the point O(0,0) called?

Q2. Shalini has to reach her office every day at 8 am. On the way to her office, she drops her brother at school. Now, the location of Shalini's home, her brother's school and her office are represented by the map below. Using the details given, answer the following questions.



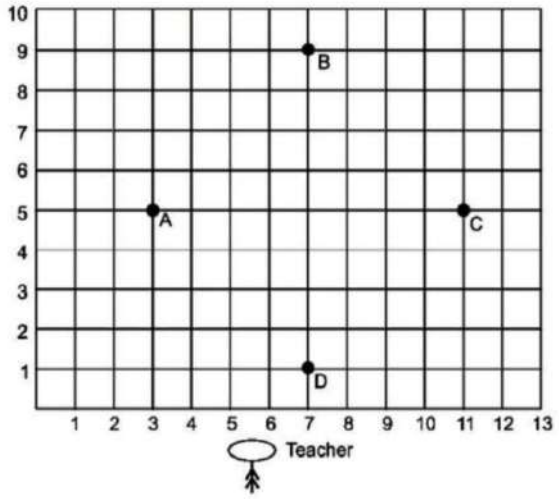
(i). Find the coordinates of Shalini's home.

(ii)What are the coordinates of Origin.

(iii) Find the distance between the Shalini's house and school

(iv) What are the coordinate of her brother's school ?

3. Students of a school are standing in rows and columns in their playground for a drill practice. A, B, C and D are the positions of four students as shown in the figure.



(a) What are the coordinates of A and B respectively?

(b) What are the coordinates of C and D respectively?

(c) What is the distance between B and D?

(d) What is the distance between A and C?

ASSERTION AND REASON BASED QUESTIONS

Q1 to Q10 are assertion and reason based questions. Choose the correct option from the following.

(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 and 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. A

Q1.Assertion: The points (-3,5) and (5,-3) are at different positions in the coordinate plane.

Reason: The position of (x,y) in the Cartesian plane is different from the position of (y, x).

Q2.Assertion: The horizontal line is called x-axis

Reason :The vertical line is called y-axis

Q3. Assertion: Point A(-2, -9) lies on III quadrant

Reason: A point both of whose coordinates are negative lies in III quadrant

Q4. Assertion: : A point whose abscissa is 5 and ordinate is -8 lies in fourth quadrant

Reason: Points of the type (-, -) lie in the second quadrant

Q5.Assertion: The perpendicular distance of a point from y-axis is called its x-coordinate.

Reason: The x co-ordinate of the point on y-axis is zero.

Q6.Assertion: Point (2,2) lies in second quadrant.

Reason:Point of the type (+,+) lies in first quadrant

Q7. Assertion: The points (-7, 2) and (2,- 7) are at different positions in the coordinate plane.

Reason:The perpendicular distance of the point A(5, 6) from the y-axis is 6

Q8. Assertion: The abscissa of a point (1, 8) is 1

Reason:The point (0,1) lies on y-axis.

Q9.Assertion: Abscissa of a point is positive in I andIV quadrant

Reason: If (x + 2, 4) = (5, y – 2), then coordinates (x, y) are(3,6)

Q10.Assertion- ABCD is a quadrilateral in which P, Q, R and S are the mid points of AB, BC, CD and DA respectively. Then, PQRS is a parallelogram..

Reason- The line segment joining the mid points of any two sides of a triangle is parallel to the third side and equal to half of it.

ANSWER KEY

MCQs

1. (a) 2. (c) 3. (b) 4. (c) 5. (d) 6. (a) 7. (b) 8. (a) 9. b) 10. (c)

2. MARKS QUESTIONS

Q1. (i) The point which lies on both the axes is (0,0). The point which lies on both the axes is called origin.

(ii) The point with ordinate 4 and on Y axis is (0 , -4)

Q2. Point (-2, 4) lies in the 2nd quadrant.

Point (3, -1) lies in the 4th quadrant.

Point (-1, 0) lies on the negative x-axis.

Point (1, 2) lies in the 1st quadrant.

Q3. (i) True, because a point on the y-axis is of the form (0, y).

(ii) False, because the perpendicular distance of a point from the x-axis is its ordinate. Hence it is 3, not 4 .

Q4. In the point (4,2) abscissa is positive and ordinate is also positive. So, it lies in first quadrant

(ii) the point (-3,5) abscissa is negative and ordinate is positive. So, it lies in second quadrant

(iii) the point (-2,-2) abscissa is negative and ordinate is also negative. So, it lies in third quadrant

(iv) the point (4,-3) abscissa is positive and ordinate is negative .So, it lies in fourth quadrant

Q5. i) The point which lies on X and Y-axes both is origin whose coordinates are (0, 0).

ii) The point whose ordinate is -5 and which lies on Y-axis, i.e., whose x-coordinate is zero, is (0,-5)

Q6. (i) The point is (-1,1). Hence, the point lies in the II quadrant.

(ii) The point is (-5,-2). Hence, the point lies in the III quadrant

Q7.(i) The point whose ordinate is - 4 and which lies on the y-axis, i.e., whose x-coordinate is zero is (0, -4).

(ii) The point whose abscissa is 5 and which lies on the x-axis, i.e., whose y-coordinate is zero is (5, 0).

Q8. The point whose ordinate is 5 and abscissa is -3 will lie in second quadrant.

The point whose abscissa is -5 and ordinate is -3 will lie in third quadrant.

Q9. A point lies on the x-axis at a distance of 7 units from the y-axis, then its coordinates are (7, 0) and if it lies on y-axis at a distance of –7 units from x-axis, its coordinates will be (0, -7).

Q10.We know that a point lies on the Y-axis if its x-coordinate is zero.

Here, x-coordinate of points C(0,1), D(0, 0), E(0, -1) and G(0, 5) are zero. So, these points lie on Y-axis.

Also, D(0, 0) is the intersection point of both the axes, so we consider that it lies on the y-axis as well as on x-axis.

3. MARKS QUESTIONS

1. i) x-axis and y- axis ii) quadrants iii) origin
2.

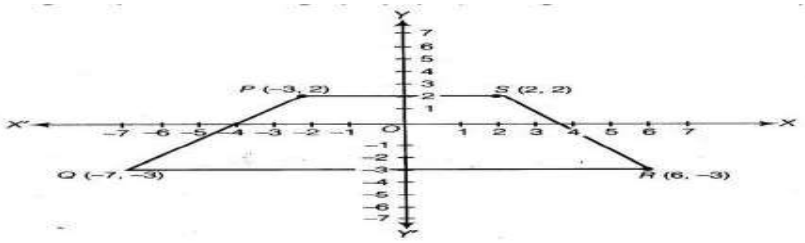
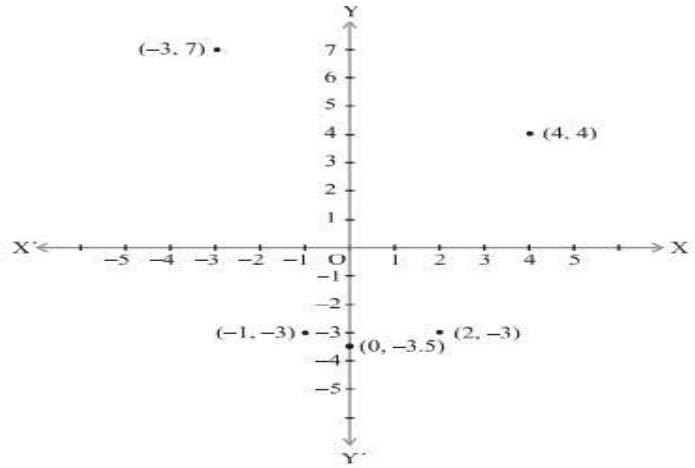


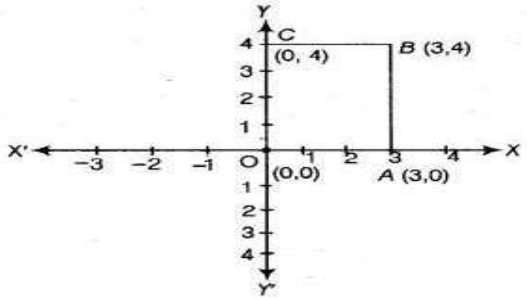
Figure is trapezium

3.



Q4.

figure obtained is a rectangle.



5. (i) The point is (-1,2). Hence, the point lies in the IV quadrant.

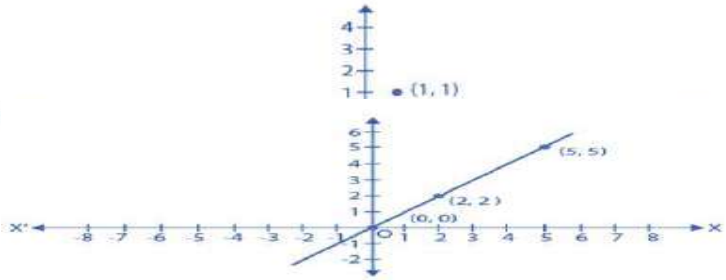
(ii) The point is (-2,-1).Hence, the point lies in the III quadrant.

(iii) The point is (-1,8).Hence, the point lies in the II quadrant.

5 MARKS QUESTIONS

1.(i)The points (1, 1), (2, – 3), (– 1, – 2) do not lie in a straight line, Hence, the points are not collinear.

(ii) The points (0, 0), (2, 2), (5, 5) lie in a straight line, Hence, the points are collinear.



2. (i) The point is (-3,5).

Hence, the point lies in the II quadrant.

(ii) The point is (-5,-3).

Hence, the point lies in the III quadrant.

(iii) The point is (-5,3).

Hence, the point lies in the II quadrant.

(iv) The point is (3,5).

Hence, the point lies in the I quadrant.

(v) The point is (2,-5).

Hence, the point lies in the IV quadrant.

3. i) D (6,2) ii)B iii) -5 iv) -3 vii) G

CASE STUDY QUESTIONS

1.(i) (3,4) (ii). (2, -3) (iii) x- axis (iv). Origin

2. (i) (4, 1) (ii) (0,0) (iii) 3 km (iv) (7, 1)

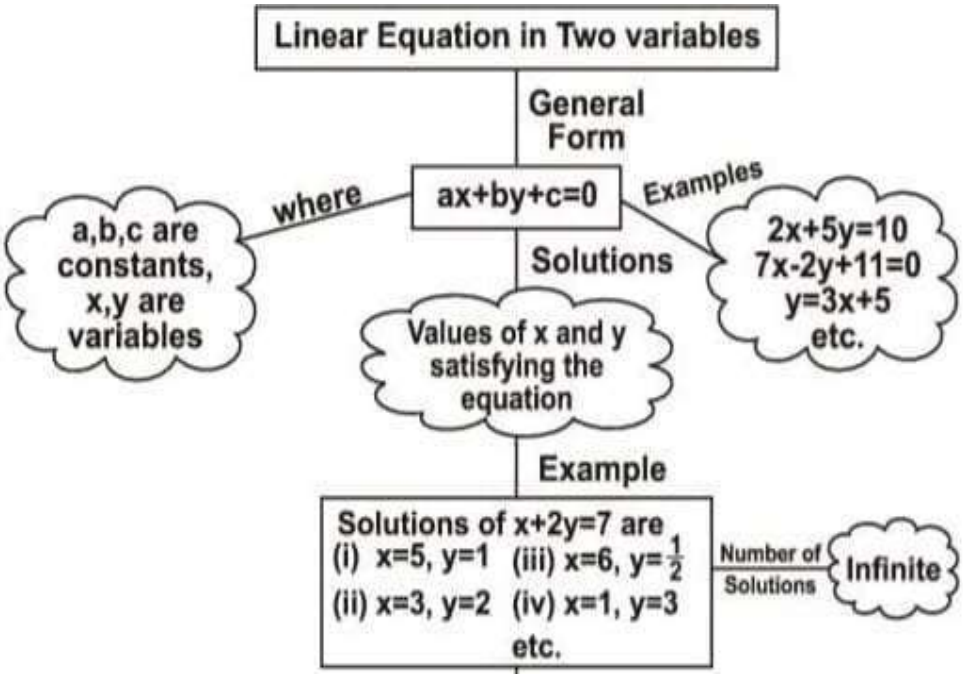
3. (a) (3, 5) and (7, 9) (b) (11, 5) and (7, 1) (c) 8 units (d) 8 units

ASSERTION AND REASON BASED QUESTIONS

1 (a) 2. (b) 3.(a) 4.(c) 5. (b) 6(d) 7.(b) 8.(b) 9.(a) 10. (a)

CHAPTER-4 LINEAR EQUATIONS IN TWO VARIABLES

MIND MAP



GIST

Linear Equations

The equation of a straight line is the linear equation. These are called **Linear Equations** because the highest degree of the variable is one.

Linear Equation in One Variable

The equation with one variable in it is known as a **Linear Equation in One Variable**.

The general form is

px + q = s, where p, q and s are real numbers and p ≠ 0.

Example

x - 5 = 10

y + 3 = 19

Linear Equation in Two Variables

An equation with two variables is known as a **Linear Equation in Two Variables**. The general form of the linear equation in two variables is

$$ax + by + c = 0$$

where a and b are coefficients and c is the constant. $a \neq 0$ and $b \neq 0$.

Example

$6x + 2y + 5 = 0$

Solution of a Linear Equation

- There is only one solution in the linear equation in one variable but there are infinitely many solutions in the linear equation in two variables.
- As there are two variables, the solution will be in the form of an ordered pair, i.e. (x, y).
- The pair which satisfies the equation is the solution of that particular equation.

MCQs

1. The general form of a linear equation in two variables is :
a) $ax + by + c = 0$, where a, b, c are real numbers and $a, b \neq 0$
b) $ax + b = 0$, where a, b are real numbers and $a \neq b$
c) $ax^2 + bx + c = 0$, where a, b, c are real numbers and $a, b \neq 0$
d) None of these
2. A linear equation in two variables has
a) a unique solution
b) no solution
c) two solutions
d) infinitely many solutions
3. The graph of the linear equation $2x – y = 4$ cuts x- axis at
a) (2,0)
b) (-2,0)
c) (0,-4)
d) (0,4)
4. $x = 2, y = -1$ is a solution of the linear equation
a) $x + 2y = 0$
b) $x + 2y = 4$
c) $2x + y = 0$
d) $2x + y = 5$
5. Any point on the x- axis is of the form
a) (x,y)
b) (0,y)
c) (x,0)
d) (x,x)
6. If (a, 4) lies on the graph of $3x + y = 10$, then the value of a is
a) 3
b) 1

c) 2
d) 4
7.If we multiply or divide both sides of a linear equation with non- zero number, then the solution of the linear equation
a) changes
b) changes in case of division only
c) remains same
d) changes in case of multiplication only
8. If (2,0) is a solution of the linear equation 2x + 3y = k, then the value of k is
a) 4
b) 6
c) 5
d) 2
9. The linear equation 2x - 5y = 7 has
a) a unique solution
b) infinitely many solutions
c) two solutions
d) no solution
10. Assertion: (2,1) is a solution of 2x + 3y = 7
Reason: If ordered pair (p, q) lies on the line then it is one of the solutions of line ax + by + c = 0.
a) Both Assertion and Reason are correct and reason is correct explanation for the assertion.
b) Both Assertion and Reason are false but reason is not correct explanation for assertion.
c) Assertion is correct but reason is false.
d) Both Assertion and reason are false.
Answers

1 (a)	2 (d)	3 (a)	4 (a)	5 (c)
6 (c)	7 (c)	8 (a)	9 (b)	10 (a)

2 Marks Questions
1. Find the value of 'k' if the line 2x + y = k passes through the point (3,5).
Sol : 2x+y=k
x=3, y=5
Put these values in equation
2(3)+5=k
6+5=k
k=11
2. Find two solutions for the equations 4x + 3y = 12.
Sol : For x = 0
4(0)+3y = 12
3y = 12
y= 4
For y = 0
4x + 3(0) = 12
4x = 12
x = 3
The two solutions are (0,4) and (3,0).
3. Write the coordinates of the point where the line 2x – 7y = 14 intersects x - axis.
Sol : y-coordinate of the point, where the line 2x−7y=14 intersects x- axis, will be zero.
Let the coordinates of the point are (h,0)

This point will satisfy the line
$2x-7y=14$
$2h-7(0)=14$
$2h=14$
$h=7$
So, the point is (7,0)

4. The cost of a notebook is twice the cost of a pen. Write a linear equation in two variables to represent this statement.

Sol : Let the price of one notebook be = ₹ x
Let the price of one pen be = ₹ y
As per the question,
The price of one notebook = 2×price of a pen
$x = 2\times y$
$x - 2y = 0$

5. Find the value of k, if x = 1, y = 1 is a solution of the equation 2x + 3y = k.

Sol : Given equation is $2x+3y= k$
Now put values of x,y in the equation
$\Rightarrow 2+3= k$
$\therefore k = 5$

6. Find the coordinates of the points where the graph of the equation 7x – 3y = 4 cuts x- axis and y- axis.

Sol : $3x + 4y = 12$
The point on y axis
Let x = 0 ,so $3(0) + 4y = 12$, $4y = 12$, $y = 3$
Point is (0, 3)
The point on x axis
Let y =0,so $3x + 4(0) =12$, $3x = 12$, $x= 4$
Point is (4,0)

7. Determine the point on the graph of the equation 2x + 5y = 20 whose x-coordinate is 5/2 times its ordinate.

Sol : $2x + 5y = 20$
$x=5/2\ y$
$2x+5y=20$
$\Rightarrow 2\times 5/2\ y+5y=20$
$\Rightarrow 10y=20$
$\Rightarrow y = 2$
$x = 5/2$ $y= 5/2\times 2=5$
$\therefore x=5$

8. At what point does the graph of the linear equation x + y = 5 meet a line which is parallel to the y-axis, at a distance 2 units from the origin and in the positive direction of x-axis.

Sol : The equation of a line which is parallel to the y-axis at a distance 2 units from the origin and in the positive direction of x-axis is x=2.
The given line is $x+y=5$
Putting x = 2 in the above equation, we get
$2+y=5$
$\Rightarrow y=3$
$\therefore$ The required point is (2, 3).

9. Note the linear equation such that every point on its graph has a coordinate 3 times its abscissa.

Sol : As per the question,

A given linear equation such that every point on its graph has a coordinate(y) which is 3 times its
abscissa(x).
So we obtain,
$\Rightarrow y = 3x$.
Therefore, $y = 3x$ is the required linear equation.
10. In an one day international cricket match, Raina and Dhoni together scored 198 runs. Express the statement as a linear equation in two variables.
Sol : Let runs scored by Raina be x and runs scored by Dhoni be y.
According to statement of the question, we have
$x + y = 198$
or $x + y – 198 = 0$

3 Marks Questions

1. Represent the following linear equations in the form $ax + by + c = 0$ and show the required values of a, b and c in each case :
a) $x = 3y$
b) $3x + 2 = 0$
c) $y – 2 = 0$
Sol : a) $x=3y$
$\Rightarrow x-3y=0$
On comparing this equation with $ax+by+c=0$, we get,
$a=1, b= -3$ and $c=0$
b) $3x+2=0$
$\Rightarrow 3x+0y+2=0$
On comparing this equation with $ax+by+c=0$, we get,
$a=3, b=0$ and $c=2$
c) $y-2=0$
$\Rightarrow 0x+y-2=0$
On comparing this equation with $ax+by+c=0$, we get,
$a=0, b=1$ and $c=-2$
2. If $(p, 2p + 1)$ is the solution of the linear equation $4x + 3y = 23$. Find the value of **p**.
Sol : $x= p$ and $y=2p+1$
$4(p) + 3(2p+1) = 23$
$4p +6p+3 = 23$
$10p = 23 – 3$
$p = 20/10$
$p = 2$
3. Find the value of **a** for which the equation $2x + ay = 5$ has (1,-1) as a solution. Find two more solutions for the equation obtained.
Sol : $2x+ay=5$ has $(1,-1)$ as its solution
$\therefore 2\times1+a(-1)=5$
$\Rightarrow 2-a=5$
$\Rightarrow a=-3$
$\therefore 2x-3y=5$
other solutions are (10,5) and (25,15)
$\because 2\times10-3\times5=20-15=5$
and $\because 2\times25-3\times15=50-45=5$
4. Note four solutions individually for the following equation:
$\pi x + y = 9$
Sol : Let $x = 0$

Now, $\pi x + y = 9$
$(\pi \times 0)+y = 9$
$y = 9$
$(0,9)$
Let $x = 1$
Now, $\pi x + y = 9$
$(\pi \times 1)+y = 9$
$\pi+y = 9$
$y = 9-\pi$
$(1, 9-\pi)$
Let $y = 0$
Now, $\pi x + y = 9$
$\pi x +0 = 9$
$\pi x = 9$
$x = 9/\pi$
$(9/\pi,0)$
The answers are $(0,9)$, $(1,9-\pi)$,$(9/\pi,0)$

5. Let y varies directly as x. If y = 12 when x = 4, then write a linear equation. What is the value of y when x = 5.

Sol : Given that, y varies directly as x.
i.e… $y \propto x$
$\Rightarrow y=kx$ …(i) [where k = arbitrary constant]
Given, y = 12 and x = 4 (substituting these values in Eq(i))
$12 = 4k$
$\Rightarrow k=12/4$
$\therefore k = 3.$
On Putting the value of k in eq.(i) we get
$y = 3x$ …(ii)
When x = 5, from Eq. (ii), we get,
$y = 3 \times 5$
$\Rightarrow y = 15$
Hence, the value of y is 15.

5 MARKS QUESTIONS

1. Find two solutions for each of the following equations:

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

Ans) $(0,4)$, $(3,0)$

(ii) $x + 4y = 0$

Ans) $(4,-1)$, $(0,0)$

(iii) $3y - 4x= 0$

Ans) $(4,3)$, $(0,0)$

iv) $x - y = 15$

Ans) $(20,5)$, $(30,15)$

v) $5x + y = 10$

Ans) (1,5) ,(2,0)

2. Express the following linear equations in the form ax + by + c = 0 and indicate the values of a, b and c in each case:

(i) 5x - 3y = 17

Ans) 5x-3y-17=0

a= 5, b= -3, c= -17

(ii) 2x –y = 0

Ans) 2x-y+0=0

a= 2 , y=-1 , c=0

(iii) 7x-3y = 16

Ans) 7x-3y-16=0

A = 7 , b =-3, y= -16

(iv) x = 3y

Ans) x-3y+0 = 0

a= 1, b= -3 , y=0

(v) -2x = 5y

Ans) -2x + 5y + 0 =0

a= -2, b = 5, c =0

3. Check which of the following are solutions of the equation x – 2y = 4 and which are not:

(i) (1, 6)

1- 2X6

= 1-12

= -11

LHS ≠ RHS

Not a solution

(ii) (2, 2)

2 – 2X2

= 2-4

= -2

Not a solution

LHS ≠ RHS

(iii) (2, -1)

2 – 2X-1

=2+2

=4

LHS = RHS

It is a solution

(iv) (2 , 3)

2 – 2X3

= 2-6

=-4

LHS ≠ RHS

Not a solution

(v) (6, 1)

6 -2X1

=6 -2

= 4

LHS = RHS

It is a solution

CASE STUDY

1. A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Raj paid Rs.30 for a book kept for five days

a) Form a pair of linear equations in two variables from this situation if the fixed charge is x and additional charge for each day is y

Ans) x+y(5-3) = 30

x+2y = 30

(ii) Express the above linear equation in the form ax + by + c = 0 and indicate the values of a, b and c

Ans) x+2y-30 =0

a = 1, b=2, c=-30

(iii)If the fixed charge is Rs.6 and the book is kept for 15 days, then what is the total amount Raj has to pay?

Ans) 6+2y =20 ; y=7

10+12×7 = 94

2. Petrol is flowing into a tank at the rate of 25cm³/sec. The volume of petrol collected in x sec is y cm³

(i) Represent the above situation in linear equations in two variables

Ans) y=25x

(ii) Express the above linear equation in the form ax + by + c = 0 and indicate the values of a, b and c

Ans) 25x+(-1)y+0 =0

a=25, b=-1, c=0

(iii)a) Find the volume of the petrol after 4 seconds

Ans) 100cm³

b) After how many seconds the volume is 500cm³?

Ans) 20 seconds

3. Rajan planned to celebrate his daughter's birthday in a small orphanage centre. He bought apples to give to children and adults working there. Rajan donated 3 apples to each children and 4 apples to each adult working there along with birthday cake. He distributed 100 total apples.

(i) How to represent the above situation in linear equations in two variables by taking the number of children as 'x' and the number of adults as 'y'?

Ans) 3x+4y =100

(ii) If the number of children is 20, then find the number of adults

Ans) 3×20 +4y = 100

4y =40

y=10

(iii) Find the value of b, if x = 9, y = 10 is a solution of the equation 3x + 5y = 11b.

Ans) 3×9+5×10 =11b

27+50 =11b

77 = 11b ; b=7

ASSERTION AND REASON

1. Assertion : There are infinite number of lines which passes through (3, 2).
Reason: A linear equation in two variables has infinitely many solutions.
(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.
Ans) (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
2. Assertion : If $x = 2k - 1$ and $y = k$ is a solution of the equation $3x - 5y - 7 = 0$, then the value of k is 10.
Reason: A linear equation in two variables has infinitely many solutions
(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.
Ans) (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).
3. Assertion: $x + y = 3$ is the equation of a line passing through the origin.
Reason: $y = 2x$ is the equation of a line passing through the origin.
(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.
Ans) (d) Assertion (A) is false but reason (R) is true.
4. Assertion : The point (3, 0) lies on the graph of the linear equation $4x + 3y = 12$.
Reason: (3, 0) satisfies the equation $4x + 3y = 12$.
(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.
Ans) (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

5. Assertion : A linear equation 5x - 3y = 2 has only (1,1) as a solution .

Reason: A linear equation in two variables has infinitely many solutions.

(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.

Ans) (d) Assertion (A) is false but reason (R) is true.

6. Assertion : The point (2, 2) is the solution of x + y = 4.

Reason: Every point which satisfy the linear equation is a solution of the equation.

(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.

Ans) (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

7. Assertion: An equation of the form ax + by + c = 0, where a, b and c are real numbers, such that a and b are not both zero, is called a linear equation in two variables.

Reason: A linear equation in two variables has infinitely many solutions.

(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.

Ans) (b) Both assertion (A) and reason (R) are true but reason (R) is not the correct explanation of assertion (A).

8. Assertion: If x = 2, y = 1 is a solution of the equation 2x + 3y = k, then the value of k is 7.

Reason: The solution of the line will satisfy the equation of the line.

(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.

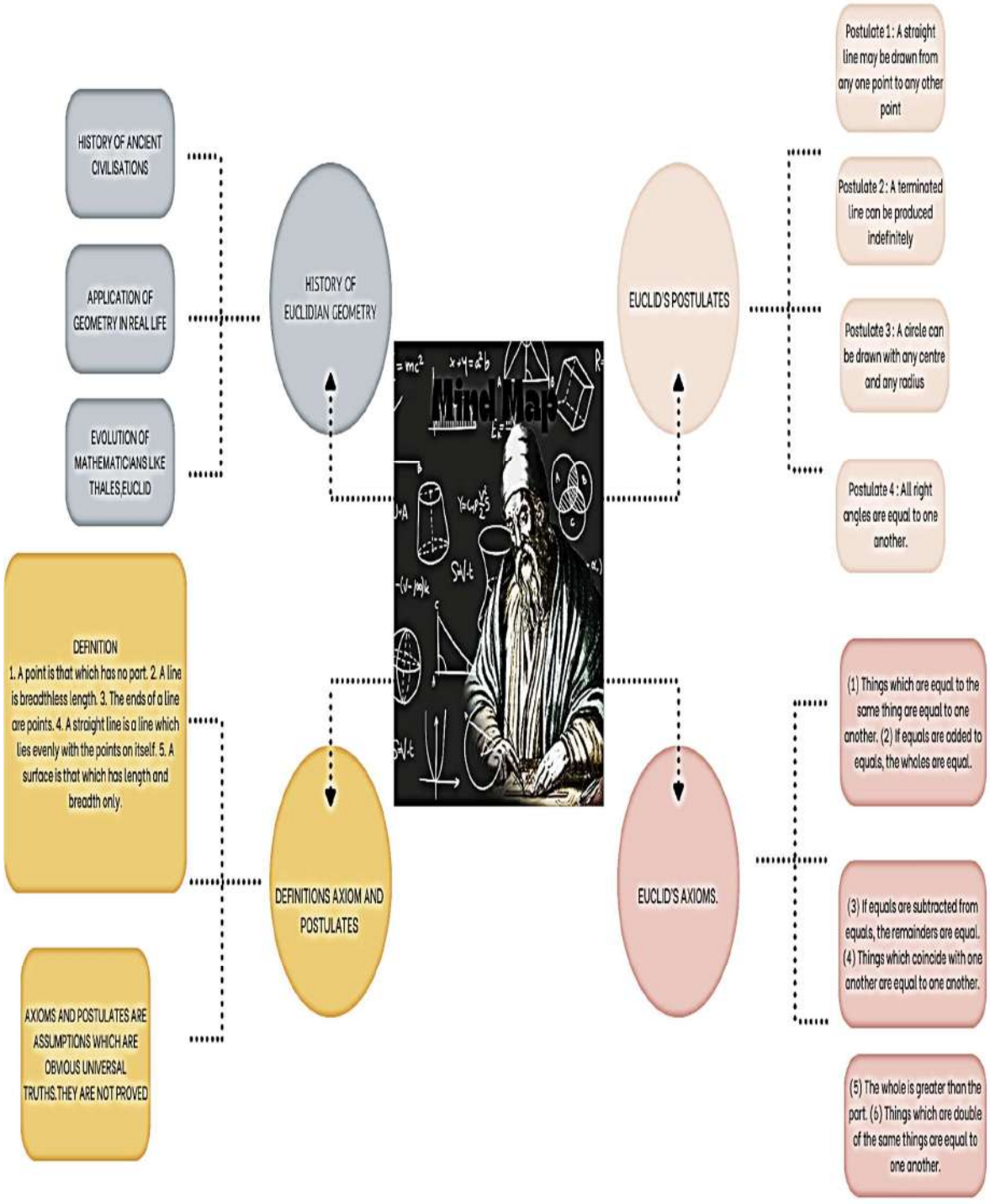
(d) Assertion (A) is false but reason (R) is true.

Ans) (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

9. Assertion : The graph of the linear equation 2x – y = 1 passes through the point (2, 3).
Reason: Every point lying on graph is not a solution of 2x – y = 1.
(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.
Ans) (C) Assertion (A) is true but reason (R) is false.

10.Assertion: The point (3, 0) lies on the graph of the linear equation 4x + 3y = 12.
Reason: (3, 0) satisfies the equation 4x + 3y = 12.
(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.
Ans) (a) Both assertion (A) and reason (R) are true and reason (R) is the correct explanation of assertion (A).

CHAPTER-5 INTRODUCTION TO EUCLID'S GEOMETRY



INTRODUCTION TO EUCLID'S GEOMETRY

- The word 'geometry' comes from the Greek words 'geo', meaning the 'earth', and 'metrein', meaning 'to measure' .
- Geometry originated from the need for measuring land.
- Euclid , the Greek mathematician is called the Father of Geometry.
- Euclid collected all the known works in his time and created his famous treatise – "Elements" . He divided the 'Elements' into thirteen chapters, each called a book.
- Euclid defined some terms precisely as below :

Euclid's Definitions

- A point is that which has no part.
- A line is a breadthless length.
- The ends of a line are points.
- A straight line is a line which lies evenly with the points on itself.
- A surface is that which has length and breadth only.
- The edges of a surface are lines.
- A plane surface is a surface which lies evenly with the straight lines on itself.

Undefined Terms:

In geometry, a point, a line and a plane (in Euclid's words, a plane surface) are considered as undefined terms.

Axioms and Postulates : Axioms and postulates are the assumptions which are obvious universal

truths , which are accepted without proof.

- Axioms are the assumptions used throughout Mathematics.
- Postulates are the assumptions which are specific to Geometry.

Theorems: Theorems are statements which are proved using definitions, axioms, previously proved statements and deductive reasoning.

Euclid's Axioms

- Things which are equal to the same thing are equal to one another.
- If equals are added to equals, the wholes are equal.
- If equals are subtracted from equals, the remainders are equal.
- Things which coincide with one another are equal to one another.
- The whole is greater than the part.
- Things which are double of the same things are equal to one another.
- Things which are halves of the same things are equal to one another.

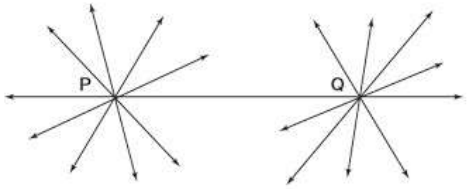
Consistent system of axioms :

A system of axioms is said to be consistent , if it is impossible to deduce from these

axioms a statement that contradicts any axiom or previously proved statement .

Euclid's Postulates:

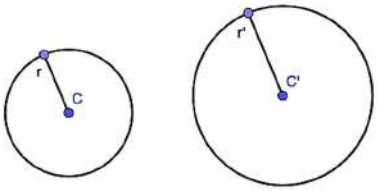
Postulate 1: A straight line may be drawn from any one point to any other point.



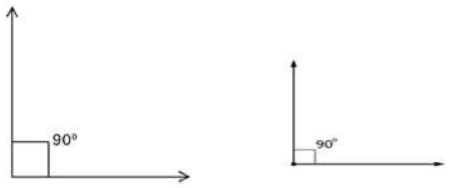
Axiom : Given two distinct points, there is a unique line that passes through them.

Postulate 2: A terminated line can be produced indefinitely.

Postulate 3: A circle can be drawn with any centre and any radius.

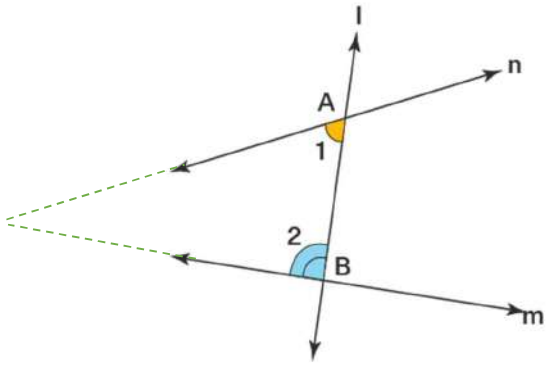


Postulate 4: All right angles are equal to one another.



If $\angle 1 = 90°$ and $\angle 2 = 90°$, then $\angle 1 = \angle 2$.

Postulate 5: If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of the angles is less than two right angles.



Theorem : Two distinct lines cannot have more than one point in common.

Given : Two lines *l* and m.

To prove : Lines *l* and m cannot have more than one point in common

Proof : Let us suppose that the two lines intersect in two distinct points, say P and Q. Now there are two lines passing through two distinct points P and Q. But this contradicts the axiom that only one line can pass through two distinct points. So, the assumption that we started with, that two lines can pass through two distinct points is incorrect .

From this, we conclude that two distinct lines cannot have more than one point in common.

SECTION A

(MCQ : 1 MARK QUESTIONS)

1. What does the Greek word ‘Geo” mean ?
   a) Line
   b) Earth
   c) Point
   d) Ground

2. According to Euclid’s definition, the ends of a line are
   a) points
   b) edges
   c) dimensions
   d) surfaces

3. The assumptions which are specific to Geometry are called as :
   a) Definitions
   b) Postulates
   c) Elements
   d) Axioms

4. Euclid stated that ‘all right angles are equal to each other’ in the form of
   a) an axiom
   b) a definition
   c) a postulate
   d) a proof

5. How many lines can pass through a given point ?
   a) Infinitely many
   b) Only 1
   c) 2
   d) 4

6. Euclid collected all the known work in geometry and arranged in his famous treatise called
   a) Axioms
   b) Postulates
   c) Definitions
   d) Elements

7. If a point A lies between points B and C , then
   a) AC = 2 BC
   b) AC = BC
   c) AC = ½ BC
   d) BC + AC = AB

8. A proved statement is called :
   a) Definition
   b) Theorem
   c) Proposition
   d) Both (b) and (c)

9. A pyramid is a solid shape , the base of which is
   a) a triangle
   b) a square
   c) a rectangle
   d) a polygon

10. How many lines can pass through 2 distinct points ?
    a) Infinite
    b) Only 1
    c) 2
    d) 4

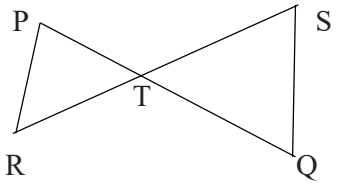
SECTION B

(2 MARK QUESTIONS)

1. In the figure, AC = BD . Prove that AD = BC.

2. In the figure , if OX $= \frac{1}{2}$ XY , PX = $\frac{1}{2}$ XZ and OX = PX , show that XY = XZ.

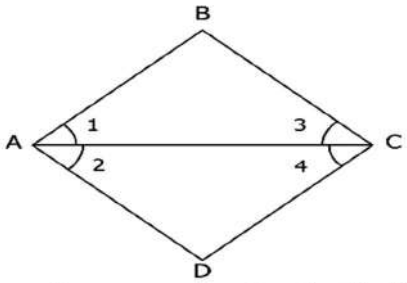
3. In the given figure , PT = RT and TQ = TS , show that PQ = RS.



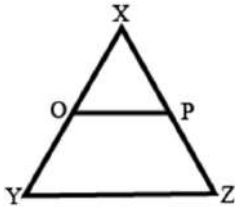
4. If point C be the mid point of a line segment AB , then write the relation between AC, BC and AB , with a suitable figure .

5. Define perpendicular lines. Are there any other words that need to be defined first?

6. In the figure, ∠1= ∠2 and ∠2= ∠3 , show that ∠1= ∠3 .Give reason .



7. State any two axioms given by Euclid.
8. Prove that an equilateral triangle can be constructed on any given line segment.
9. What is a consistent system of axioms ?
10. Using the given figure , show that length AG > Sum of lengths of AB, BC and CD



A B C D E F G H

SECTION C

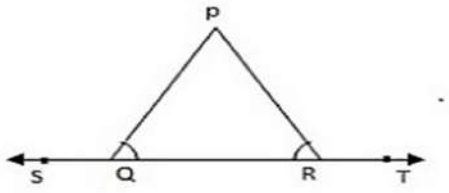
(3 MARK QUESTIONS)

1. Define the following terms with suitable figure for each :

   (a) Parallel lines (b) Collinear points (c) Line segment

2. State Euclid's 5th postulate with an appropriate figure .

3. In the figure, ∠PQR = ∠PRQ . Using an axiom of Euclid , prove that ∠PQS = ∠PRT.



4. Consider given postulates:

   (i) Given any 2 distinct points P and Q, there exists a third point R which is

between P and Q.

(ii) There exists at least 3 points that are not on the same line.

Write the undefined terms in these postulates .

Are these postulates consistent? Explain

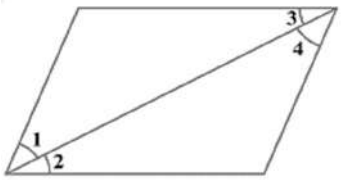
Do they follow from Euclid's postulates?

5. Prove that " Two distinct lines cannot have more than one point in common" .

SECTION D

(5 MARK QUESTIONS)

1. In the given fig. if $\angle 1 = \angle 3$, $\angle 2 = \angle 4$ and $\angle 3 = \angle 4$,



a) write the relation between ∠1 and ∠2 using an Euclid's axiom.
b) state the axiom used in (a)
c) write any other two axioms given by Euclid.

2. a) Write 2 similarities and 1 difference between axioms and postulates.
   b) Why is that axiom 5 in the list of Euclid's axioms is called 'Universal Truth'?

3. Write any two axioms and any three postulates of Euclid.

SECTION E

4 MARK (1+1+2 Marks) QUESTIONS

CASE STUDY QUESTION -1

In a trip to a museum in Delhi, students observed that one of the halls is not a rectangle. They imagined that if the edges of the hall's floor are extended it will appear as lines exhibited in Euclid's 5^{th} postulate . Later on the way back to school, they discussed Euclid's other axioms and postulates with their teacher. Next day they had a revision class in school where teacher asked them following questions:

a) State the first postulate of Euclid .

b) If PQ = QR and QR = RP , then PQ = RP.
Identify the axiom used in this.

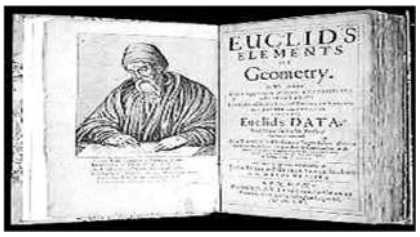
c) State Euclid's 5th postulate with a figure

OR

Does Euclid's 5th postulate imply the existence of parallel lines ? Explain.

CASE STUDY QUESTION -2

One day during their visit to mathematics laboratory , some students observed a solid which looked like an incomplete pyramid. They asked their teacher about the solid and she told them that it is a truncated pyramid. She also told them that how ancient Egyptians could find the area of such shapes using basic knowledge of geometry.



The whole class was amazed to know the contributions of Greek Mathematician Thales and his pupil , Pythagoras and also about Euclid , the Father of Geometry, who collected all the known work and arranged them in his book called "Elements" having 13 chapters. The teacher then explained about axioms and postulates. Later , the students were asked the following questions:

a) Name the shape that forms the base of a pyramid .
b) Name the famous book of Euclid and the number of chapters it has.
c) What is an axiom ? State any one axiom.

OR

Prove that a line segment has one and only one midpoint.

CASE STUDY QUESTION -3

Rohan, a student of class 9th learnt that Labour day is celebrated on May 1st. He learnt the importance of house help and how everyone should respect each other's work. Rohan's maid has 2 children . Both of them have equal number of dresses . So Rohan , on his birthday, plans to give both of them same number of dresses.

a) If the children had x dresses each and Rohan gifts them 2 dresses , then how many dresses will each child have after Rohan's birthday?

b) Will the children have equal number of dresses after Rohan's birthday ? Which Euclid's axiom is used here ?

c) If $p + q = 7$, then $p + q – r = 7 – r$. Is any axiom used here? If yes, state the axiom.

OR

If $\angle 1 = \angle 2$, then $2\angle 1 = 2\angle 2$. Is any axiom used here? If yes, state the axiom .

SECTION F

(ASSERTION - REASON QUESTIONS)

In the following questions , a statement of ASSERTION is followed by a statement of REASON . Choose the correct option from the following :

(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 and 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) Assertion: There can be infinite number of lines that can be drawn through a single point.
Reason: Lines are made up of infinite number of points.

2) Assertion: Through two distinct points , only one line can be drawn.
Reason: A line is formed by the join of only 2 points.

3) Assertion: If AB = PQ and PQ = XY, then AB = XY.
Reason: Things which are equal to the same thing are equal to one another.

4) Assertion: If two circles are equal, then their radii are equal.
Reason: Congruent circles have equal radii .

5) Assertion: Parallel lines are those lines which never intersect each other.
Reason: Parallel lines can be two or more lines.

6) Assertion: A dimensionless dot which is drawn on a plane surface is known as point.
Reason: A point is that which has no part.

7) Assertion: A line segment cannot be extended from both sides.
Reason: A collection of points that has only length and no breadth is known as a line.

8) Assertion: A line segment can be extended on both sides .
Reason: According to Euclid's second postulate , a terminated line can be extended on both sides .

9) Assertion: An apple weighs 125 g but a part of it weighs more than 125 g.
Reason: The whole is always greater than the part.

10) Assertion: Axioms are universal truths.
Reason: Euclid stated only 6 axioms in his book "Elements".

****

ANSWER KEY

SECTION A - MCQ

1. b 2. a 3. b 4. c 5. a 6. d 7. c 8. d 9. d 10. b

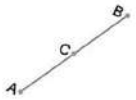
SECTION B - 2 mark Qs

1. AC = BD
   AC + CD = BD + CD (equals added to equals)
   AD = BC

2. OX = PX
   $\frac{1}{2}$ XY = $\frac{1}{2}$ XZ and then XY = XZ

3. PT = RT and TQ = TS
   PT + TQ = RT + TS
   So, PQ = RS

4. Relation : AC + CB = AB

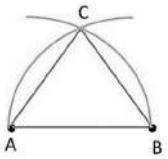


5. Two lines which intersect at right angles
   Words that need to be defined : line, intersect, right angle

6. Given ∠1= ∠2 and ∠2= ∠3
   So, ∠1= ∠3
   Reason : Things which are equal to the same thing are equal to one another

7. Any 2 axioms

8. Given : line segment AB of any length. Draw an arc with point A as the centre and AB as the radius .Similarly, draw an arc with point B as the centre and BA as the radius. The two arcs meet at a point, say C. Draw the line segments AC and BC to form Δ ABC .



   Now, AB = AC (equal radii) . Also , AB = BC (equal radii)
   By Euclid's axiom , things which are equal to the same thing are equal to one another
   Then AB = BC = AC. So, Δ ABC is an equilateral triangle.

9. A system of axioms is said to be consistent , if it is impossible to deduce from these axioms a statement that contradicts any axiom or previously proved statement .

10. AB+BC+CD = AD , is a part of AG
    By Euclid's axiom , the whole is greater than the part

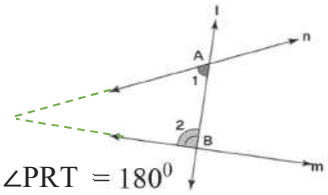
So, AG > AD and AG > AB+BC+CD

SECTION C (3 mark Qs)

1. Parallel lines : Two or more lines which do not meet at any point
   Collinear points : Three or more points which lie on the same line
   Line segment : Part of a line having two endpoints
   Figure for each

2. If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of the angles is less than two right angles.

3. Given ∠PQR = ∠PRQ .



   ∠PQR + ∠PQS = 180^0. Also, ∠PRQ + ∠PRT = 180^0
   ∠PQR + ∠PQS = ∠PRQ + ∠PRT
   So, ∠PQS = ∠PRT (Equals subtracted from equals)

4. Undefined terms : point , line
   These postulates are consistent, because they deal with two different situations:
   (i) says that for given 2 points P and Q, there is a point R lying on the line in between them;
   (ii) says that given P and Q, we can take R not lying on the line through P and Q.
   These postulates do not follow from Euclid's postulates.

5. Given : Two lines *l* and m.
   To prove : Lines *l* and m cannot have more than one point in common
   Proof : Let us suppose that the two lines intersect in two distinct points, say P and Q.

Now there are 2 lines passing through two distinct points P and Q. But this contradicts

the axiom that only one line can pass through two distinct points. So, the assumption

that we started with, that two lines can pass through two distinct points is incorrect .

From this, we conclude that two distinct lines cannot have more than one point in common.

SECTION D - 5 MARKS

1. a) ∠1= ∠2
   b) Things which are equal to the same thing are equal to one another
   c) any 2 axioms

2. a) similarities: i) Axioms and postulates are universal truths

ii) Both are accepted without proof

Difference : Axioms are used throughout Mathematics while postulates are specific to

Geometry.

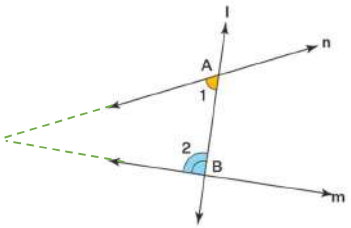
b) Axiom 5 states that " The whole is greater than the part"
This is true for anything , anywhere in the universe . Hence an universal truth.

3. Any 2 axioms and any 3 postulates

SECTION E - 4 MARKS (1+1+2 Marks)

CASE STUDY QUESTION -1

a) A straight line may be drawn from any one point to any other point
b) Things which are equal to the same thing are equal to one another.
c) If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of the angles is less than two
right angles.



OR

Yes , if the two straight lines make the interior angles on the same side of it taken together as equal to two right angles, then the two straight lines will never meet and

will be parallel.

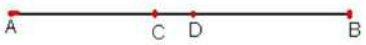
CASE STUDY QUESTION -2

a) A polygon
b) Elements ; 13 chapters.
c) i)Axioms are the assumptions which are obvious universal truths , used throughout Mathematics . ii)Any one axiom

OR

Consider a line segment AB. Assume that it has two midpoints say C and D
Now, AC = BC and AD = DB
Since C is midpoint of AB, we have A, C and B are collinear

∴ AC + BC = AB → (1)



Similarly, AD + DB = AB → (2)
From (1) and (2), AC + BC = AD + DB
Then 2 AC = 2AD and so , AC = AD
This is possible only when C and D coincide.
Thus every line segment has one and only one midpoint.

CASE STUDY QUESTION -3

a) x + 2
b) yes, if equals are added to equals , the wholes are equal.
c) Yes, If equals are subtracted from equals, the remainders are equal.

OR

Yes, Things which which are double of the same things are equal to one another.

.

SECTION F : ASSERTION - REASON QUESTIONS

1. b 2. c 3. a 4. a 5. b 6. a 7. d 8. a 9. d 10. C

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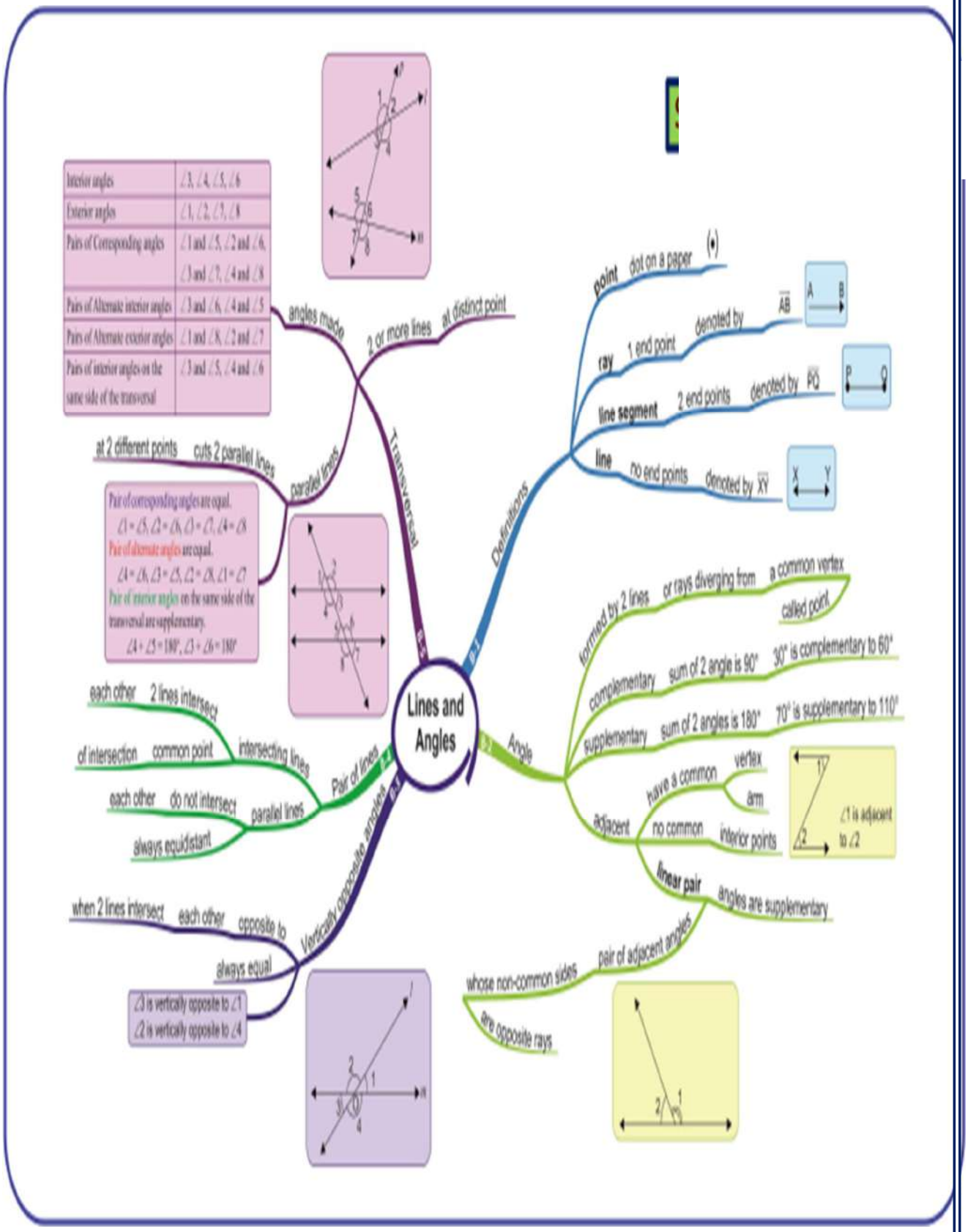
CHAPTER-6 LINES AND ANGLES

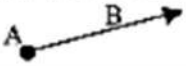


Key points of Lines and Angles

Point: A Point is that which has no component. It is represented by a dot.

1) **Collinear points: The points which lie on the same line.**
2) **Non-Collinear Points: These are the points which do not lie on the same line.**

1) **Line segment: Part of a line which has two end points.**
2) **Ray: The line which has one end point.**
3) **Line: It has no end point and can be extended to any length.**

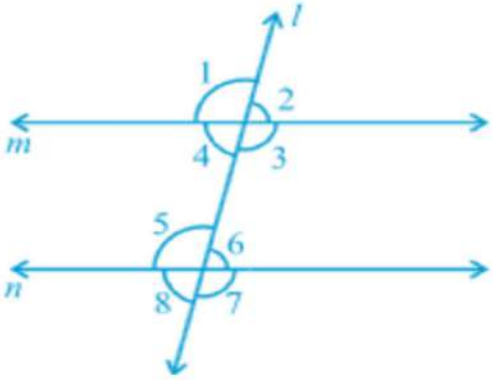
Term	Dimensions	Graphic	Symbol
Point	Zero		•A
Line Segment	One		$\overline{AB}$
Ray	One		$\overrightarrow{AB}$
Line	One		$\overleftrightarrow{AB}$

Angles: Two rays with a common vertex forms an Angle. The two rays are the arms of the angle and the common point is the vertex of the angle.

- **Complementary angles: Two angles whose sum is equal to 90°.**
- **Supplementary angles: Two angles whose sum is equal to 180°.**

Parallel Lines: Two lines whose perpendicular distance always remains the same. They never(meet) intersect each other.

Transversal : If a line passes through two lines and intersects them at distinct points then this line is called Transversal Line.



1. Corresponding Angles: ∠ 1 and ∠ 5; ∠ 2 and ∠ 6; ∠ 4 and ∠ 8; ∠ 3 and ∠ 7
2. Alternate Interior Angles: ∠ 4 and ∠ 6; ∠ 3 and ∠ 5
3. Alternate Exterior Angles: ∠ 1 and ∠ 7; ∠ 2 and ∠ 8
4. Interior Angles on the same side of the transversal: ∠ 4 and ∠ 5; ∠ 3 and ∠ 6
NOTE : If the two given lines are parallel and cut by a transversal , then i) corresponding angles are equal . ii) alternate interior angles are equal . iii)

alternate exterior angles are equal iv) Interior Angles on the same side of the transversal are supplementary .

MULTIPLE CHOICE QUESTIONS (1 MARK EACH)

1. In a right angled triangle where angle A= 90° and AB=AC. What are the values of angle B.

a. 45°
b. 35°
c. 75°
d. 65°

2. What is the supplement of 105°

a. 65°
b. 75°
c. 85°
d. 95°

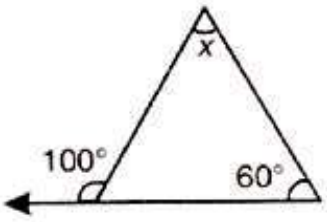
3. If ∠S and 100° form a linear pair. What is the measure of ∠S

a. 180°
b. 120°
c. 90°
d. 80°

4. One angle is three times its supplement . The measure of the angle is

a. 60°
b. 135°
c. 110°
d. 120°

5. Value of *x* in the figure below is:



(a) 20°
(b) 40 °
(c) 80°
(d) 160 °

6. Two straight lines AB and CD intersect one another at point O.

If ∠AOC + ∠COB + ∠BOD = 274°, then ∠AOD =

(a) 86°
(b) 90°
(c) 94°
(d) 137°

7. Consider the following statements:
When two straight lines intersect:

(i) adjacent angles are complementary
(ii) adjacent angles are supplementary
(iii) opposite angles are equal
(iv) opposite angles are supplementary

Of these statements

(a) (i) and (iii) are correct
(b) (ii) and (iii) are correct
(c) (i) and (iv) are correct
(d) (ii) and (iv) are correct

8. An exterior angle of a triangle is 105° and its two interior opposite angles are equal. Each

of these equal angles is

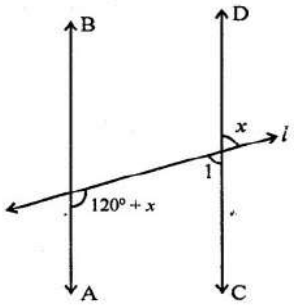
(a) 37 ½°
(b) 72 ½°
(c) 75°
(d) 52 ½°

9. Given ∠*AOC* = 3*x* and ∠*BOC* = 2*x* + 10°. If *AOB* is a straight line, then the value of *x* is

a. 30°
b. 34 °
c. 26 °
d. none of these

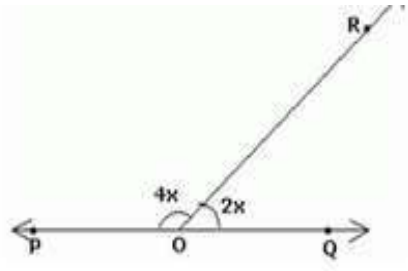
10. In the figure, if AB || CD, then the value of x is

(a) 20°
(b) 30°
(c) 45°
(d) 60°

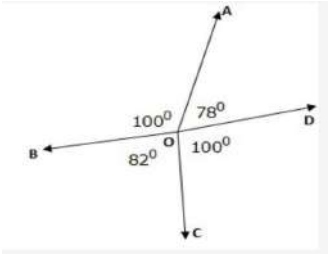


VERY SHORT ANSWER TYPE QUESTIONS (2 MARKS EACH)

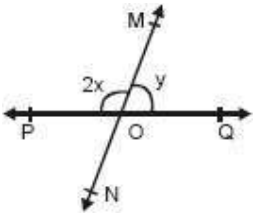
1. **In the given fig, POQ is a line and** ∠POR = 4x, ∠QOR= 2x. Find the value of x**.**



2. Let OA, OB, OC, and OD be rays in the anticlockwise direction such that ∠AOB=∠COD=100°,∠BOC=82° &∠AOD=78°.Is it true to say that AOC and BOD are lines?



3.Determine x, when y = 40°.



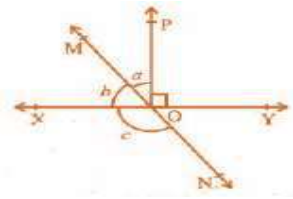
4. If ∠1 = 3x + 15 and ∠2 = 4x – 10, where ∠1 and ∠2 forms supplementary, then find the value of x.

5. Find the angle which is 1/5 of its complement.

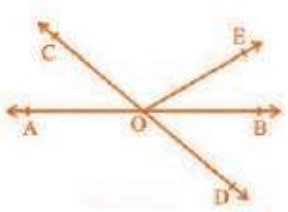
6. If the angles (4y + 4)° and (6y – 4)° are the supplementary angles, find the value of y.

7. The angles of a triangle are arranged in ascending order of magnitude. If the difference between two consecutive angles is 10°, find all the three angles.

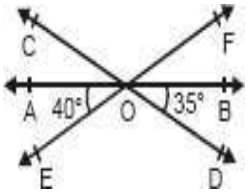
8. In the Figure, lines XY and MN intersect at O. If ∠POY = 90° and a: b = 2 : 3, find c.



9. : In the figure, lines AB and CD intersect at O. If ∠AOC + ∠BOE = 70° and ∠BOD = 40°, find ∠BOE and reflex ∠COE.



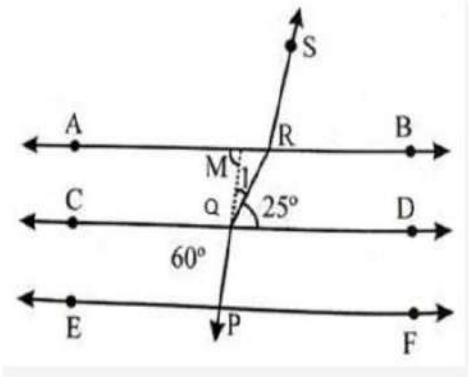
10. In the given figure, lines AB, CD and EF intersect at O



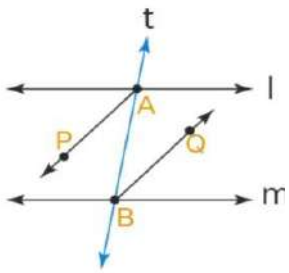
Find the measure of ∠AOC, ∠COF

SHORT ANSWER TYPE QUESTIONS (3 MARKS EACH)

1. In given figure , if AB || CD || EF, PQ || RS, ∠ RQD=25° , and ,∠CQP=60°, then find the value of ∠QRS .

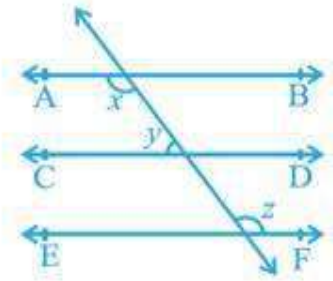


2. AP and BQ are the bisectors of the two alternate interior angles formed by the intersection of a transversal t with parallel lines l and m . Show that AP || BQ.

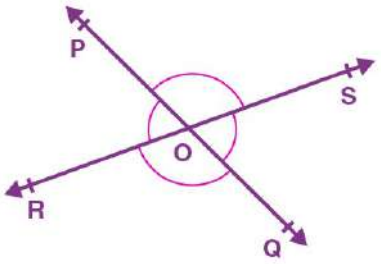


3. If the two lines intersect each other, prove that the vertically opposite angles are equal.

4.. In the given figure, if AB || CD, CD || EF and y: z = 3 : 7, find x.

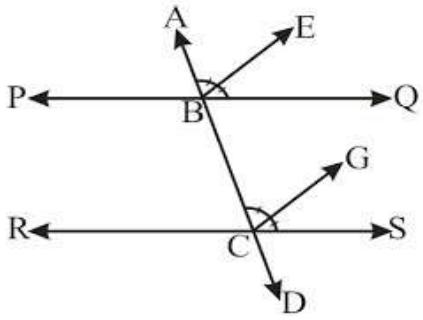


5. In the figure, lines PQ and RS intersect at point O. If ∠POR : ∠ROQ = 5 : 7, find all the angles.

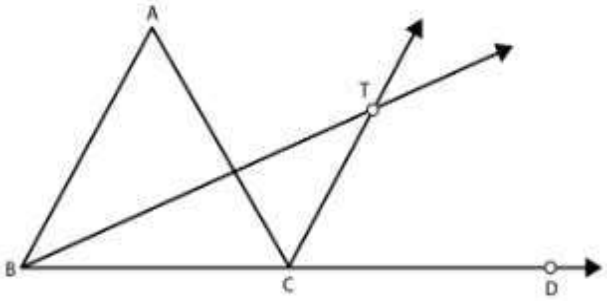


LONG ANSWER TYPE QUESTIONS (5 MARKS EACH)

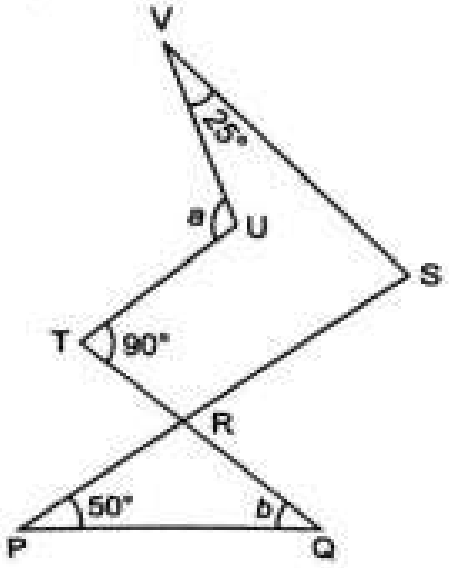
1. If a transversal intersects two lines such that the bisectors of a pair of corresponding angles are parallel, then prove that the two lines are parallel.



2. Bisectors of interior ∠B and exterior ∠ACD of a Δ ABC intersect at point T. Prove that ∠BTC = ½ ∠ BAC.



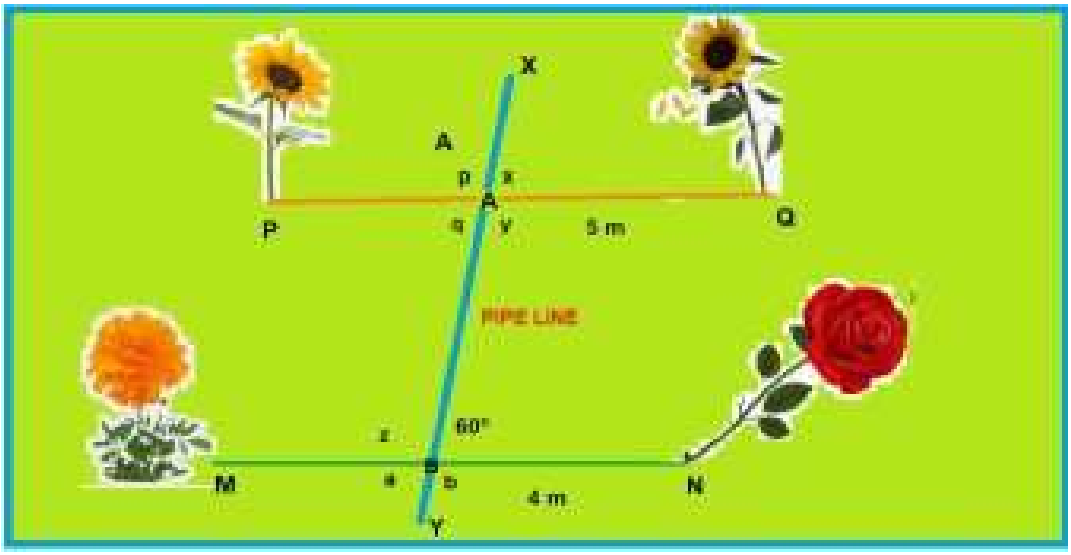
3. In the given figure, TU II SR and TR II SV, then find ∠a and ∠b



CASE STUDY QUESTIONS (4 MARKS EACH)

Q1. Once 4 students from class IX A were selected for plantation of flower plants in the school

garden. The selected students were Pankaj, Raju, Deepak and Renu.



As shown PQ and MN are the parallel lines of the plants. Pankaj planted a sunflower plant at P, then Raju planted another sunflower at Q. Further, Deepak was called to plant any flowering plant at point M. He planted a marigold there. Now it was the turn of Renu, She was told to plant a flowering plant different from the three planted one. So she planted a rose plat at N. There was a water pipeline XY which intersects PQ and MN at A and B and ∠XBN = 60°

Answer the following questions

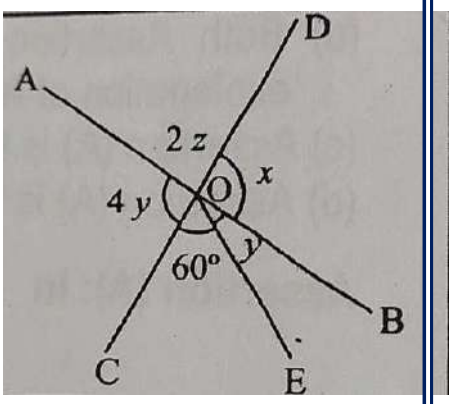
(i) **What is the measure of∠ XBM?**
(ii) **What is the measure of ∠ XAQ?**

(iii) **What is the value of p + q?**

(iv) **What is the value of (p+ q + a + z) /6?**

Q2. Maths teacher draws a straight line AB shown on the blackboard as per the following figure. Now he told Raju to draw another line CD as in the figure

- **The teacher told Ajay to mark ∠AOD as 2z**
- **Suraj was told to mark ∠AOC as 4y**
- **Clive Made and angle COE = 60°**
- **Peter marked ∠BOE and ∠BOD as y and x respectively**



Now answer the following questions:

i. **What is the value of x?**

a. **48°**
b. **96°**
c. **100°**
d. **120°**

ii. **What is the value of y?**

a. **48°**

b. **96°**

c. **100°**

d. **24°**

iii. **What should be the value of x + 2z?**

a. **148°**

b. **360°**

c. **180°**

d. **120°**

iv. **What is the relation between y and z?**

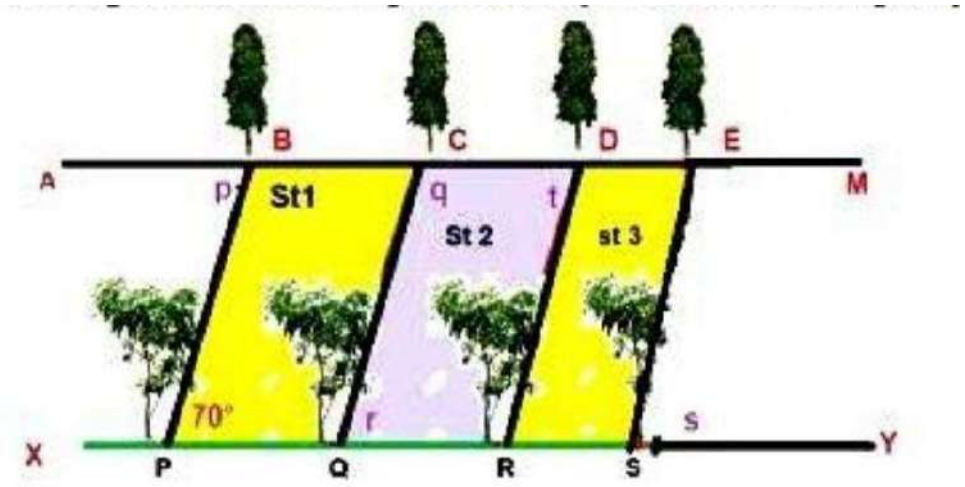
a. **2y + z = 90°**

b. **2y + z = 180°**

c. **4y + 2z = 120°**

d. **y = 2z**

Q3. There were two parallel roads AM and XY in New Delhi. Due to increasing pollution, MCD planned to get planted trees on these roads. On the road AM, plants of Ashoka were planted by one company. While on the road XY, mango trees were planted by another company.
Between these roads three streets St 1, St 2 and St 3 were situated. During the survey, ZBPQ was measured to be 70° and other angles p, q, r, s and t were also measured.



Now answer the following questions:

(i) What is the measure of ∠p?

a. **60°**
b. **70°**
c. **160°**
d. **100°**

(ii) What is the value of (p + q + t) / 5?

a. 50°
b. 70°
c. 160°
d. 100°

(iii) What is the measure of ∠ESY?

a. 60°
b. 140°
c. 70°
d. 110°

(iv) What is value of {4p - (q + r) - (r - s)}?

a. 50°
b. 100°
c. 160°
d. 180°

ASSERTION AND REASONING (1 MARK EACH)

Directions: **In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:**
(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.

Q1. Assertion: If the two lines intersect at each other, then the vertically opposite angles present are equal in nature.
Reason: If a transversal line intersects the two other lines, then the sum of the two interior angles present on the same side of the transversal is 180 degrees

Q2. Assertion : Sum of the pair of angles 120° and 60° is supplementary.
Reason: Two angles, the sum of whose measures is 180°, are called supplementary angles.

Q.3. Assertion : If angles 'a' and 'b' form a linear pair of angles then a = 40°, then b = 150°.
Reason: Sum of linear pair of angles is always 180°.

Q4. Assertion: The angles of a triangle are in the ratio 2:3: 4. The largest angle of the triangle is 80°.
Reason: The sum of all the interior angles of a triangle is 180°

Q5. Assertion : If two interior angles on the same side of a transversal intersecting two parallel lines are in the ratio 5:4, then the greater of the two angles is 80°
Reason: If a transversal intersects two parallel lines, then the sum of the interior angles on the same side of the transversal is 180°

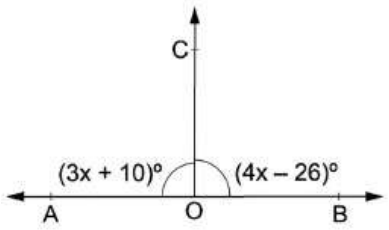
Q6. Assertion: the sum of two adjacent angle is 100° and one of them is 35° then other is 65°
Reason: adjacent angle is always supplementary.

Q7. Assertion: A triangle can have two obtuse angles.
Reason: The sum of all the interior angles of a triangle is 180°

Q8. Assertion:An exterior angle of triangle is equal to sum of two interior opposite angle.
Reason: If two angles are complementary of each other then each angle is acute angle.

Q9. Assertion: The sum of two adjacent angle is 100° and one of them is 35° then other is 65°
Reason: Adjacent angle are always supplementary.

Q10. Assertion: In the given figure, AOB is a straight line. If ∠AOC = (3x + 10)° and ∠BOC (4x – 26)°, then ∠BOC = 86^0
Reason: The sum of angles that are formed on a straight line is equal to 180°



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SOLUTIONS

MULTIPLE CHOICE QUESTIONS

1 (a) 2. (b) 3.(d) 4.(b) 5. (b) 6(a) 7.(b) 8.(d) 9.(b) 10. (b)

VSA (2 MARKS)

1. Linear pair
   $4x+2x = 180^0$
   ⇨ $X = 30^0$

2. **AOC is not a line, because ∠ AOB+ ∠COB=100°+82°=182°, so this is not equal to 180. Similarly, BOF is also not a line.**

3. **$2x = 180 – 40 = 140$, $X = 70^0$**

4. **∠1 + ∠2 = 180° =>(3x + 15) + (4x – 10) = 180°**

   ⇨ **7x + 5 = 180°**
   ⇨ **7x = 175°**
   ⇨ **x = 25°**

5. **Let the required angle be x°**
   its complement = (90 – x)°
   x = 1/5 of (90 – x) , 6x = 90
   The required angle will be 15^0.

6. (4y + 4)° + (6y – 4)° = 180 , 10 y =180 , y = 18^o

7. x + (x + 10) + (x + 20) = 180 afterf solving angles are 50°,60°and 70°

8. a + b = 90 , 2x + 3x = 90 , x = 18

3x = 18 x 3 =54 , c = 180 – 54 = 126

9. . ∟BOE = 30° and Reflex ∟COE = 110°

10. ∟AOC = 35°and ∟COF = 105°

SHORT ANSWERS (3 marks)

1. **Here we have PQ || RS. Produce PQ to M.**
   ∠CQP=∠MQD [Vertically opp. ∠S]
   Therefore,60°=∠1+25° => ∠1=35°
   Now, QM || RS and QR will cut CD and AB
   ∠ARQ=∠RQD=25°[Alt. ∠S]
   Therefore,∠1+(∠ARQ+∠RMP)=180°
   This implies ∠1+(∠ARQ+∠ARS)=180°
   This implies 35°+(25°+∠ARS)=180°
   This implies ∠ARS=180°−60°=120°
   Therefore ∠QRS=∠ARQ+∠ARS
   =25°+120°=145°.

2. **Since, l||m and t is the transversal**
   ∠MAB= ∠SBA [Alt. ∠s]
   1/2 ∠MAB=1/2∠SBA
   This implies ∠PAB=∠QBA
   But ∠PAB and ∠QBA are alternate angles
   Therefore AP || BQ.

3. **Proving theorem of vertically opposite angles are equal using linear pair twice**

4. **Y + Z = 180 , Y= 3 x 18 = 54 , Z= 7 x 18 = 126,, X = Z = 126 (alt int)**

5. **∠POR +∠ROQ = 180° (linear pair of angles since PQ is a straight line)**
   ∠POR : ∠ROQ = 5 : 7
   Therefore, ∠POR = (5/12) × 180° = 75°
   Similarly, ∠ROQ = (7/12) × 180° = 105°
   Now, ∠POS = ∠ROQ = 105° (vertically opposite angles)
   ∠SOQ = ∠POR = 75° (vertically opposite angles)

LONG ANSWERS (5 marks)

Sol.(1) Given: PQ and RS are the two lines and a transversal AD intersects these two lines at points B and C, respectively. Ray BE is the bisector of ∠ABQ and ray CG is the bisector of ∠BCS, and BE || CG.

To prove: PQ || RS

Proof:Given that ray, BE is the bisector of ∠ABQ, Therefore, ∠ABE = (1/2) ∠ABQ….(1)

Similarly, ray CG is the bisector of ∠BCS, Therefore, ∠BCG = (1/2) ∠BCS….(2)

As we know, BE || CG and AD is the transversal.

Therefore, ∠ABE = ∠BCG (corresponding angles axiom)…..(3)

Substituting (1) and (2) in (3), we get;

(1/2) ∠ABQ = (1/2) ∠BCS

⇒ ∠ABQ = ∠BCS

These are the corresponding angles formed by transversal AD with PQ and RS; they are equal.

Thus, by the converse of corresponding angles axiom, we have; PQ || RS

Hence proved.

Sol (2). Given: △ABC, produce BC to D, and the bisectors of ∠ABC and ∠ACD meet at point T.

To prove: ∠BTC = ½ ∠BAC

Proof: In △ABC, ∠ACD is an exterior angle.

We know that, The exterior angle of a triangle is equal to the sum of two opposite angles,

Then, ∠ACD = ∠ABC + ∠CAB

Dividing both sides of the equation by 2, we get;

⇒ ½ ∠ACD = ½ ∠CAB + ½ ∠ABC

⇒ ∠TCD = ½ ∠CAB + ½ ∠ABC ….(1)

[∵CT is a bisector of ∠ACD ⇒ ½ ∠ACD = ∠TCD]

As we know, the exterior angle of a triangle is equal to the sum of two opposite angles.

In △ BTC, ∠TCD = ∠BTC + ∠CBT

⇒ ∠TCD = ∠BTC + ½ ∠ABC ….(2)

[∵BT is bisector of △ ABC ⇒∠CBT = ½ ∠ABC]

From (1) and (2), we get;

½ ∠CAB + ½ ∠ABC = ∠BTC + ½ ∠ABC

⇒ ½ ∠CAB = ∠BTC

Or ½ ∠BAC = ∠BTC

Hence proved.

Sol (3) a = 115° and b = 40° (using properties of parallel lines)

CASE STUDY QUESTIONS

Q1. (i) 120^0 (ii) 60^0 (iii) 180^0 (iv) 60^0
Q2. (i) 96^0 (ii) 24^0 (iii) 180^0 (iv) y=2z
Q3. (i) 70^0 (ii) 50^0 (iii) 70^0 (iv) 100^0

ASSERTION AND REASON BASED QUESTIONS

1 (b) 2. (a) 3.(d) 4.(a) 5. (d) 6(c) 7.(d) 8.(b) 9.(c) 10. (a)

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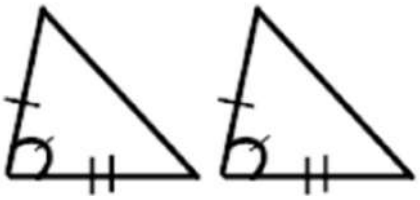
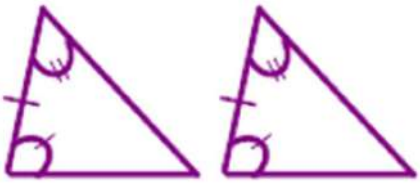
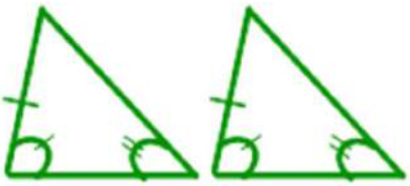
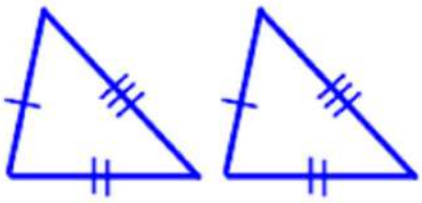
CHAPTER-7 TRIANGLES

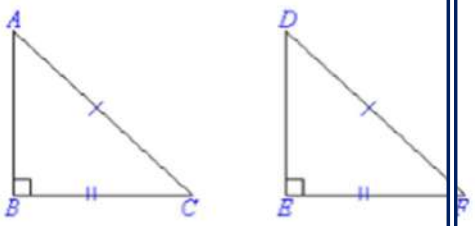
IMPORTANT CONCEPTS

- Two figures are congruent if they are of the same shapes and of the same sizes.
- Two circles of the same radii are congruent.
- Two squares of the same sides are congruent.
- Two triangles are congruent if their corresponding parts are equal.
- If two triangles ABC and PQR are congruent under the correspondence A ↔ P, B ↔ Q and C ↔ R, then

symbolically, it is
expressed as Δ ABC
≅ Δ PQR

Criteria for Congruence of Triangles

S No.	Rule	Meaning	Figure
1.	SAS (Side-Angle-Side) Congruence rule	If the two sides and the including angle of one triangle is equal to two sides and included angle of another triangle then they are called congruent triangles.	
2.	ASA (Angle-Side-Angle) Congruence rule	If two angles and the included side of one triangle is equal to two angles and included side of another triangle then they are called congruent triangles.	
3.	AAS (Angle-Angle-Side) Congruence rule	If any two angles and a side of a triangle are equal to two angles and a side of another triangle then these are called congruent triangles.	
4.	SSS (Side-Side-Side) Congruence rule	If all the three sides of a triangle are equal with the three corresponding sides of another triangle, then these are called congruent triangles.	

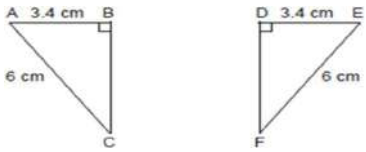
5.	RHS (Right angle-Hypotenuse-Side) Congruence rule	If there are two right-angled triangles then they will be congruent if their hypotenuse and any one side are equal.	

ONE MARK QUESTIONS(MCQ)

Q1. The exterior angle of a triangle is equal to the

(a) sum of the two interior opposite angles.
(b) sum of the three interior angles.
(c) difference of two interior angles.
(d) opposite of the interior angle.

Q2.In two right-angled triangles ABC and DEF, the measurement of hypotenuse and one side is given. Check if they are congruent or not? If yes, by which rule.



a) SAS b) ASA c) SSS d) RHS

Q3. The angles of a triangle are in the ratio 3 : 4: 2. Find all the angles of the triangle.

(a) 110°,40° ,30° b)60°,80° ,40° c) 60°,50° ,70° d) 110°,50° ,20°

Q4. In SAS congruence rule

a) The angle should be included
b) The angle should not be included
c) Any two sides and one angle
d) None of the above

Q5. If E and F are the midpoints of equal sides AB and AC of a triangle ABC. Then:

a. BF = AC b. BF = AF c. CE = AB d. BF = CE

Q6. If ABC and DBC are two isosceles triangles on the same base BC. Then:

a. ∠ABD = ∠ACD b. ∠ABD > ∠ACD c. ∠ABD < ∠ACD d. None of the above

Q7. If ABC is an equilateral triangle, then each angle equals to:

a. 90° B.180° c. 120° d. 60°

Q8. If AD is an altitude of an isosceles triangle ABC in which AB = AC. Then:

a. BD = CD b. BD > CD c. BD < CD d. None of the above

Q 9. In a right triangle, the longest side is:

a. Perpendicular b. Hypotenuse c. Base d. None of the above

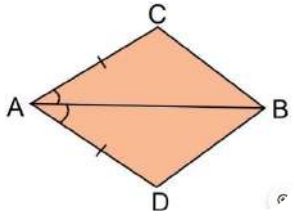
Q10. Which of the following is not a criterion for congruence of triangles?

(a) SAS (b) ASA (c) SSA (d) SSS

SHORT ANSWERS TYPE

Q1 The angles of triangle are (x + 10°),(2x - 30°) and x°. Find the value of x.

Q2. In quadrilateral ACBD. AC=AD and AB bisects ∠A. show that ΔABC ≅ ΔABD. What can you say about BC and BD



Q3.D, E, F are the midpoints of the sides BC,CA and AB respectively of ΔABC ,

then ΔDEF is congruent to triangle ΔAEF

Q4. In an isosceles triangle ABC, with AB = AC, the bisectors of ∠B and ∠C intersect each other at O. Join A to O. Show that:

i) OB = OC (ii) AO bisects ∠A

Q5. ABC is a right angled triangle in which ∠A = 90º and AB

= AC. Find ∠B and ∠C. Q6. ABC is an isosceles triangle with

AB = AC. Drawn AP ⊥ BC to show that ∠B = ∠C.

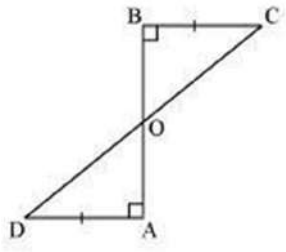
Q7.BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule ,

Prove that the triangle ABC is isosceles.

Q8. Prove that if two angles of a triangle are equal then sides opposite to them are also equal.

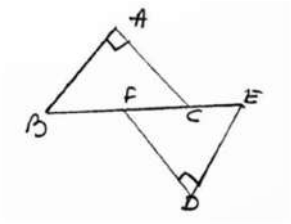
Q9. BE and CF are two equal altitudes of a triangle ABC. Using RHS congruence rule, prove that the triangle ABC is isosceles.

Q10.AD and BC are equal perpendiculars to a line segment AB (See the given figure). Show that CD bisects AB



3 MARKS QUESTIONS

1. . ABC is an isosceles triangle with AB = AC and BD and CE are two medians. Show that BD = CE.
2. In the given figure BA is perpendicular to AC , DE is perpendicular to DF such that BA = DE and BF = EC. Show that Δ ABC ≅ ΔDEF.



3. If two isosceles triangles have a common base , prove that the line joining the vertex bisect the base at right angle..
4. ABC is right angled triangle in which ∠A= 90 and AB = AC .Find ∠B and∠C.
5. Prove that the Perimeter of a triangle is greater than the sum of the three medians.

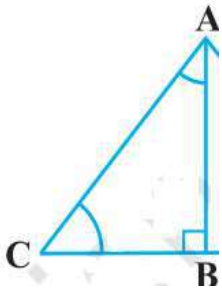
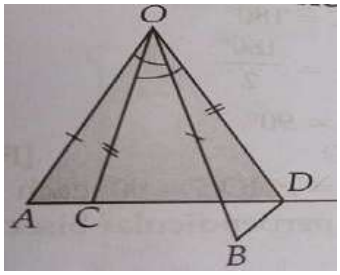
ANSWER KEY:

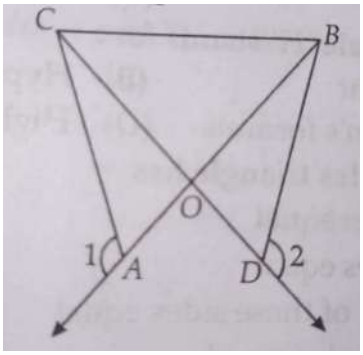
MCQ

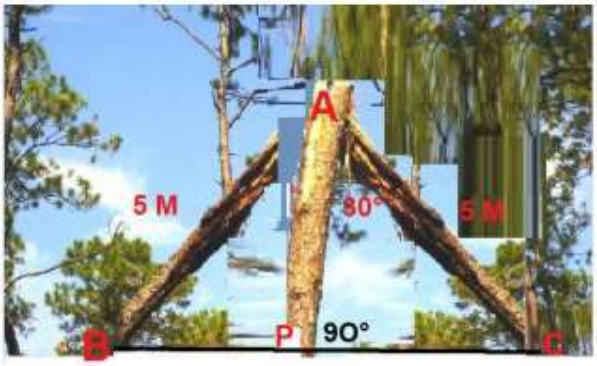
1.a 2.RHS 3.b 4.a 5.d (BF=CE) 6.a 7.d 8.a 9.b 10.c

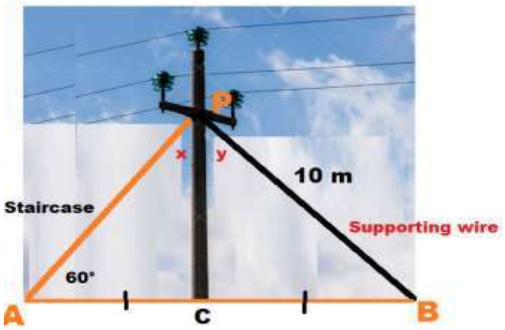
2 MARKS QUESTION:

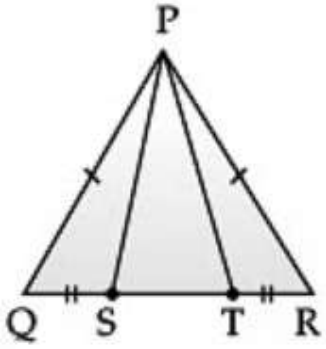
1. $x = 50^{\circ}$

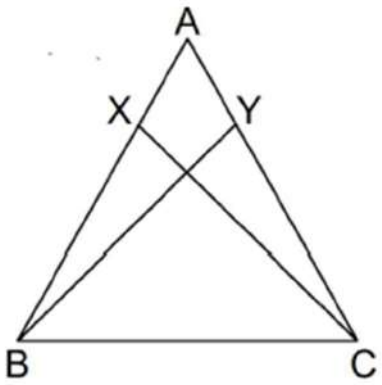
	5 MARK QUESTIONS	ANSWERS
1	ABC is a right triangle and right angled at B such that ∠BCA = 2 ∠BAC. Show that hypotenuse AC = 2 BC. 	
2	**In the figure OA=OB, OC=OD and ∠AOB=∠COD. Prove that AC=BD.** 	

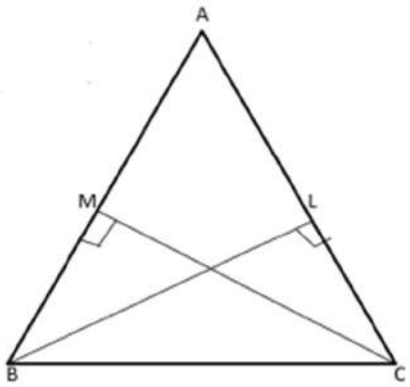
3	**In the figure OA=OD and ∠1=∠2. Prove that ΔOCB is an isosceles triangle.** 	
	CASE STUDY BASED QUESTIONS	

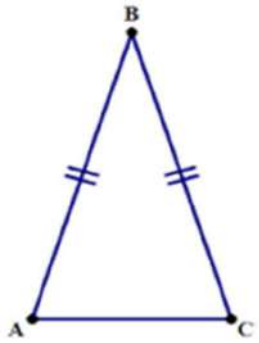
1	**In a forest, a big tree got broken due to heavy rain and wind. Due to this rain the big branches AB and AC with lengths 5m fell down on the ground. Branch AC makes an angle of 30° with the main tree AP. The distance of Point B from P is 4 m. You can observe that ΔABP is congruent to ΔACP.**  **Now answer the following questions:** **i. ΔACP and ΔABP are congruent by which criteria?** **a. SSS b. SAS c. ASA d. RHS** **ii. What is the length of CP?** **a. 4 m b. 5m c. 3m d. 10 m** **iii). What is the height of the remaining tree?** **a. 4 m b. 5m c. 3m d. 10m**	**i)a. RHS** **ii)a.4 m** **iii)c.3 m**

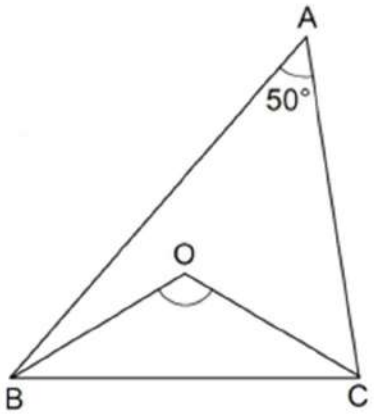
2	**As shown In the village of Rampur there was a big pole PC. This pole was tied with a strong wire of 10 m length. Once there was a big spark on this pole, thus wires got damaged very badly. Any small fault was usually repaired with the help of a rope which normal board electricians were carrying on bicycles. This time electricians need a staircase of 10 m so that it can reach at point P on the pole and this should make 60° with line AC.**  **Answer the following questions:** **i. In the ΔPAC and ΔPBC which side is common?** **a. PC b. AB c. AC d. BC** **ii. In the ΔPAC and ΔPBC which angles are given to be equal?** **a. ∠A = ∠x b. ∠B = ∠x c. ∠B = ∠y d. ∠x=∠y** **iii. What is the value of ∠ x?** **a. 45° b. 60° c. 90° d. 30°**	**i)a.PC** **ii) d. ∠x = ∠y** **iii)d. 30°**

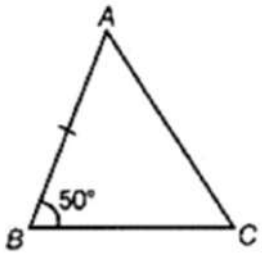
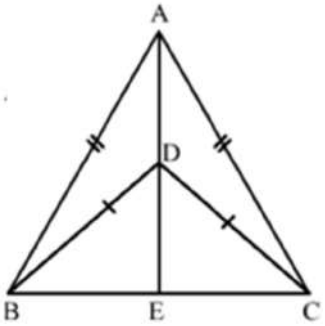
3	**A children's park is in the shape of isosceles triangle said PQR with PQ = PR, S and T are points on QR such that QT = RS.**  **i) Which rule is applied to prove that congruency of ΔPQS and ΔPRT.** **a) SSS b) SAS c) AAS d) RHS** **ii) Name the type of triangle PST** **iii) If PQ=6 cm QR=7cm then find perimeter of triangle PQR**	**i) b.SAS** **ii)Isosceles** **iii)19cm**
	ASSERTION AND REASON QUESTIONS. **Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:** **(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.**	

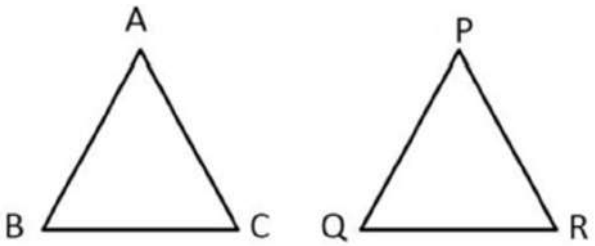
1	**Assertion : In the adjoining figure, X and Y are respectively two points on equal sides AB and AC of ΔABC such that AX = AY then CX = BY.** **Reason: If two sides and the included angle of one triangle are equal to two sides and the included angle of the other triangle, then the two triangles are congruent**  **(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.**	**(a)**

2	**Assertion: If the altitudes from two vertices of a triangle to the opposite sides are equal, then the triangle is an isosceles triangle.** **Reason: If two angles and one side of one triangle are equal to two angles and the corresponding side of the other triangle, then the two triangles are congruent.**  **(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.**	**(a)**

3	**Assertion: In ABC, ∠A = ∠C and BC = 4 cm and AC = 3 cm then the length of side AB = 3 cm.** **Reason: Sides opposite to equal angles of a triangle are equal.**  **(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.**	**(d)**

4.	**Assertion : In the given figure, BO and CO are the bisectors of ∠B and ∠C respectively. If ∠A = 50° then ∠BOC = 115°** **Reason: The sum of all the interior angles of a triangle is 180^0**  **(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.**	**(a)**
5.	**Assertion: In ΔABC, ∠C = ∠A, BC = 4 cm and AC = 5 cm. Then, AB = 4 cm** **Reason: In a triangle, angles opposite to two equal sides are equal.** **(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.**	**(b)**
6.	**Assertion: In ΔABC, BC = AB and B = 80°. Then, ∠A = 50°** **Reason: In a triangle, angles opposite to two equal sides are equal** **(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.**	**(a)**

7.	**Assertion: In ΔABC, AB = AC and ∠B = 50°, then ∠C is 50°.** **Reason: Angles opposite to equal sides of a triangle are equal.**  **(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.**	**(a)**
8.	**Assertion: ΔABC and ΔDBC are two isosceles triangles on the same base BC and vertices A and D are on the same side of BC. If AD is extended to intersect BC at E, then ΔABD ≅ ΔACD** **Reason: If in two right triangles, hypotenuse and one side of a triangle are equal to the hypotenuse and one side of other triangle, then the two triangles are congruent.**  **(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.**	**(b)**

9.	**Assertion: In triangles ABC and PQR, ∠A = ∠P, ∠C = ∠R and AC = PR. The two triangles are congruent by ASA congruence.** **Reason: If two angles and the included side of one triangle are equal to two angles and the included side of the other triangle, then the two triangles are congruent.** **(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.**	**(a)**
10	**Assertion: In ΔABC and ΔPQR, AB = PQ, AC = PR and ∠BAC = ∠QPR then ΔABC ≅ ΔPQR** **Reason: Both the triangles are congruent by SSS congruence.**  **(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.**	**(c)**

CHAPTER-8 QUADRILATERALS

Key Points of the Chapter:

- The sum of all the four angles of a quadrilateral is 360°.
- A diagonal of a parallelogram divides it into two congruent triangles.
- A quadrilateral is a parallelogram if
    - opposite sides are equal.
    - opposite angles are equal,
    - diagonals bisect each other.
- A quadrilateral is a parallelogram if
    - its opposite angles are equal.
    - its opposite sides are equal.
    - its diagonals bisect each other.
    - a pair of opposite sides is equal and parallel.
- Diagonals of a rectangle bisect each other and they are equal and vice-versa.
- Diagonals of a rhombus bisect each other at right angles and they are not equal and vice-versa.
- Diagonals of a square bisect each other at right angles and they are equal and vice-versa.
- The line segment joining the mid-points of any two sides of a triangle is parallel to the third side and equal to half of it. (Mid-point theorem)
- The line drawn through the mid-point of one side of a triangle, parallel to another side, intersects the third side at its mid-point. (By converse of mid-point theorem)
- The quadrilateral formed by joining the mid-points of the sides of a quadrilateral, taken in order, is a parallelogram.
- In a quadrilateral, if diagonals bisect each other, then it forms a parallelogram.

Multiple Choice Question (1 Mark)

1. The bisectors of angles of a parallelogram form a:
(a) trapezium (b) rectangle (c) rhombus (d) kite

2. The angles of a quadrilateral are in the ratio 3 : 4 : 5 : 6. The respective angles of the quadrilaterals are
(a) 60^0, 80^0, 100^0, 120^0 (b) 120^0, 100^0, 80^0, 60^0
(c) 120^0, 60^0, 80^0, 100^0 (d) 80^0, 100^0, 120^0, 60^0

3. In a ΔABC, P, Q, R, are the midpoints of the sides BC, CA and AB respectively. If AC = 21cm, BC = 29cm, AB = 30cm.Find the perimeter of quadrilateral ARPQ.
(a) 20 cm (b) 52cm (c) 51cm (d) 80cm

4. The quadrilateral formed by joining the midpoints of the sides of the quadrilateral PQRS taken in order, is a rectangle if
(a) diagonals of PQRS are at right angles (b) PQRS is a rectangle
(c) PQRS is a parallelogram (d) none of these

5. What is the sum of angles of quadrilaterals?
(a) 180^0 (b) 90^0 (c) 360^0 (d) none of these

6. ABCD is rhombus such that $\angle ACB = 40^0$ then $\angle ADB$ is
(a) 40^0 (b) 45^0 (c) 50^0 (d) 60^0

7. Three angles of a quadrilateral are 75^0, 90^0 and 75^0. The fourth angle is
(a) 90^0 (b) 95^0 (c) 105^0 (d) 120^0

8. A quadrilateral with only one pair of opposite sides parallel is :
(a) Trapezium (b) Square (c) Rectangle (d) Rhombus

9. The consecutive angles of a parallelogram are
(a) Complementary (b) Supplementary (c) Equal (d) None

10. If angles A, B, C and D of the quadrilateral ABCD, taken in order are in the ratio 3:7:6:4, then ABCD is a
(a) parallelogram (b) kite (c) rhombus (d) trapezium

Answer:

1. (b) rectangle
2. (a) 60^0, 80^0, 100^0, 120^0
3. (c) 51cm
4. (a) diagonals of PQRS are at right angles
5. (c) 360^0
6. (c) 50^0
7. (d) 120^0
8. (a) Trapezium
9. (b) Supplementary
10. (d) trapezium

Very Short Answer Questions (2 Marks)

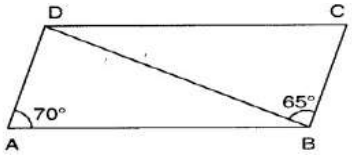
1. Three angles of a quadrilateral are equal and the fourth angle is equal to 144°. Find each of the equal angles of the quadrilateral.

2. Two consecutive angles of a parallelogram are (x + 60)° and (2x + 30)°. What special name can you give to this parallelogram?

3. If one angle of a parallelogram is 30° less than twice the smallest angle, then find the measure of each angle.

4. If the diagonals of a parallelogram are equal, then show that it is a rectangle.

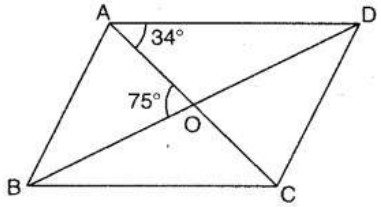
5. In the given Fig, ABCD is a parallelogram in which ∠DAB = 70 and $\angle DBC = 65$, then find the measure of $\angle CDB$.



6. In quadrilateral PQRS, if ∠P = 60° and ∠Q :∠R : ∠S = 2:3:7, then find the measure of ∠S.

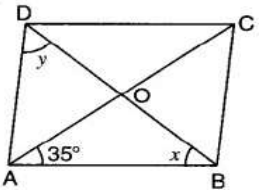
7. PQRS is a parallelogram, in which PQ = 12 cm and its perimeter is 40 cm. Find the length of each side of the parallelogram.

8. The diagonal AC and BD of a parallelogram ABCD intersect at point O. Find ∠DBC.



9. If ABCD is a parallelogram, then what is the measure of ∠A – ∠C ?

10.In the fig, ABCD is a rhombus, whose diagonals meet at O. Find x and y.



Answer:

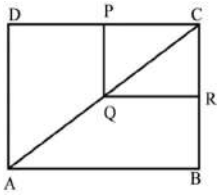
1. $72^0 9.0^0$
2. x = 30^0, Rectangle
3. 70^0, 110^0
5. 45^0
6. 175^0
7. 12cm, 8cm.
8. 41^0
10. x = y = 55^0

SHORT ANSWER TYPE II (EACH CARRIES 3 MARKS)

1. In a parallelogram ABCD, AB = 10 cm and AD = 6 cm. The bisector of ∠A meets DC in E. AE and BC produced meet at F. Find the length of CF.

2. Prove that a diagonal of a parallelogram divides it into two congruent triangle.

3. In the given figure, ABCD and PQRC are rectangles and Q is the mid-point of AC.

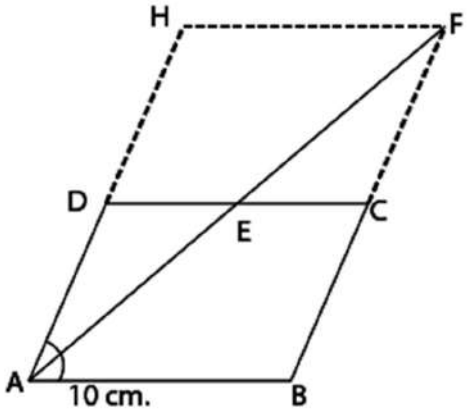


Prove that: (i) DP = PC (ii) PR = $\frac{1}{2}$ AC

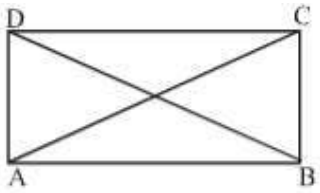
4. ABCD is a parallelogram. If its diagonals are equal, then find the value of ∠ABC.
5. Diagonals of a quadrilateral ABCD bisect each other. If ∠A = 35°, determine ∠B

ANSWER KEY

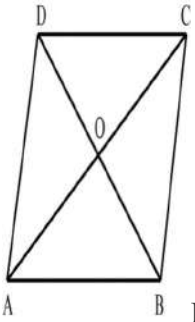
1. Given, a parallelogram ABCD in which AB = 10 cm and AD = 6cm.
   Now, draw a bisector of ∠A meets DC in E and produce it to F Also, produce AD to H and join HF, so that ABFH is a parallelogram.



2. Since HF ∥ AB
   ∴∠AFH=∠FAB [alternate interior angles]
   ∠HAF=∠FAB [since, AF is the bisector of ∠A]
   ⇒∠HAF=∠AFH [from eq.(i)]
   ⇒HF=AH [sides opposite to equal angles are equal]
   But HF = AB = 10 cm
   ∴AH=AB=10cm
   ⇒AD+DH=10cm
   ⇒DH=(10−6)cm
   ∴DH=4cm
   Since CFHD is a parallelogram.
   Therefore, the opposite sides are equal.
   ∴DH=CF=4cmnd produce BC to meet at F.
3. Correct proof
4. Correct proof



5. Since ABCD is a parallelogram,
   AB = CD and AD = BC [Opposite sides of a parallelogram are equal]
   Now, in Δs ABD and ACB, we have
   AD = BC [As proved above]
   BD = AC [Given]
   and AB = AB [common]
   Sp, by SSS criterion of congruence
   Δ ABC ≅ Δ ACB
   ⇒ ∠BAD = ∠ABC .....(i)
   [Corresponding parts of congruent triangle are equal]
   Now, AD‖ BC and transversal AB intersects them at A and B respectively.
   Therefore,
   ∠BAD + ∠ABC =180∘ [Using (i)]
   ⇒ ∠ABC + ∠ABC =180∘
   ⇒ 2∠ABC =180∘
   ⇒ ∠ABC =90∘
   Hence, the measure of ∠ABC is 90∘



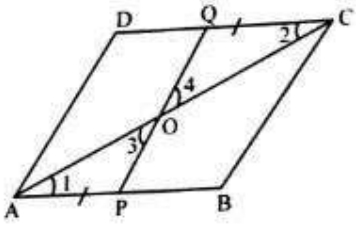
Diagonals AC and BD of quadrilateral ABCD bisect each other at O. ∵AO=OC,BO=OD∴ABCD is a ||gm. ∠A=45∘But ∠A+∠B=180∘ (Sum of consecutive angles)∴∠B=180∘−∠A=180∘−45∘=135∘

LONG ANSWER TYPE QUESTIONS (EACH CARRIES 5 MARKS)

1. Show that the quadrilateral formed by joining the mid-points of the sides of a square, is also a square.
2. E and F are respectively the mid-points of the non-parallel sides AD and BC of a trapezium ABCD. Prove that EF || AB and EF=$\frac{1}{2}$ (AB+CD)
3. ABCD is a rectangle in which diagonal BD bisects ∠B. Show that ABCD is a square.
4. Points P and Q have been taken on opposite sides AB and CD, respectively of parallelogram ABCD

5. such that AP = CQ as shown in figure. Show that AC and PQ bisect each other.

PQ and RS are two equal and parallel line-segments. Any point M not lying on PQ or RS is joined to Q and S and lines through P parallel to QM and through R parallel to SM meet at N. Prove that line segments MN and PQ are equal and parallel to each other.



CASE STUDY QUESTIONS(EACH CARRIES 4 MARKS)

1. A group of students is exploring different types quadrilaterals. They encountered the following scenario:

Four friends, Aryan, Bhavana, Chetan, and Divya, participated in a geometry project. They constructed a figure with four sides and made the following observations:

1. The opposite sides of the figure are parallel.
2. The opposite angles of the figure are congruent.
3. The figure has two pairs of congruent adjacent sides.
4. The sum of the measures of the interior angles of the figure is 360 degrees.

Based on this information, the students were asked to analyze the properties of the quadrilateral they constructed. Let's see if you can answer the questions correctly:

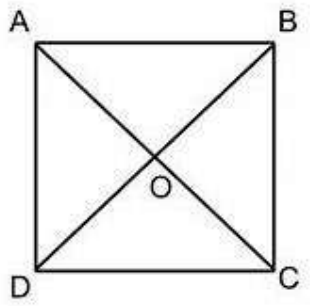
i) The type of quadrilateral formed by their figure is:
(a) Parallelogram
(b) Rhombus
(c) Rectangle
(d) Square

ii). The measure of each angle in the figure is:
(a) 90 degrees
(b) 120 degrees
(c) 135 degrees
(d) 180 degrees

iii). The figure is an example of a quadrilateral that satisfies the:
(a) Opposite sides are equal condition
(b) Opposite angles are congruent condition
(c) Diagonals bisect each other condition
(d) None of the above

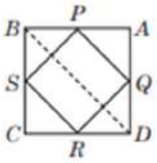
iv). The sum of the measures of the exterior angles of the figure is:
(a) 90 degrees
(b) 180 degrees
(c) 270 degrees
(d) 360 degrees

2. Rajan is studying in IX standard. His father purchased a plot which is in a square shape. After visiting the land, few questions came in his mind. Give answers to his questions by looking at the figure.



i) Measure of ∠AOB
a) 70° b) 80° c) 90° d) 100°
ii) If OA = 3 cm , then value of OC is
a) 6cm b) 3 cm c) 9cm d) 7cm
iii) Which is the correct congruence rule applicable to prove ΔABO ≅ ΔADO
a) SSS b) SAS c) ASA d) AAS
iv) If OB = 5cm, then value of BD is
a) 10 cm b) 6 cm c)8cm d)12 cm
v) Which is the correct congruence rule applicable to prove ΔABC ≅ ΔBAD
a) SSS b) SSA c) ASA d) AAS

3. The class teacher of IX class gave students coloured papers made by recycling of waste products in shape of quadrilateral. She asked them to make a parallelogram from it using paper folding.



Then teacher ask them some questions .To answer these questions , choose the correct option.
i) How can a parallelogram be formed by using paper folding?
a) Joining the sides of quadrilateral
b) Joining the midpoints of sides of quadrilateral
c) Joining the vertices of quadrilateral
d) None of the above
ii) Which of the following is the correct condition?
a) PQ= BD b) PQ= ½ BD c) 3PQ=BD d) PQ=2BD
iii) Which of the following is the correct condition?
a) 2RS= BD b) RS = 1/3BD
c) RS =BD d) RS = 2BD
iv) Which of the following is correct condition.
a) PQ= 1/2 SR b) PQ =SR c) PQ= SR/3 d) 4PQ=SR

v)Write the formula to find the perimeter of quadrilateral PQRS
a) PQ +QR+RS+PS
b) PQ-QR-RS +PS
c) (PQ+QR+RS+PS)/2
d) (PQ+QR+RS+PS)/3

Answer:

1. i)(a) Parallelogram

ii)Since the sum of the interior angles of any quadrilateral is 360 degrees, and if we divide it by 4 (as there are four angles), each angle would measure 90 degrees. So, the correct answer is (a) 90 degrees.

Iii)(a) Opposite sides are equal condition.

iv)The sum of the exterior angles of any polygon, including a quadrilateral, is always 360 degrees. So, the correct answer is (d) 360 degrees.

2. i)c)90°

ii)b)3 cm

iii)a)SSS

iv)a)10 cm

v)b)SSA

3. i)(b) Joining the mid-points of sides of quadrilateral

ii)(b) PQ = 1/2 BD

iii)(a) 2RS = BD

iv)(b) PQ = SR

v)(a)PQ +QR+RS+PS

Assertion and Reasoning (1 Mark)

Directions:

(A) Assertion and reason are true and reason is the correct explanation of assertion.
(B) Both assertion and reason are true but reason is not the correct explanation of assertion.
(C) Assertion is true but reason is false.
(D) Assertion is false but reason is true.

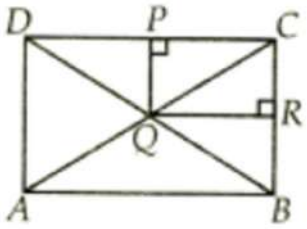
1. Assertion : The angles of a quadrilateral are x^0, $(x - 10)^0$, $(x + 30)^0$ and $(2x)^0$, the smallest angle is equal to 58^0.
Reason : Sum of the angles of a quadrilateral is 360^0.

2. Assertion : If the diagonals of a parallelogram ABCD are equal, then $\angle ABC = 90^0$.
Reason : If the diagonals of a parallelogram are equal, it becomes a rectangle.

3.Assertion : A parallelogram consists of two congruent triangles.
Reason : Diagonal of a parallelogram divides it into two congruent triangles.

4.Assertion : ABCD is a square. AC and BD intersect at O. The measure of $\angle ABC = 90^0$.
Reason : Diagonals of a square bisect each other at right angles.

5. Assertion : ABCD and PQRC are rectangles and Q is a midpoint of AC . Then DP = PC.



Reason : The line segment joining the midpoint of any two sides of a triangle is parallel to the third side and equal to half of it.

6. Assertion : In ΔABC , median AD is produced to X such that AD DX = . Then ABXC is a parallelogram.
Reason : Diagonals AX and BC bisect each other at right angles.

7. Assertion : The consecutive sides of a quadrilateral have one common point.
Reason : The opposite sides of a quadrilateral have two common point.

8. Assertion : Two opposite angles of a parallelogram are $(3x-2)^0$ and $(50-x)^0$. The measure of one of the angle is 37^0.
Reason : Opposite angles of a parallelogram are equal.

9. Assertion : If the angles of a quadrilateral are in the ratio 2 : 3 : 7 : 6, then the measure of angles are 40^0, 60^0, 140^0 120^0, respectively.
Reason : The sum of the angles of a quadrilateral is 360^0.

10. Assertion : In ΔABC , E and F are the midpoints of AC and AB respectively. The altitude AP at BC intersects FE at Q. Then, AQ = QP.
Reason : Q is the midpoint of AP.

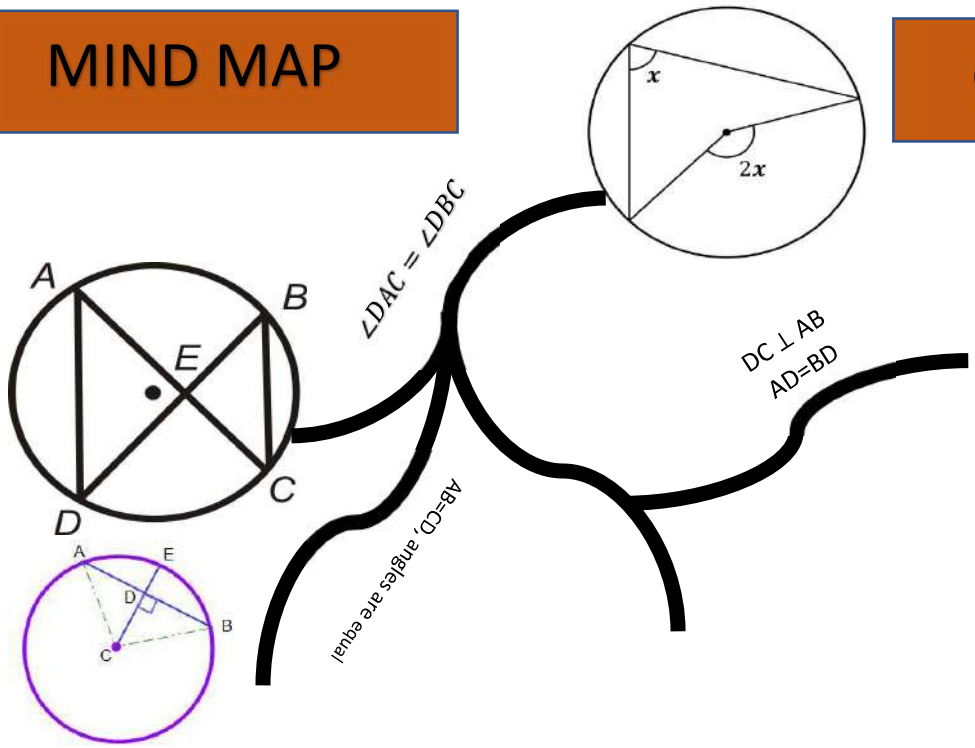
Answer:

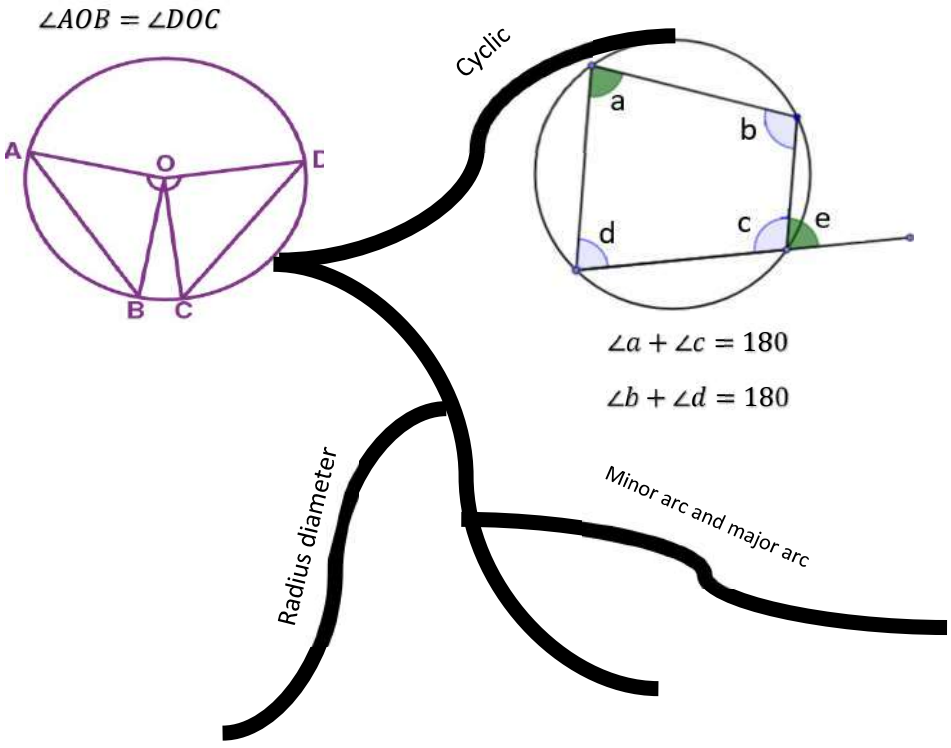
1. A
2. A
3. A
4. A
5. B
6. C
7. C
8. A
9. A
10. B

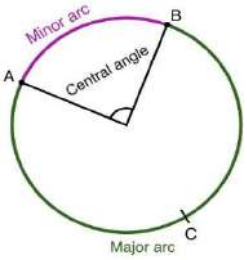
CHAPTER-9 CIRCLES

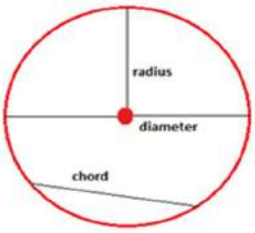
MIND MAP

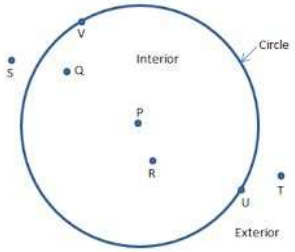
CIRCLES











KEY POINTS:

1. **Circle** is group of points which are at a **fixed distance** from a **fixed point** in the same plane. The fixed point is called its **centre** and fixed distance is called its **radius**.
2. The line segment joining any two point of a circle is called its **chord**.
3. The line passing through any two point of circle is called its **secant**.
4. **Theorems to use:**

   a. **Equal chords** of a circle subtend **equal angles** at the centre.

   b. If the **angles** subtended by the chords of a circle **at the centre** are equal, then the chords are equal.

   c. The **perpendicular** from the centre of a circle to a chord **bisects** the chord.

   d. **The line** drawn through **the centre** of a circle to bisect a chord is **perpendicular** to the chord .

   e. There is **one and only one** circle passing through three given non-collinear points

f. **Equal chords** of a circle (or of congruent circles) **are equidistant** from the centre (or centres).

g. **Chords equidistant** from the centre of a circle **are equal** in length.

h. The **angle subtended** by an arc **at the centre** is **double** the angle subtended by it at any point on the remaining part of the circle.

i. **Angles** in the **same segment** of a circle **are equal**.

j. If a line segment joining two points subtends equal angles at two other points lying on the same side of the line containing the line segment, the four points lie on a circle (i.e. they are concyclic).

k. The **sum** of either pair of opposite angles of a **cyclic quadrilateral** is **180º.**

l. If the sum of a pair of opposite angles of a quadrilateral is 180º, the quadrilateral is cyclic.

A. MCQ (1 MARK EACH)

Example 1. Equal _____ of the congruent circles subtend equal angles at the centers.

a. Segments

b. Radii

c. Arcs

d. Chords

Answer : d. Chords

Example 2. If a line intersects two concentric circles with centre O at A, B, C and D, then:

a. AB = CD

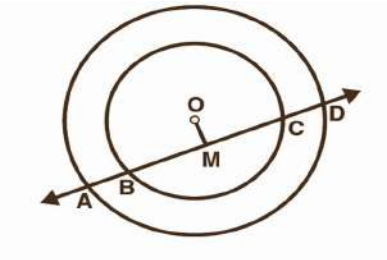
b. AB > CD

c. AB < CD

d. None of the above

Answer: a. AB = CD

Explanation:



From the above fig., OM ⊥ AD.

Therefore, AM = MD ……. (1)

Also, since OM ⊥ BC, OM bisects BC.

Therefore, BM = MC ……. (2)

From equation (1) and equation (2).

AM – BM = MD – MC

∴ AB = CD

B. PRACTICE QUESTION MCQ

1. If chords AB and CD of congruent circles subtend equal angles at their centres, then:

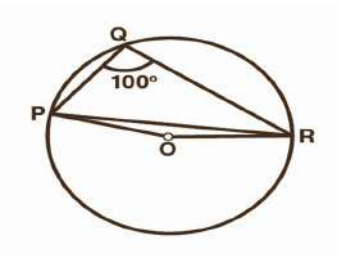
a. AB = CD

b. AB > CD

c. AB < AD

d . None of the above

2. In the given figure, find angle OPR.



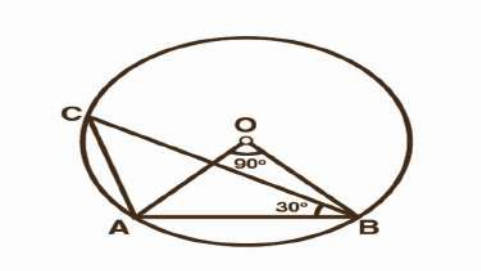
a. 20°

b. 15°

c. 12°

d. 10°

3.In the given figure, ∠AOB = 90º and ∠ABC = 30º, then ∠CAO is equal to:



(a) 30º

(b) 45º

(c) 60º

(d) 90º

4.ABCD is a cyclic quadrilateral such that AB is a diameter of the circle circumscribing it and

$\angle ADC = 140^0$ then $\angle BAC$ is equal to:

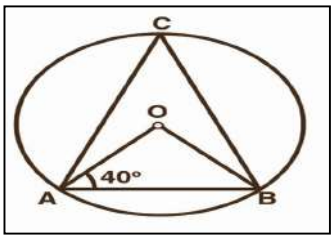
(a) 30º

(b) 40º

(c) 50º

(d) 80º

5.In the given figure, if ∠OAB = 40º, then ∠ACB is equal to



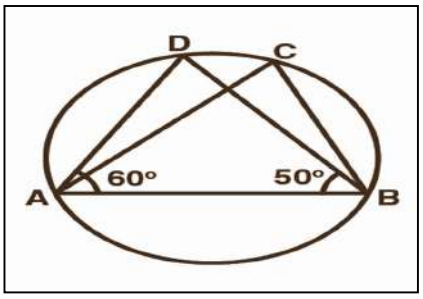
(a) 40º

(b) 50º

(c) 60º

(d) 70º

6 In the given figure, if ∠DAB = 60º, ∠ABD = 50º, then ∠ACB is equal to:



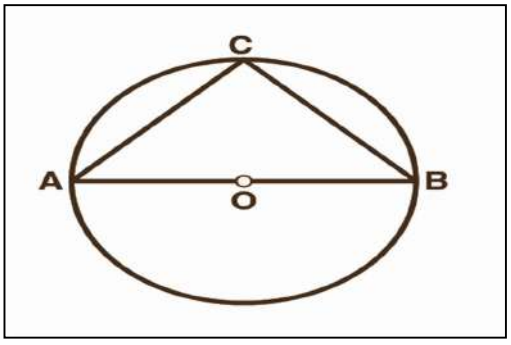
(a) 50°

(b) 60°

(c) 70°

(d) 8

7. In the given figure, if AOB is a diameter of the circle and AC = BC, then ∠CAB is equal to:



(a) 30°

(b) 45°

(c) 60°

(d) 90°

8. AD is the diameter of a circle and AB is a chord. If AD = 34 cm, AB = 30 cm, the distance of AB from the centre of the circle is

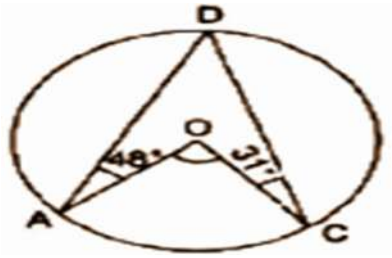
(a) 4 cm

(b) 8 cm

(c) 15 cm

(d) 17 cm

9. In the figure, O is the centre of the circle. ∠OAD= 48° and ∠OCD = 31° What is the measure of *L*AOC?



(a) 120°

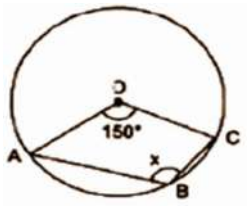
(b) 136°

(c) 128°

(d) 158°

10.In the figure, O is the centre of the circle. What is the value of x?

(a) 125°



(b) 105°

(c) 95°

(d) 85°

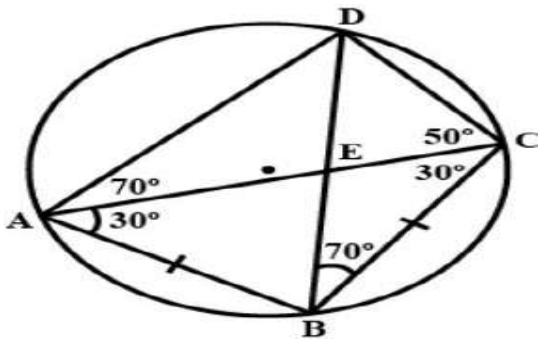
Answers :

1	2	3	4	5	6	7	8	9	10
a	d	c	c	b	c	b	b	d	b

SHORT ANSWERS QUESTION (each carry 2 marks)

1. ABCD is a cyclic quadrilateral whose diagonals intersect at a point E.$\angle DBC = 70^0$, $\angle BAC$ is 30^0 find $\angle BCD$. Further if ABCD is a cyclic quadrilateral AB =BC, find $\angle ECD$.

Ans. Now ABCD is a cyclic quadrilateral.



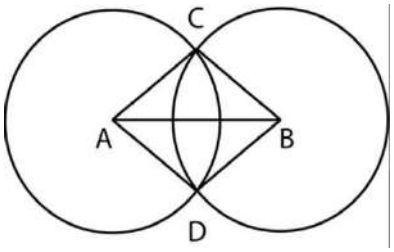
$\angle DAB + \angle BCD = 180^0$

[Sum of opposite angles of a cyclic quadrilateral is supplementary]

$100^0 + \angle BCD = 180^0$

$\angle BCD = 80^0$

2. Prove that the line of centres of two intersecting circles subtends equal angles at the two points of intersection.



Ans. Let two circles with respective centers A and B intersect each other at points C and D.

We have to prove $\angle ACB = \angle ADB$

Proof: In triangles ABC and ABD,

$AC = AD = r$

$BC = BD = r$

$AB = AB$ [Common]

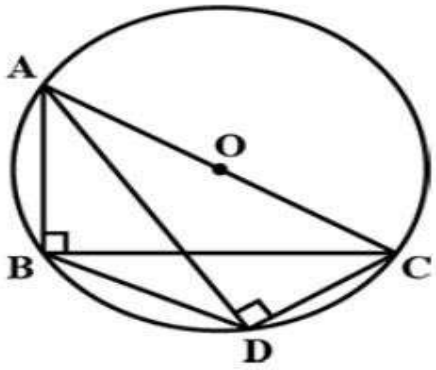
$\Delta ABC \cong \Delta ABD$

[SSS rule of congruency]

$\Delta ACB \cong \Delta ADB$ [By CPCT]

Q 1. If AB = DC and diagonal AC and BD intersect at P in cyclic quadrilateral. Prove that $\Delta PAB \cong \Delta PDC$

Q 2. Prove that $\angle CAD = \angle CBD$, if Δ ABC and Δ ADC are two right triangle with

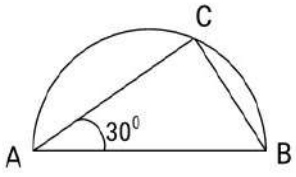


common hypotenus

Q 3. If BC **is diameter of circle with centre** O **and** OD $\perp$ **A B . Prove** CA = 2OD

Q 4. AB and CB are two chords of circle. Prove that BO bisects $\angle ABC$.

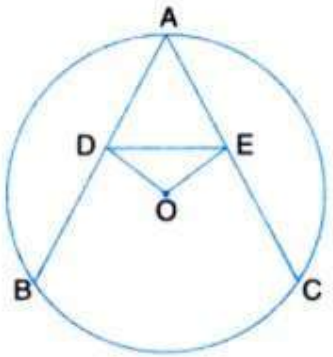
Q 5. C point is taken so that $m\angle CAB = 30^0$ from a semi-circle with AB as diameter. So find $m\angle ACB$ and $m\angle ABC$.



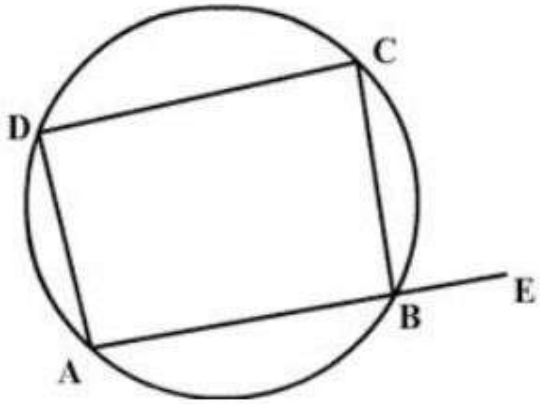
Q 6 Prove that two different circle can't interact each other at more than two points .

Q 7 O is the centre and $OP \perp AB$, find the length of the chord AB if radius is 5cm and perpendicular distance of it from centre is 3cm.

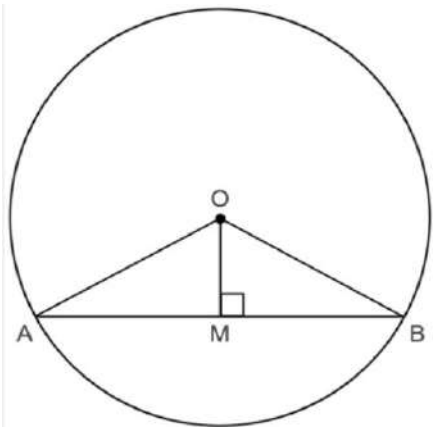
Q 8 Prove that ADE is an isosceles triangle if $AB = AC$ with $OD \perp AB$ and $OE \perp AC$



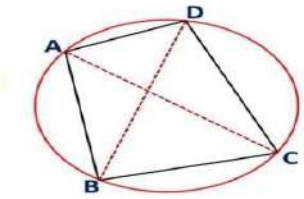
Q 9 Prove that the exterior angle formed by producing a side of a cyclic quadrilateral is equal to the interior opposite angle.



Q 10 Prove that OM Bisect AB if $OM \perp AB$.



ANS 1. IN Δ PAB and ΔPDC



AB =DC

$\angle ABP = \angle DCP$ [Angle in the same segment]

$\angle PAB = \angle PDC$ [Angle in the same segment]

$\Delta PAB \cong \Delta PDC$ [ASA criterion]

ANS 2

$\angle ADC = \angle ABC = 90^0$[AC is the common hypotenuse of ΔADC and ΔABC

$\angle ADC + \angle ABC = 180^\circ$

∴ Quadrilateral ABCD is cyclic

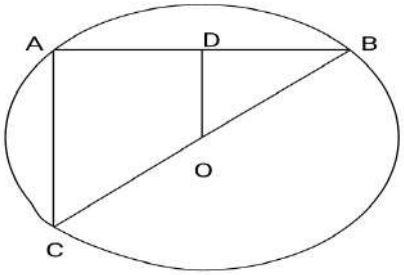
Now, chord CD subtends $\angle CAD$ and $\angle CBD$

$\angle CAD = \angle CBD$ [Angle in the same segment]

ANS 3

Join AC Given that OD ⊥ AB

D is the mid-point of AB



O is the mid-Point of BC

Now in ΔABC,

OD is the line joining the mid points of sides BC and AB

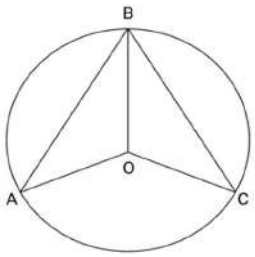
$\overline{}$

OD = 1/2AC by mid point theorem.

So AC = 2 OD.

Hence proved.

ANS 4



Join OA and OC

IN ΔOAB AND ΔOCB

OA = OC (radii of circle)

OB =OB (common)

AB = AB (given)

$\Delta OAB \cong \Delta OCB$ (by SSS)

$\angle ABO = \angle CBO$

Hence, BO bisects $\angle ABC$

ANS 5.

AB is a diameter and C is a point on the semi-circle

$m\angle ACB = 90^0$

$m\angle CAB = 30^0$

In ΔACB,

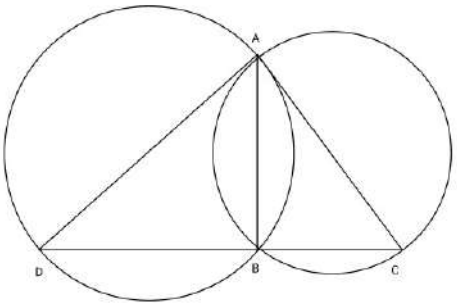
$m\angle ABC + 30^0 + 90^0 = 180^\circ$

$m\angle ABC + 120^\circ = 180^\circ$

$m\angle ABC = 180^0 - 120^0 = 60^0$

$m\angle ACB = 90^0$ AND $m\angle ACB = 90^0$.

ANS 6. Let the two different circles intersect in three point A, B, C. Then these points A, B and C one non-collinear. We know that through three non-collinear Points, one and only one circle can pass so, it contradicts the hypothesis



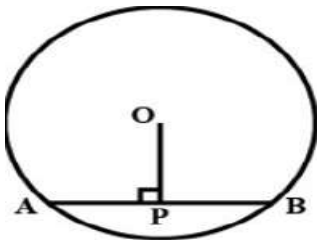
.

ANS 7 . Perpendicular drawn from the centre to the chord bisects the chord.

$AP = PB = \frac{1}{2} AB$

In right angled triangle BPO,

$OB^2 = OP^2 + BP^2$



$(5)^2 = (3)^2 + (BP)^2$

$(BP = \sqrt{16} = 4\text{cm})$

$AB = 2BP = 2\text{X}4 = 8\text{cm}$

ANS 8 Given that AB and AC is two equal chords of the circle with centre O,

$OD \perp AB$ And $OE \perp AC$

$OD = OE$ (Equal chords are equidistant)

$\angle ODE = \angle OED$……..(i)

$\angle ODA = \angle OEA$……..(ii)

Subtracting (i) from (ii)

$\angle ODA - \angle ODE = \angle OEA - \angle OED$

$\angle ADE = \angle AED$

AD = AE

ΔADE is an isosceles triangle.

ANS 9 , $\angle ABC + \angle ADC = 180^\circ$ [Opposite angles of a cyclic quadrilateral]

$\angle ABC + \angle CBE = 180^\circ$

$\angle ABC + \angle ADC = \angle ABC + \angle CBE$

$\angle ADC = \angle CBE$

$\angle CBE = \angle ADC$

ANS 10 . AB is a chord of the circle with centre O.

OM ⊥ AB

OA = OB (radii of same circle)

OM = OM (common)

ΔAOB ≅ ΔCOD (by SSS)

∠OMA = ∠OMB [each 90^0]

ΔOAM ≅ ΔOBM (by SAS)

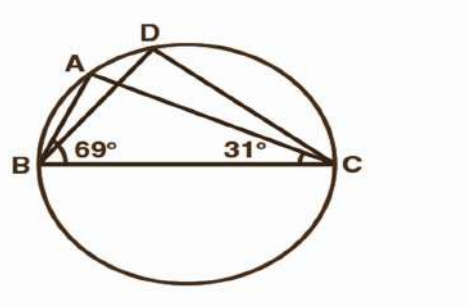
AM = BM

Hence OM bisects AB

3 MARKS QUESTIONS:

Example 1.

In Figure, *L*ABC = 69°, *L* ACB = 31°, find ∠BDC.



Solution:

As we know, angles in the segment of the circle are equal so,

∠BAC = ∠BDC

Now in the In ΔABC, sum of all the interior angles will be 180°

So, ∠ABC + ∠BAC + ∠ACB = 180°

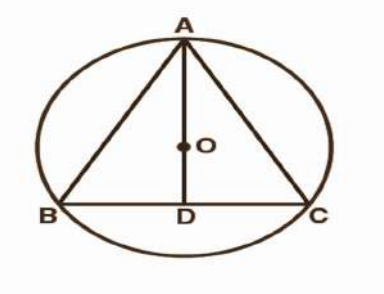
Now, by putting the values,

∠BAC = 180° – 69° – 31°

So, ∠BAC = 80°

Example 2. A circular park of radius 20m is situated in a colony. Three boys Ankur, Syed and David are sitting at equal distance on its boundary each having a toy telephone in his hands to talk each other. Find the length of the string of each phone.

Solution:



Here the positions of Ankur, Syed and David are represented as A, B and C respectively. Since they are sitting at equal distances, the triangle ABC will form an equilateral triangle.

AD ⊥ BC is drawn. Now, AD is median of Δ ABC and it passes through the centre O.

Also, O is the centroid of the ΔABC. OA is the radius of the triangle.

OA = $\frac{2}{3}$ AD

Let, the side of a triangle a metres then BD = $\frac{a}{2}$m.

Applying Pythagoras theorem in ΔABD,

$AB^2 = BD^2 + AD^2$

$\Rightarrow AD^2 = AB^2 - BD^2$

$\Rightarrow AD^2 = a^2 - (\frac{a}{2})^2$

$\Rightarrow AD^2 = \frac{3a^2}{4}$

$\Rightarrow AD = \frac{\sqrt{3}}{2}a$

Now, $OA = \frac{2}{3}AD$

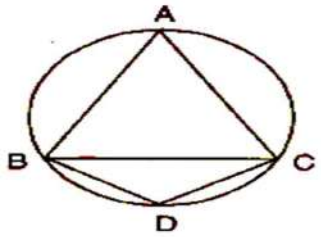
$\Rightarrow 20\text{ m} = \frac{2}{3} \times \frac{\sqrt{3}}{2}a$

$\Rightarrow a = 20\sqrt{3}$ m

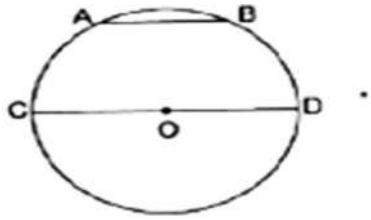
So, the length of the string of the toy is $20\sqrt{3}$ m.

PRACTICE QUESTIONS:

1. In the given figure, ΔABC is an equilateral triangle and ABDC is a cyclic quadrilateral, then find the measure of $\angle BDC$.



2. What is the length of a chord which is at a distance of 4 cm from the centre of a circle of radius 5 cm?
3. Two circles intersect at two points, prove that their centres lie on the perpendicular bisector of the common chord.
4. In the figure. AB and CD are two chords of a circle with centre O, such that C, O, D are collinear and $AB = \frac{1}{3}CD$. If AB = 3 cm, then what is the radius of the circle?

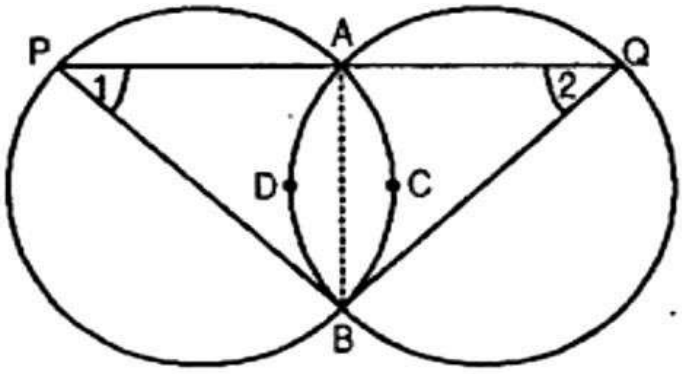


5. ABCD is a cyclic quadrilateral in which AB and CD when produced meet in E and EA = ED. Prove that : (i) AD // BC (ii) EB = EC.

Answer :

Question 1	Question 2	Question 4
120^0	6cm	4.5cm

1. Two congruent circles intersect each other at points A and B. Through A any line segment PAQ is drawn so that P , Q lie on the two circles. Prove that BP = BQ .



Ans. Given: Two equal circles intersect in A and B .

A straight line through A meets the circles in P and Q.

To prove: BP = BQ

Construction: Join A and B .

Proof: AB is a common chord and the circles are equal.

∴ Arc about the common chord are equal, i.e.,

arc ACB = arc ADB

Since equal arcs of two equal circles subtend equal angles at any point on the remaining part

of the circle, then we have,

$\angle 1 = \angle 2$

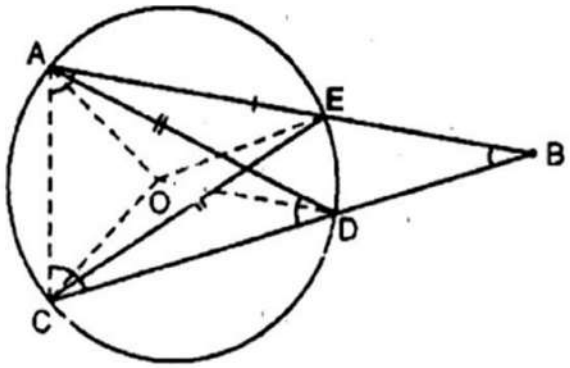
In triangle PBQ,

$\angle 1 = \angle 2$ [proved]

Sides opposite to equal angles of a triangle are equal.

Then we have, BP □ BQ

2. Let vertex of an ∠ ABC be located outside a circle and let the sides of The angle intersect chords AD and CE. Prove that ∠ABC is equal to half the difference of the angles subtended by the chords AC and DE at the centre.



Ans. Vertex B of ∠ABC is located out side the circle with centre O.

Side AB intersects chord CE at point *E* and side BC intersects chord AD at point D with the circle

We have to prove that

$\angle ABC = \frac{1}{2}[\angle AOC - \angle DOE]$

Join OA ,OC ,OE and OD.

Now $\angle AOC = 2\angle AEC$

[Angle subtended by an arc at the centre of the circle is twice the angle subtended by the same arc at any point in the alternate segment of the circle]

$\frac{1}{2}\angle AOC = \angle AEC$…….(i)

Similarly $\frac{1}{2}\angle DOE = \angle DCE$……..ii)

Subtracting eq. (ii) from eq. (i),

½ $(\angle AOC - \angle DOE) = \angle AEC - \angle DCE$ ……(iii)

Now ∠AEC=∠ADC (Angles in same segment in circle) .....
Also ∠DCE=∠DAE

Using eq. (iv) and (v) in eq.(iii),

1/2[∠AOC-∠DOE]= (∠DAE+∠ABD) -∠DAE ….(exterior property)

$\frac{1}{2}[\angle AOC - \angle DOE] = L ABD$

Or

$\frac{1}{2}[\angle AOC - \angle DOE] = L ABC$

Hence proved.

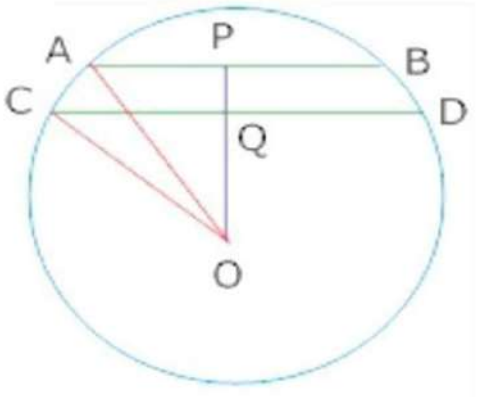
PRACTICE QUESTIONS

Q 1.The two chords AD and BC bisect each other, show that

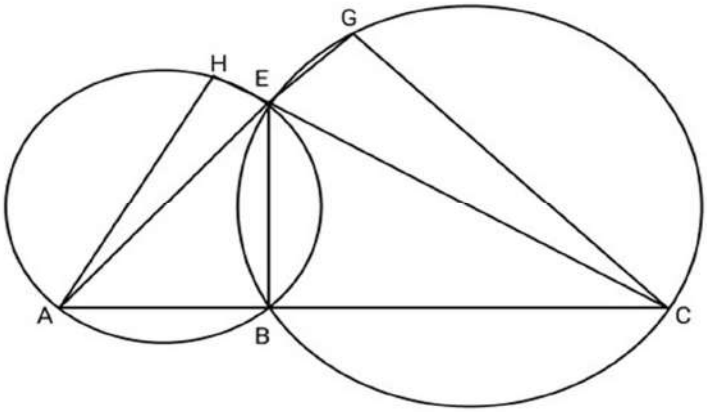
(1) AD **and** BC **are diameter**

(2) ABCD **is a rectangle**

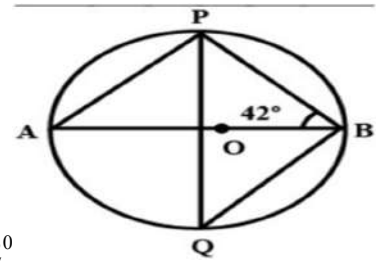
Q 2. OP ⊥ AB, **OQ**⊥ CD, AB // CD. AB= 6cm and CD = 8cm. Determine PQ**, radius is** 5cm**.**



Q 3 Show that $\angle AHE$ **and** $\angle EGC$ **are supplementary . Given that ABC , AEG and HEC are straight lines.**

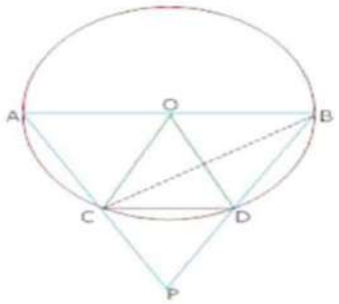


Q 4. Calculate the measure of $\angle PQB$, where O is the centre of the circle and $\angle$PBO=



42^0

Q 5. OC radius equal to chord CD **and** AB **is diameter and AC and BD are produced meet at P . Prove that** $\angle CPD=60^0$



ANSWER KEY

ANS 1. a) SHOW $\angle A= \angle B = \angle C = \angle D = 90^0$ (AC ,BD is diameters of

circle as they bisect each other)

b) ABCD **is a rectangle**

ANS 2 $PQ=1CM$

ANS 3. BY USING LINEAR PAIR

ANS 4. $\angle$PAB =$\angle$PQB= 48^0

Ans.5 . In ΔOCD,

$OC= OD$ (Radii of same circle)

OC= CD(Given)
OC = OD = CD

ΔOCD is equilateral. Hence, $\angle COD=60^0$

$\angle CBD=30^0$ [Angle subtended by arc CD at centre is double the angle at any Point of the remaining part]

$\angle ACB=90^0$ (angle in semicircle)

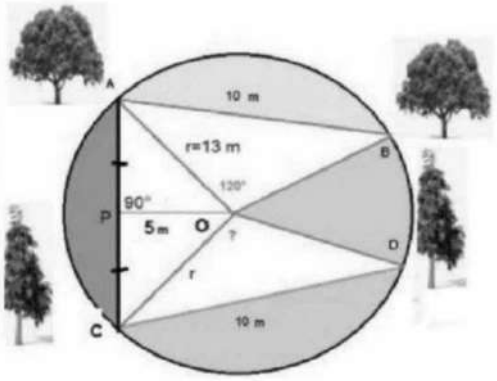
Also by Exterior angle property , we have

$\angle ACB=\angle CBP+\angle CPB$

$90^0-30^0=\angle CPB$

$\therefore \angle CPB=60^0$

CASE BASE QUESTIONS:



Example 1. A farmer has a circular garden as shown in the picture above . He has a different type of tree , plants and flower plants in his garden. In the garden, there are two mango trees A and B at a distance of AB=10m. Similarly has two Ashok trees at the same distance of 10m as shown at C and D AB subtends ∠AOB=120° at the center O, The perpendicular distance of AC from center is 5m the radius of the circle is 13m.

Q.1 what is the value of ∠COD?

(i) 60° (ii) 120° (iii) 80° (iv) 100°

Q.2 What is the distance between mango tree A and Ashok tree C?

(i) 12m (ii) 24m (iii) 13m (iv) 15m

Q.3 What is the value of angle ∠OAB ?

(I) 60° (ii) 120° (iii) 30° (iv) 90°

OR

Q.4 What is the value of angle ∠OCD ?

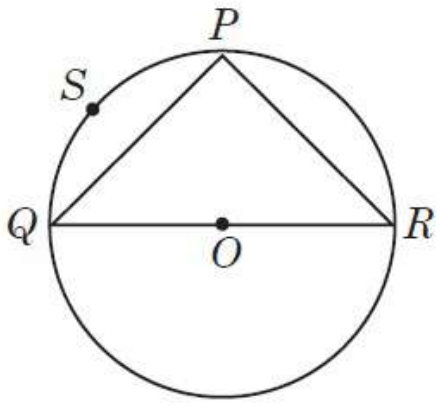
(i) 30° (ii) 120° (iii) 60° (iv) 90°

ANSWERS :

1	2	3	4
(ii) 120°	(ii) 24m	. (iii) 30°	(i) 30°

PRACTICE QUESTIONS:

Question 1. Ankit visited in a mall with his father. He sees that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m, that of between shop Q and R is 10 m and between shop P and R is 6 m.



(i) Find the radius of the circle.

(a) 5 m (b) 7 m (c) 14 m (d) 8 m

(ii) Measure of ∠QPR is

(a) 60° (b) 90° (c) 120° (d) 180°

(iii) Area of Δ PQR is

(a) 18 m^2 (b) 20 m^2 (c) 22 m^2 (d) 24 m^2

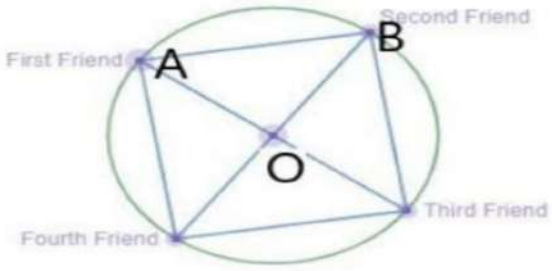
OR

(iv) In figure, PSQP is known as

(a) Major segment (b) minor segment

(c) Major sector (d) Minor sector

Question 2. Four Friends are sitting in a circular table such that distance between first and third is equal to distance between second and fourth which is diameter of circular table



1. If distance between two consecutive friend is not equal and we join all points where friends are there which type of quadrilateral we get?

(a) Trapezium (b) Rectangle (c) Rhombus (d) None of them

2. Angle subtended by first friend, second friend at the centre is -

(a) 30 (b) 60 (c) 90 (d) 120

3. If distance between two consecutive friend is equal If we join all points where friends are there which type of quadrilateral we get?

(a) Trapezium (b) Rectangle (c) Square (d) Rhombus

OR

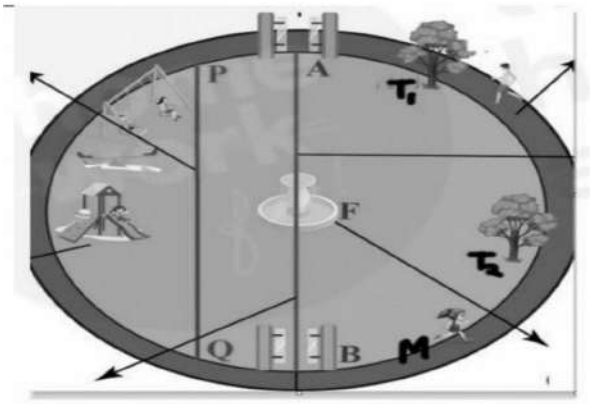
4. Which type of triangle ABC is

(a) right angle triangle (b) isosceles triangle

(c) both A and B (d) None of them

Question 3. A circular park is there in a city in which there is a fountain in the centre, there are two trees in park from which gates are 20 m far each, there are two gates in park entrance(A) and exit gate(B) ,monika is walking on boundary of this circular park she is 15 m far from fountain.

1. distance between monika and fountain is called



(a) Radius (b) Chord (c) Segment (d) Axis

2. Assume that distance between tree 1 and entrance gate is equal to distance between tree 2 and exit gate then the angle made by fountain with entrance gate and tree 1 and fountain with exit gate and tree 2 are_____.

(a) unequal (b) equal (c) can't say

3. if circular park is circle ,fountain is its

(a) chord (b) diameter (c) centre (d) segment

OR

4. PQ in figure is

(a) chord (b) diameter (c) centre (d) segment

Answer 1.	Answer 2.	Answer 3 :
1. (a) 5 m 2. (b) 90° 3. (d) 24 m^2 4. (b) Minor segment	1. b) Rectangle 2. c) 90 3. c) square 4. a) right angled triangle	1. (a) Radius 2 (b) equal 3(c) centre 4(a) chord

ASSERTION AND REASONING

Q 1) Assertion: circle is a plane figure
Reason: circle is a 2d figure and it can be drawn on a plane.
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not 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

Q 2) Assertion: A chord of a circle, which is twice as long as its radius, is a diameter of the circle.
Reason: As we know that any chord whose length is twice as long as the radius of the circle always passes through the centre of the circle
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not 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

PRACTICE QUESTION …

Q 1 . Assertion: there can be infinite numbers of equal chords of a circle.
Reason: A circle has only finite number of equal chords.
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not correct explanation for Assertion
c) Assertion is correct but reason is false
d) both Assertion and reason are false

Q 2 . Assertion: A circle has only one centre.
Reason: A circle is defined as the path traced by a moving point that always remains at a fixed distance from a given fixed point
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not correct explanation for Assertion
c) Assertion is correct but reason is false
d) both Assertion and reason are false

Q 3 . Assertion: With a given centre and a given radius, only one circle can be drawn.
Reason: Because circles have only one parameter
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not correct explanation for Assertion
c) Assertion is correct but reason is false
d) both Assertion and reason are false

Q 4 . Assertion: Two diameters of a circle will necessarily intersect.
Reason: diameters will always intersect each other at the centre of the circle.
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not correct explanation for Assertion
c) Assertion is correct but reason is false
d) both Assertion and reason are false

Q 5 . Assertion: A circle of radius 3cm can be drawn through two points A,B such that AB=6 cm.
Reason: Diameter of circle =2*radius of circle
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not correct explanation for Assertion
c) Assertion is correct but reason is false
d) both Assertion and reason are false

Q 6 . Assertion: If the sum of the circumferences of two circles with radii R 1 and R2 is equal to the circumference of a circle of radius R, then R1+R2=R
Reason: circumference of circle with radius $=2\pi R$
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not correct explanation for Assertion
c) Assertion is correct but reason is false
d) both Assertion and reason are false

Q 7 . Assertion: There is only one tangent at a point of the circle.
Reason: The tangents drawn at the extremities of the diameter of a circle are parallel
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not correct explanation for Assertion
c) Assertion is correct but reason is false
d) both Assertion and reason are false

Q 8 . Assertion: The angle subtended by the diameter of a semi-circle is180°
Reason: The semicircle is half of the circle, hence the diameter of the semicircle will be a straight line subtending 180 degrees
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not correct explanation for Assertion

c) Assertion is correct but reason is false
d) both Assertion and reason are false

Q 9 . Assertion: angle in the same segment are equal.
Reason: angle in a semi circle is a Right angle.
a) both Assertion and reason are correct and reason is correct explanation for Assertion
b) both Assertion and reason are correct but reason is not correct explanation for Assertion
c) Assertion is correct but reason is false
d) both Assertion and reason are false

Q 10 . Assertion: A semi-circle is one fourth part of the circle
Reason: A semi-circle is obtained when a circle is divided into two unequal parts.

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

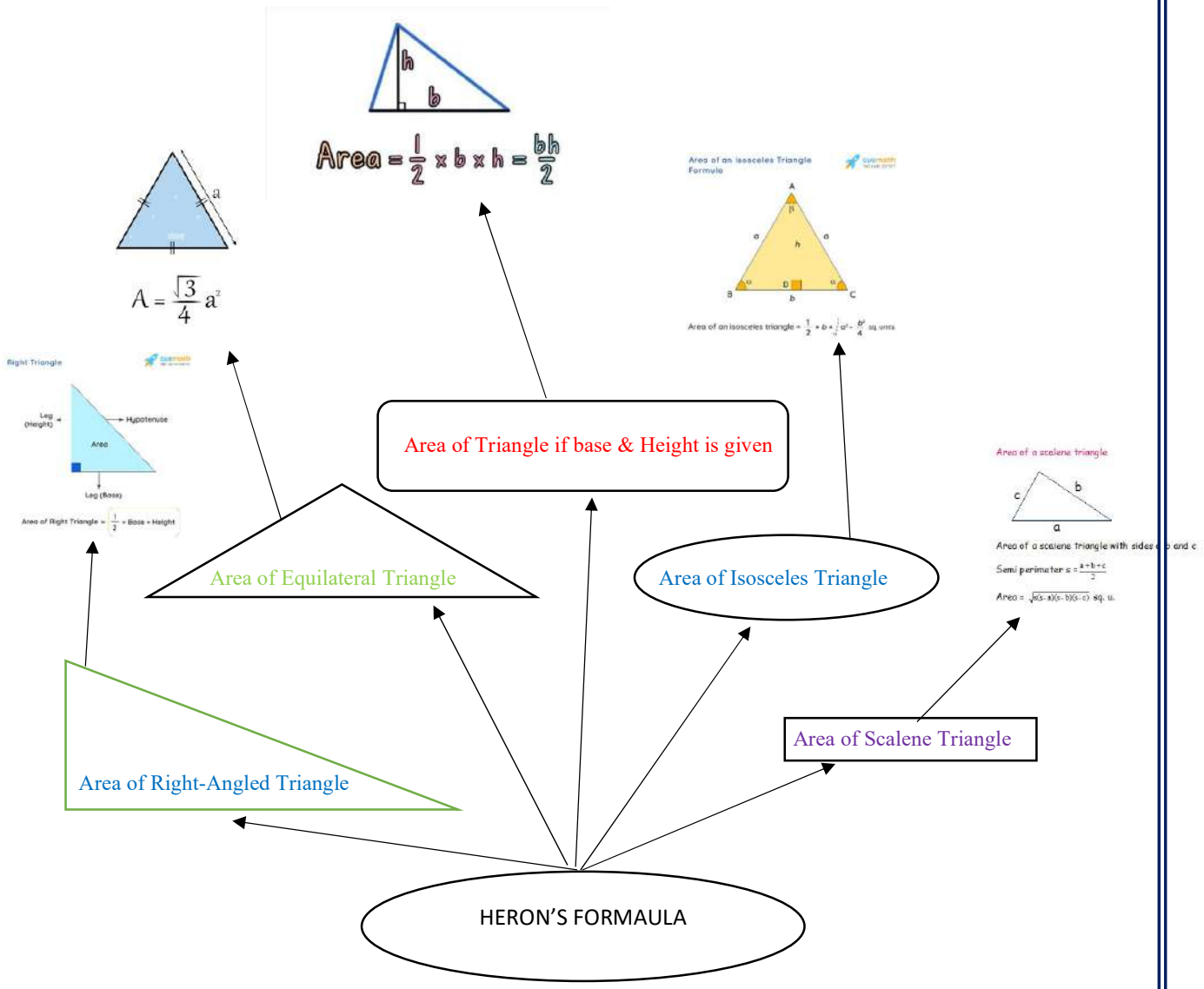
b) both Assertion and reason are correct but reason is not correct explanation for Assertion

c) Assertion is correct but reason is false

d) both Assertion and reason are false

Answers key
Q 1 Ans: c) Assertion is true but reason is false
Q 2 Ans: a) both Assertion and reason are correct and reason is correct explanation for Assertion
Q 3 Ans: a) both Assertion and reason are correct and reason is correct explanation for Assertion
Q 4 Ans: a) both Assertion and reason are correct and reason is correct explanation for Assertion
Q 5 Ans: a) both Assertion and reason are correct and reason is correct explanation for Assertion
Q 6 Ans: a) both Assertion and reason are correct and reason is correct explanation for Assertion
Q 7 Ans: b) both Assertion and reason are correct but reason is not correct explanation for Assertion
Q 8 Ans: a) both Assertion and reason are correct and reason is correct explanation for Assertion.
Q 9 Ans:c) Assertion is correct but reason is false
Q 10 Ans:d) both Assertion and reason are false

CHAPTER-10 HERON'S FORMULA



Key Points:

- If a, b and c are the length of sides of a scalene triangle,

A = √{s(s-a)(s-b)(s-c)}, where s = (a + b + c)/2.

- Area of Equilateral Triangle = √3/4 × (side)²
- Area of Isosceles Triangle with Base b and equal sides

= $\frac{1}{2}\left[\sqrt{\left(a^2-\frac{b^2}{4}\right)}\times b\right]$

- Area of Regular Hexagon = 6 x √3/4 × (side)²

Problems based on Heron's Formula:

- With the help of Heron's Formula, we can find the area of Equilateral triangles and Isosceles triangles.
- Diagonals of a Quadrilateral divides it into two triangles, with the help of Heron's formula, we can find the Area of given Quadrilateral.

MULTIPLE CHOICE QUESTIONS (1 MARK)

1. If sides of an equilateral triangle of area A is tripled, then area of new triangle is

1. 4A
2. 6A
3. 9A
4. 8A

2. Area of an equilateral triangle if its side is √7 unit

1. √21/4 square unit
2. √42/4 square unit
3. 7√3/4 square unit
4. None of these

3. Area of rhombus of diagonals 16cm and 8cm is

1. 128 cm^2
2. 64 cm^2
3. 48 cm^2
4. 96 cm^2

4. Perimeter of an equilateral triangle is 9cm find its area

1) 9√3/4 cm^2
2) 36√3/4 cm^2
3) 8√3/4 cm^2
4) none of these

5. Sides of a triangle are 45cm,60cm and 75cm then find its area

1) 1450 cm^2
2) 1550 cm^2
3) 1650 cm^2
4) 1350 cm^2

6. Find the value of altitude of a right-angled triangle if it's base is 5cm and hypotenuse is 13cm

1) 12 cm
2) 6 cm
3) 11 cm
4) 8 cm

7. If area of an equilateral triangle is $12\sqrt{3}$ square unit then its side is

1) $2\sqrt{3}$ unit
2) $4\sqrt{3}$ unit
3) $3\sqrt{3}$ unit
4) $5\sqrt{3}$ unit

8. Find area of a triangle whose sides are 6cm, 8cm, 6cm -

1) $7\sqrt{5}$
2) $6\sqrt{5}$
3) $8\sqrt{5}$
4) $5\sqrt{5}$

9. Find area of an isosceles triangle having base 4cm and each of equal side is 6cm

1) $5\sqrt{2}$ cm square
2) $6\sqrt{2}$ cm square
3) $7\sqrt{2}$ cm square
4) None of these

10. Base and height of a right-angled triangle are 10cm and 24cm the its area is -

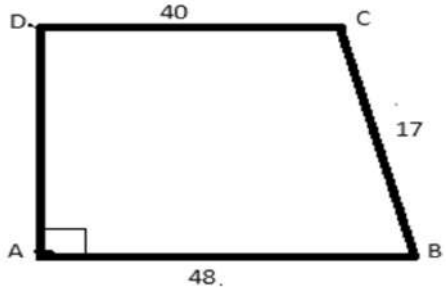
1) 100 cm^2
2) 120 cm^2
3) 140 cm^2
4) 160 cm^2

VERY SHORT ANSWER TYPE QUESTIONS (2 MARKS)

1) Find area of an equilateral triangle with side 8 cm
2) Base of a right-angled triangle is 48cm and its hypotenuse is 50cm. Find its area.
3) Area of a triangle is 60 cm^2.Its base is 12cm. Find its corresponding altitude.
4) The hypotenuse of an isosceles right-angled triangle is $\sqrt{72}$cm. Find its area.
5) An isosceles right-angled triangle has an area 8 cm^2.Then find length of its hypotenuse.
6) Area of an equilateral triangle is $4\sqrt{3}cm^2$. Find its semi perimeter .
7) Find area of a regular hexagon whose side is 8 cm.
8) Perimeter of an equilateral triangle is 60 m. Find its area.
9) Find area of an isosceles right-angled triangle if its equal sides are 6 cm each.
10) Find area of a rhombus if its diagonal is 10 cm and 16 cm.

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1) If ratio of the sides of a triangle is 2:3:4 and its perimeter is 180 m. Find its area.
2) If two sides of a triangle are 6 cm ,8 cm and its perimeter is 24 cm then find its area.
3) Sides of a triangle are 20 cm,21 cm and 15 cm. Find its area by Heron's formula.
4) Two adjacent sides of a cardboard in the shape of a parallelogram are 4cm and 5cm. If one of its diagonals is 7 cm then find area of the cardboard.
5) Find area of the given quadrilateral if its perimeter is 120 m.

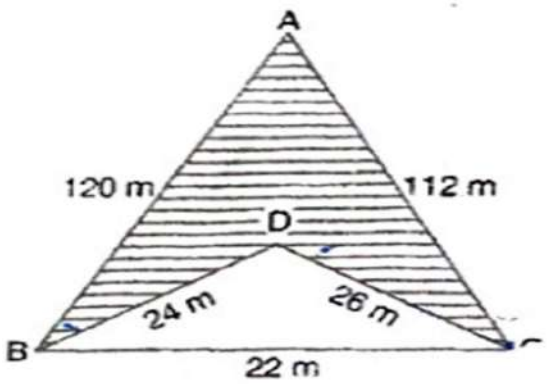


LONG ANSWER TYPE QUESTIONS (5 MARKS)

1) Sides of a triangle are 45cm, 55cm and 60cm. Find its area and also find the length of longest altitude.
2) Riya has a piece of land in the shape of a rhombus of perimeter 800m. She wants her son and daughter to work on the land to produce different crops. So, she divided the land into two equal parts. Determine how much area each of them will get for their crops if one of the diagonals is 160m.
3) Find area of a trapezium shaped field whose parallel sides are 30cm and 16cm and other two sides are 10cm each.

CASE BASED QUESTIONS (4 MARKS)

1. Howard University organized an educational tour for students, where student visited the Giza pyramid (shown in figure). After seeing the pyramid, some questions arise in minds of students.



Answer the following questions:

1. The semi perimeter of ▲BDC is:
(a) 30 m (b) 36 m (c) 38 m (d) 39 m

5. The area of ▲BDC is:
(a) 12 √105 m2 (b) 24 √105 m2 (c) 20 √105 m2 (d) 26 √105 m2

6. The semi-perimeter of ▲ABC is :
(a) 128m (b) 130m (c) 132m (d) 127m

7. The area of ▲ABC is:
(a) 1220m^2 (b) 1320m^2 (c) 105 √127m^2 (d) 1420m^2

2. To spread awareness about traffic signal, Central Board of Secondary Education (CBSE) decided to conduct an activity of making a traffic signal board and should take a photo if themselves telling about that particular traffic signal. One of the students decided to make a triangular sign board showing road work ahead. The dimensions of the sign board are 11cm, 12 cm and 13 cm.

On the bases of the above information, solve the following questions : (1x4=4)

1. If dimension of sign board is given, then which formula is used for finding the covered area.

(a) Heron's formula (b) Area of circle (c) Area of square (d) Area of rhombus

2. The area of sign board is:

(a) √110cm2 (b) 6√105cm2 (c) 7√105cm2 (d) 3√105cm2

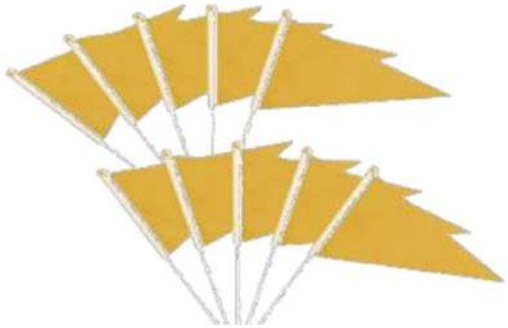
3. The smallest altitude of a triangle is :

(a) 12/7√105 cm (b) 13/5 √105 cm (c) 11√105 cm (d) 12/13√105 cm

4. What is the perimeter of the triangle?

(a) 36 (b) 46 (c) 26 (d) 56

3. While selling clothes for making flags, a shopkeeper claims to sell each piece of cloth in the shape of an equilateral triangle of each side 10 cm while actually he was selling the same in the shape of an isosceles triangle with sides 10 cm, 10 cm and 8 cm.



1. Find the area of an equilateral triangular flag?
2. If the shopkeeper sells 500 equilateral triangular flags, then find its area.
3. What is the semi-perimeter of an isosceles triangular flag.
4. Find the area of an isosceles triangular flag.

ASSERTION(A) AND REASON(R) BASED QUESTIONS

The following questions consist of two statements-Assertion(A) and Reason(R). Answer these questions selecting the appropriate option

(A) Both Assertion and Reason are true and Reason is the correct explanation of 'Assertion'

(B) Both Assertion and Reason are true and Reason is not the correct explanation of 'Assertion'

(C) Assertion is true but Reason is false

(D) Assertion is false but Reason is true

1.Assertion: The product of diagonals of a rhombus is equal to twice the area of rhombus.

Reason: The area of rhombus is equal to 1/2 x product of diagonals.

2.Assertion: Semi Perimeter of a triangle =(a+b+c)/2

Reason: If the sides of the triangle are 30m, 24m, and 22m, then its semi perimeter is 76m.

3.Assertion: The sides of triangle are 6 cm, 8 cm and 10 cm. Its area is 24 cm².

Reason: If 2s=(a+b+c), where a,b and c are the sides of the triangle then area= $\sqrt{s(s-a)(s-b)(s-c)}$

4 Assertion: The area of an equilateral triangle whose altitude is 3cm, is $3\sqrt{3}$ cm².

Reason: the area of an equilateral triangle with altitude x is, area = $x^2/\sqrt{3}$

5Assertion: The area of an equilateral triangle with each side a is given by, area =$(\sqrt{3}/4)\ a^2$.

Reason: The area of a triangle with sides a, band c and semi perimeter s are given by

area=$\sqrt{s(s-a)(s-b)(s-c)}$

6:Assertion:The area of an equilateral triangle with each side 6cm is $6\sqrt{3}$ cm²

Reason: Area of an equilateral triangle=$(\sqrt{3}/4)\ a^2$.

7:Assertion: area of triangle= $\sqrt{s(s-a)(s-b)(s-c)}$

Reason: 2s = (a+b+c)/2

8:Assertion: Area of rhombus whose side is 10 cm and one diagonal is 16 cm is 96cm²

Reason: Area of rhombus= 1/2 x (d1+d2)

9: Assertion: If the sides of a triangle are in ratio 3 : 4 : 5 and its perimeter is 24 cm then its area is 24 cm².

Reason: Area of triangle =$s\sqrt{(s-a)(s-b)(s-c)}$

10: Assertion: The base of a triangle is 10cm and its area is 25 cm² then its height is 5 cm.

Reason: Area of triangle=1/2 x base x height.

ANSWER KEY

MULTIPLE TYPE QUESTIONS (1MARK)

1. (3)
2. (3)
3. (2)
4. (1)
5. (4)
6. (1)
7. (2)
8. (3)

9. (4)

10. (2)

VERY SHORT ANSWER TYPE QUESTIONS (2 MARKS)

1.$16\sqrt{3}$ cm^2
2.336 cm^2
3.10 cm^2
4.18 cm^2
5.$4\sqrt{2}$ cm^2
6.6cm
7.$96\sqrt{3}$ cm^2
8.$100\sqrt{3}$ cm^2
9.18 cm^2
10.80 cm^2

SHORT ANSWER TYPE QUESTIONS (3 MARKS)

1.$300\sqrt{15}m^2$

2.$24cm^2$

3.$28\sqrt{26}cm^2$

4.$8\sqrt{6}cm^2$

5.$660m^2$

LONG ANSWER TYPE QUESTIONS (5 MARKS)

1.$80/9\sqrt{35}$ cm

2.$3200\sqrt{21}$ cm^2

3.$23\sqrt{51}$ cm^2

ASSERTION(A) AND REASON(R) BASED ANSWERS

1.a

2.c

3.a

4.a

5.a

6.d

7.c

8.c

9.b

10.a

CHAPTER-11 SURFACE AREAS AND VOLUMES

MIND MAP

SURFACE AREA

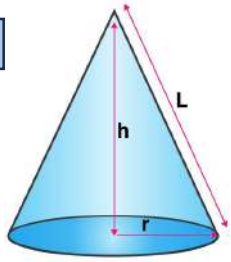
VOLUME

CSA/LSA

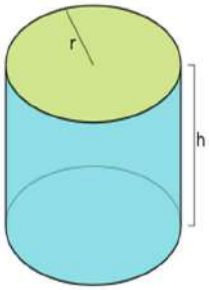
TSA

$\prod rl$

$\prod r(l+r)$



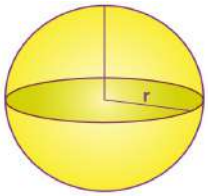
$1/3\prod r^2h$



$2\prod rh$

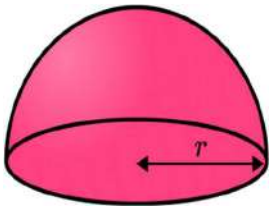
$2\prod r(h+r)$

$\prod r^2h$



$4\prod r^2$

$4/3\prod r^3$



$2\prod r^2$

$3\prod r^2$

$2/3\ \prod r^3$

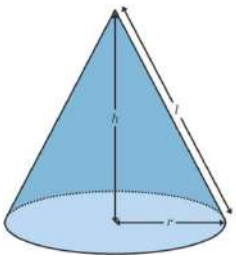
Key points

Volume: volume is the measure of the space it occupies and capacity of an object it holds.

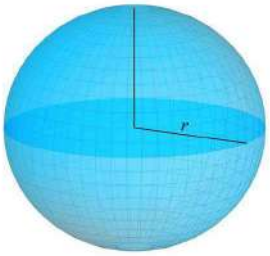
Surface area: Total area occupied by the surfaces of an object.

Curved /Lateral surface area: Area of the curved parts of an object excluding (without) its base.

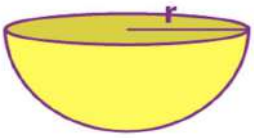
Total surface area: Curved surface area +Base area



Cone



sphere



hemisphere

Cone:

Curved surface area: πrl
Total surface area: $\pi rl+\pi r^2$
Volume: $1/3\ \pi r^2 h$

Here, $l^2=r^2+h^2$

Sphere:

Curved surface area: $4\pi r^2$
Total surface area: $4\pi r^2$
Volume: $4/3\pi r^3$

Hemisphere:

Curved surface area: $2\pi r^2$
Total surface area: $3\pi r^2$
Volume:
$2/3\pi r^3$

Multiple choice question:

1) If the surface area of a sphere of radius "R" is equal to the curved surface area of a hemisphere of radius "r", what is the ratio of R/r?

(a) 1⁄2

(b) 1/√2

(c) 2

(d) √2

2) If a right circular cone has a radius of 4 cm and a slant height of 5 cm then what is its volume?

(a) 16 π cm^3

(b) 14 π cm^3

(c) 12 π cm^3

(d) 18 π cm^3

3) Two right circular cones of equal curved surface areas have slant heights in the ratio of 3: 5. Find the ratio of their radii.

(a) 4: 1

(b) 3: 5

(c) 5: 3

(d) 4: 5

4) A hemispheric dome of radius 3.5 m is to be painted at a rate of ₹600/m^2. What is the cost of painting it? (Take π = 22/7)

(a) ₹46200

(b) ₹45000

(c) ₹47260

(d) ₹48375

5) The diameter of a sphere whose surface area is 346.5 cm^2 is

(a) 5.25 cm

(b) 5.75 cm

(c) 11.5 cm

(d) 10.5 cm

6) What is the formula for total surface area of a cone?

(a) $\pi r^2 h$

(b) πr (l +h)

(c) πr (r +l)

(d) $2\pi rl$

7) The diameter of the moon is approximately one-fourth of the diameter of the earth. What fraction of the volume of the earth is the volume of the moon?

(a) 1/64

(b) 1/32

(c) 1/48

(d) 1/16

8) The radius of the sphere is 2r, then its volume will be

(a) (4/3) πr^3

(b) $4\pi r^3$

(c) (8/3) πr^3

(d) (32/3) πr^3

9) Find the amount of water displaced by a solid spherical ball of diameter 14 cm. (Take π = 22/7)

(a) 1437.33cm^2

(b) 1457cm^2

(c) 4308cm^2

(d) 956cm^2

10) The total surface area of a cone whose radius is r/2 and slant height 2l is

(a) 2πr(l+r)

(b) πr(l+(r/4))

(c) πr(l+r)

(d) 2πrl

ASSERTION AND REASONING

CHOOSE THE CORRECT OPTION FOR THE FOLLOWING

a) **Assertion is true, reason is true and reason is the correct explanation of assertion**

b) **Assertion is true, reason is true and reason is not the correct explanation of assertion**

c) **Assertion is true but reason is false**

d) **Assertion is false but reason is true**

2. **ASSERTION: the volume and surface area of sphere are related to each other by radius.**

   REASON: relation between surface area and volume is $s^3=36\Pi v^2$

3. **ASSERTION: Volume of two spheres are in the ratio 27:8 then their surface areas are in the ratio 3:2**

   REASON: Volume= $4/3\Pi R^3$ **and surface area =** $4\Pi R^2$

4. **ASSERTION: Curved surface area of a cone of radius 3 cm and height 4 cm is 15** Π***sq.cm.***

   REASON: Volume of cone = $\Pi R^2 h$**.**

5. **ASSERTION: Volume of cone =1/3** $\Pi R^2 h$**.**

   REASON: we can carve 3 cones of equal radius from a cylinder.

6. **ASSERTION: In a cylinder if radius is halved and height is doubled, the volume will be halved.**

   REASON: In a cylinder if the radius is doubled and the height is halved the curved surface area will remain same.

7. **ASSERTION: Volume of a sphere = 4/3 ΠR^3**

   REASON: Volume of a hemisphere=3ΠR^2

8. **ASSERTION: Two cylinders of equal volume have height in ratio 1:2 then radii is in the ratio 2:1.**

   REASON: Height and radius of volume in a cylinder are inversely proportional.

9. **ASSERTION: Curved surface area of cylinder= 2 Πrh.**

   REASON: Cylinder can be formed by rotating the rectangular sheet along x or y axis.

10. **ASSERTION: Volume of a solid is equal to product of base area and height.**

    REASON: Volume =lbh for a cuboid.

11. **ASSERTION: Cone is a solid surface.**

    REASON: Cone is generated when rectangular sheet is rotated along its x axis.

Short answer type questions: Each question contain 2 marks.

e) **If the volume of a sphere is numerically equal to its surface area, then find the diameter of the sphere.**
f) **Find the total surface area of a hemisphere of radius 10cm. (use π=3.14)**
g) **The outer and the inner radii of a hollow sphere are 12 cm and 10 cm. Find its volume.**
h) **What is the total surface area of a cone of radius 7cm and height 24cm?**

(Take π = 22/7)

i) **Curved surface area of a cone is 308cm^2 and its slant height is 14cm.find the radius of the base.**

j) **Calculate the surface area of a hemispherical dome of a temple with radius 14 m to be whitewashed from outside.**

k) **Diameter of the base of a cone is 10.5 cm and its slant height is 10 cm. Find its total surface area.**

l) **The height of a cone is 15 cm. If its volume is 1570 cm^3. find the radius of the base (Take π=3.14)**

m) **A conical pit of top diameter 3.5 m is 12 m deep. What is its capacity in kilolitres.**

n) **A capsule of medicine is in the shape of a sphere of diameter 3.5 mm. How much medicine is needed to fill the capsule?**

SHORT ANSWER QUESTIONS(EACH ONE CARRIES 3 MARKS)

j) Two cones have their height in the ratio 1:3 and their bases in the ratio 3:1. Find the ratio of their volumes.

k) A cylinder and a cone have equal radius and equal height. Show that their volumes are in the ratio 3:1

l) A spherical marble of radius 5 cm is immersed in the water filled in a cylinder. The level of the water raised by 5/3 cm. find the radius of the cylinder.

m) A hemispherical bowl is made of steel 0.25cm thick. The inside radius of the bowl is 5cm. find the volume of the steel used in making the steel bowl.

n) The radius and the slant height of a cone are in the ratio 4:7. If it's curved surface area is 792 sq.cm then find the radius.

LONG ANSWER QUESTI

1.How many spherical balls can be made of a lead cylinder 28cm high and base radius 6 cm. if each ball is 1.5 cm in diameter.

2. Radha visited a sweet shop where she took 50 grams of laddu. the radius of the laddu is 4 cm. she also took soan papdi which is in the shape of cube which measures side 20 cm. Find the TSA of laddu as well as soan papdi.

3.A cone of radius 21 cm and height 8 cm is given to Rashi and asked to find the volume and CSA of the cone. But Rashi did not know the slant height. Find the slant height, volume, and CSA of cone.

Case Based Study Questions

6. **Sita is an entrepreneur and has a business of making tents for the family functions in her own city. Once she has a piece of canvas whose area is 551 m^2. She uses it to have a conical tent made, with a base radius of 7 m. Assuming that all the stitching margins and the wastage incurred while cutting, amounts to approximately 1 m^2,**

   (A) Find slant height of the conical tent.

   (B) Find the height of the tent.

   (C) find the volume of the tent that can be made with it.

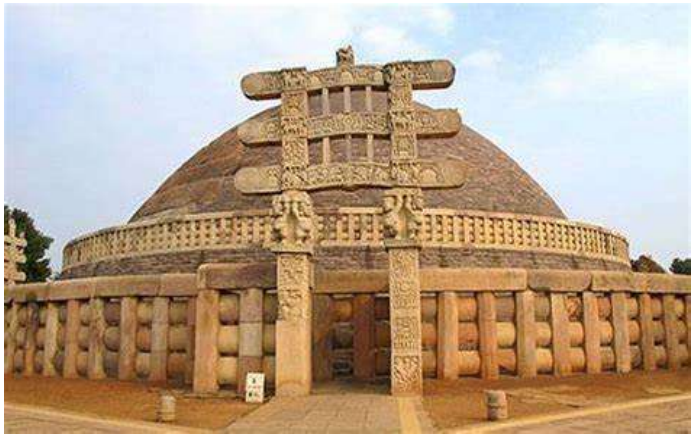
7. **Rohan and Sohan are siblings and studied in VIII and X class respectively. They are often discuss mathematical problem with each other. Once Sohan gives a spherical ball to Rohan which is divided into two equal halves. Given that the curved surface area of each half is 56.57 cm, then** (Take $\pi = 3.14$)

   (A)Find the radius of the hemisphere.

   (B)Deduce the total surface area of the divided part.

   (C) what will be the volume of the spherical ball?

8. The Great Stupa at Sanchi is one of the oldest stone structures in India, and an important monument of Indian Architecture. Its nucleus was a simple hemispherical brick structure built over the relics of the Buddha. It is a perfect example of combination of solid figures. A big hemispherical dome with a cuboidal structure mounted on it. (Take $\pi = 22/7$)



(e) **Calculate the volume of the hemispherical dome if the height of the dome is 21 m.**

(f) **The cloth requires to cover the hemispherical dome if the radius of its base is 14m is**

MCQ ANSWERS:

1. (b) $1/\sqrt{2}$ **2. (a) $16\ \pi\ cm^3$**

3.(c) 5: 3 **4. (a) ₹46200**

5. (a) 5.25 cm **6. (c) $\pi r\ (r + l)$**

7. (a) 1/64 **8. (d) $(32/3)\ \pi r^3$**

9. (a) $1437.33 cm^2$ **10. (b) $\pi r(l+(r/4)$**

ASSERTION AND REASONING:

1.A 2. D 3.C 4. A 5.A

6. C 7.A 8.B 9. A 10.A

SHORT ANSWER QUESTIONS 2 MARKS

1. 6 2. $942 cm^2$ 3. 3050.67cubic cm 4. 704 sq.cm 5. 7cm

6. 1232 m^2 7. 251.625sq cm 8. 10 cm 9. 0.0385 KL 10. $22.45 cm^3$

SHORT ANSWER QUESTIONS 3 MARKS

1. 3:1 2. proof 3.10cm 4. 41.282cubic cm 5. 12cm

LONG ANSWER QUESTIONS

1. 1792 2. 200.96 sq. cm and 2400 sqcm 3. 22.47 cm, CSA 1481 sq. cm. volume: 3692.64 cubic cm

CASE BASE STUDY

1.(A)25m (B) 24 m (C)1232 m^3

2.(A) 3 cm (B) 84.78 cm (C)2113.04 cm^3

3.(A) 19404 cm^3 (B) 1232 cm^2

CHAPTER-12 STASTISTICS

SECTION- A (MCQS)

Question 1:
The upper limit of the class 90-120 is
(a) 90 **(b)** 105 **(c)** 115 **(d)** 120

Question 2:
The width of each of five continuous classes in a frequency distribution is 5 and the lower-class limit of the lowest class is 10. The upper class limit of the highest class is
(a) 15 **(b)** 25 **(c)** 35 **(d)** 40

Question 3:
If m is the mid-point and l is the upper class limit of a class in a continuous frequency distribution, then lower class limit of the class is
(a) 2m+l **(b)** 2m-l **(c)** m-l **(d)** m-2l

Question 4:
A grouped frequency table with class intervals of equal sizes using 250-270 (270 not included in this interval) as one of the class interval is constructed for the following data
268, 220, 368, 258, 242, 310, 272, 342,
310, 290, 300, 320, 319, 304, 402, 318,
406, 292, 354, 278, 210, 240, 330, 316,
406, 215, 258, 236.
The frequency of the class 310-330 is
(a) 4 **(b)** 5 **(c)** 6 **(d)** 7

Question 5:
To draw a histogram to represent the following frequency distribution.

CLASS INTERVAL	5-10	10-15	15-25	25-45	45-75
FREQUENCY	6	12	10	8	15

The adjusted frequency for the class 25-45 is
(a) 6 **(b)** 5 **(c)** 3 **(d)** 2

Question 6. The ratio of the sum of all observations and the total number of observations is called:

(a). Mean (b) Median (c) Mode (d) Central tendency

Question 7. The collection of information, collected for a purpose is called:

(a). Mean (b) Median (c) Mode (d) Data

Question 8. Statistics is branch of-

(a)Mathematics (b)Physics (c)Chemistry (d)Psychology

Question 9. What is the class mark of the class interval 90-130?

(a). 90 (b) 105 (c)110 (d) 120

Question 10. Find the maximum value if the range is 38 and the minimum value is 38.

(a) 60 (b) 76 (c) 120 (d) 82

SECTION- B

ASSERTION- REASON TYPE QUESTION

For 1-10 questions pick one option which is correct out of given options

(a) Both assertion and reason is true and reason is correct explanation of assertion.
(b) Both assertion and reason are true but reason is not correct explanation of assertion.
(c) Assertion is true but reason is false.
(d) Reason is true but assertion is false.

QUESTION 1:

ASSERTION : Tally marks for 5 is 𝍸

REASON : Tally marks for 15 is 𝍸 𝍸 𝍸. As 15 = 5+5+5

QUESTION 2:

ASSERTION: In bar graph frequency is taken only along y-axis.

REASON: In bar graph frequency can be taken only along any axis.

QUESTION 3 :

ASSERTION: In a histogram the area of each rectangle is proportional to the class size of corresponding interval.

REASON: To draw the histogram of a continuous frequency distribution with unequal class interval the frequencies of classes are adjusted by using the formula

$$\text{Adjusted frequency of a class} = \frac{Minimum\ class\ size}{class\ size} \times \text{frequency of the class}$$

QUESTION 4:

ASSERTION: Frequency polygon can not be drawn for discontinuous data.

REASON: Frequency polygon can be drawn for discontinuous data also by changing it into continuous data.

QUESTION 5 :

ASSERTION : Class mark for 20-30 is 25.

REASON: class mark of an interval is given by $\frac{upper\ limit+lower\ limit}{2}$

QUESTION 6.
Assertion: The difference between the maximum and minimum values of a variable is called its range.
Reason : The number of times a variate (observation) occurs in a given data is called range.

QUESTION 7.
Assertion: According to statistics more female children are born each year than male children in India.
Reason: In India the death rate of a male child is higher than that of the female child.

QUESTION 8.

Assertion: Range = Maximum value – Minimum value

Reason: The range of the first 6 multiples of 6 is 9.

QUESTION 9.
Assertion: the class intervals 10-20, 20-30, 20 is included in interval 20-30
Reason: The lower limit of the class interval is included in the interval.

QUESTION 10
. Assertion: the class size for the grouped frequency distribution of the class intervals 0-20 is 20
Reason: Class size is given by $\frac{upper\ limit+lower\ limit}{2}$

SECTION- C (2 MARKS)

Question 1 . Find the class size of given data. Also find the interval with minimum frequency.

Interval	140-150	150-160	160-170	170-180	180-190	190-200
Frequency	69	79	78	124	142	89

Question 2. Shown are the scores (out of 25) of 9 students a, b, c, d, e, f, g, h, i in a Monday's test:

16, 25, 17, 22, 20, 19, 12, 8 and 23

Draw bar graph of scores of the data.

Question 3. The following table gives the frequencies of the most commonly used books A, B, C, D, E, F, G from a book page.

Books	A	B	C	D	E	F	G
Frequency	75	100	80	70	80	95	75

Express the information above by a bar graph.

Question 4. Darw the Histogram of given data

Age	1-4	4-7	7-10	10-13	13-16
No. of students	6	30	44	16	4

Question 5. The height of 20 students of class V are noted as follows:

123 , 126,127, 156, 145, 126, 126, 126, 130, 145, 158, 134, 126, 123, 126, 130, 130 ,137, 149, 126

(i)Make a frequency distribution table for the above data.

(ii) Which is the most common height and which is the rarest height among these students?

Question 6. Provide three examples of data which you can obtain from your day-to-day life.

Question 7 The blood group of 30 students are recorded as follows:

A	B	O	A	AB	O
A	O	B	A	O	B
A	AB	B	A	AB	B
A	A	O	A	AB	B
A	O	B	A	B	A

Prepare a frequency distribution table for the data.

Question 8. A shop-keeper purchase some items for her shop. The data for which is shown as below

Heads	**Price (in Rs)**
Notebook	50
Pen	10

Heads	Price (in Rs)
Eraser	5
Book	80

Draw a graph for the data above.

Question 9. From the following observations:

0.03, 0.05, 1.04, 0.08, 0.05, 1.03, 0.03, 0.04, 0.07, 0.05, 0.02, 1.00, 0.08

Calculate the Range

Question 10. Consider the marks, out of 100, obtained by 51 students of a class in a test:

Marks	Number of students
0-10	5
10-20	10
20-30	4
30-40	6
40-50	7
50-60	3
60-70	2
70-80	2
80-90	3
90-100	9
Total	51

Draw a frequency polygon corresponding to this frequency distribution table

SECTION- D (3 MARKS)

QUESTION 1: A family with a monthly income of Rs 15,000 had planned the following expenditures per month under various heads:

HEADS	Expenditure (in thousand rupees)
Grocery	4
Rent	3
Education of children	4
Entertainment	1
Miscellaneous	3

Draw a bar graph for the data above.

QUESTION 2 : : In a class of 25 students , heights is measured in centimeters whose data are given in the following table:

HEIGHT (IN CM)	NUMBER OF STUDENTS
110-120	5
120-130	7
130-140	1
140-150	6
150-160	6

Draw a frequency polygon for the data above

QUESTION 3 : Given below are the seats won by different political parties in the polling outcome of a state assembly elections:

PARTY	NUMBER OF SEATS WON
A	12
B	5
C	35
D	27
E	11

(i) Draw a bar graph to represent the polling results.
(ii) Which political party won the minimum number of seats?
(iii) Which political party won the maximum number of seats?

QUESTION 4 : The result of pass percentage of class 9^{th} and 10^{th} examination for four years is given below

YEAR	2020-2021	2021-2022	2022-2023	2023-2024
PASS PERCENTAGE 9^{th}	100	78	82	89
PASS PERCENTAGE 10^{th}	95	87	92	76

Draw a bar graph to represent given information.

QUESTION 5 : The following is the distribution of weights of 35 students (in kg)

WEIGHT (IN KG)	45-50	50-55	55-60	60-65	65-70	70-75
NO. OF STUDENTS	2	7	8	10	3	5

Draw a histogram for the above data.

SECTION- E (5 MARKS)

Question 1: Draw a histogram to represent the following grouped frequency distribution

AGE (IN YEARS)	NUMBER OF TEACHERS
20-24	**10**
25-29	**28**
30-34	**32**
35-39	**48**
40-44	**50**
45-49	**35**
50-54	**12**

QUESTION 2 : The marks obtained (out of 100) by a class of 80 students are given below

MARKS	NUMBER OF STUDENTS
10-20	6
20-30	17
30-50	15
50-70	16
70-100	26

Draw a histogram for the given information.

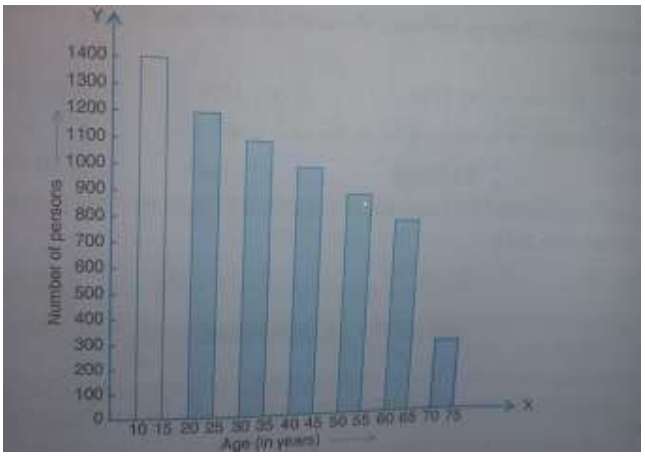
QUESTION 3: Following table gives the distribution of students of sections A and B of a class according to the marks obtained by them.

SECTION A		SECTION B	
0-15	5	0-15	3
15-30	12	15-30	16
30-45	28	30-45	25
45-60	30	45-60	27
60-75	35	60-75	40
75-90	13	75-90	10

Represent the marks of the students of both the sections on the same graph by two frequency polygons.

SECTION – F

QUESTION 1 : A health survey was done by state and family welfare care board of the state of Bangalore. The data is collected by forming age groups i.e. 10-15 , 20-25, 30- 35 , 40-45 , 50-55 , 60-65 , 70-75. The overall data from a town is given below in the form of bar graph. Read the data carefully and answer the question that follows:



(i) How many persons are more in age group 10-15 than in age group 30-35.

(ii) What is the age group of exactly 1200 persons living in the town.

(iii) What is the percentage of the age group persons in 60-65.

OR

What is the ratio of age group persons in 70-75 to that of 20-25.

QUESTION 2: A group of students decided to make a project on Statistics. They are collecting the heights (in cm) of their 51 girls of Class IX-A, B and C of their school. After collecting the data, they arranged the data in the following frequency distribution table form:

Height (in cm)	Number of girls

135 – 140	4
140 – 145	7
145 – 150	18
150 – 155	11
155 – 160	6
160 – 165	5

Based on the information, answer the following questions:

(a)Which is the class interval with highest frequency?

(b) What is the width of the class?

(c) How many students of the height 150 cm and below are there?

OR

How many students of the height more than 145 cm but less than 155 are there?

QUESTION 3. A Mathematics teacher asks students to collect the marks of Mathematics in Half yearly exam. She instructed to all the students to prepare frequency distribution table using the data collected. Ram collected the following marks (out of 50) obtained in Mathematics by 60 students of Class IX
21, 10, 30, 22, 33, 5, 37, 12, 25, 42, 15, 39, 26, 32, 18, 27, 28, 19, 29, 35, 31, 24, 36, 18, 20, 38, 22, 44, 16, 24, 10, 27, 39, 28, 49, 29, 32, 23, 31, 21, 34, 22, 23, 36, 24, 36, 33, 47, 48, 50, 39, 20, 7, 16, 36, 45, 47, 30, 22, 17.

Groups	**Frequency**
0-10	2
10-20	10
20-30	21
30-40	19
40-50	7
50-60	1
Total	**60**

(i) How many students scored more than 20 but less than 30?

(ii) How many students scored less than 20 marks?

(iii) How many students scored more than 60% marks?

OR Draw a frequency polygon for the given information.

SECTION-= A

1. B) 105
2. **(C) 35**
3. B) 2m-1
4. (C) 6
5. (D) 2
6. (A) MEAN
7. (D) DATA
8. (A) MATHEMATICS
9. (C) 110
10. (B) 76

SECTION – B

1. (B)
2. (C)
3. (D)
4. (D)
5. (A)
6. (C)
7. (C)
8. (C)
9. (A)
10. (C)

SECTION – C

1. CLASS SIZE = 10

INTERVAL WITH MINIMUM FREQUENCY = 140-150

5. (i)

HEIGHT	FREQUENCY
123	2
126	7
127	1
130	3
134	1
137	1

145	2
149	1
156	1
158	1

(ii) MOST COMMON = 126

RAREST = 127, 134,,137,149,156,158

7.

BLOOD GROUP	FREQUENCY
A	12
B	8
AB	4
O	6

9. MINIMUM VALUE=0.03

MAXIMUM VALUE= 1.04

RANGE= 1.01

SECTION- D

3) (ii) B
(iii) C

SECTION- F

1. (i) 300
(ii) 20-25
(iii) 11.94 %
OR
1:4

2. (i) 145-150
(ii) 5
(iii) 29
OR
29

3. (i) 21
(ii) 12
(III) 25

KENDRIYA VIDYALAYA SANGATHAN
BENGALURU REGION
SESSION ENDING EXAM (SESSION 2024-25)
SAMPLE QUESTION PAPER 1

CLASS: 9th BLUE PRINT MATHEMATICS

UNITS	CHAPTER NAME	MCQ (1 M)	2 M	3 M	5 M	CASE STUDY 4 M	TOTAL	UNIT WEIGHTAGE
NUMBER SYSTEM	NUMBER SYSTEM	2(2)		1(3)*	1(5)		4(10)	10
ALGEBRA	POLYNOMIALS	2(2)		1(3)	1(5)*	1(4)	5(14)	20
	LINEAR EQN IN 2 VARIABLES	3(3)		1(3)			4(6)	
COORDINATE GEOMETRY	COORDINATE GEOMETRY	2(2)	1(2)				4(6)	4
GEOMETRY	EUCLID'S GEOMETRY		1(2)				1(2)	27
	LINES AND ANGLES	2(2)		1(3)*			3(5)	
	TRIANGLES	1(1)	1(2)*	1(3)			3(6)	
	QUADRILATERALS	2(2)			1(5)*		3(7)	
	CIRCLES	3(3)				1(4)	4(7)	
MENSURATION	HERON'S FORMULA	1(1)		1(3)			2(4)	13
	SURFACE AREA AND VOLUME	1(1)	1(2)* 1(2)			1(4)	4(9)	
STATISTICS	STATISTICS	1(1)			1(5)		2(6)	6
TOTAL		20(20)	5(10)	6(18)	4(20)	3(12)	38(80)	**80**

NOTE:

1. * Indicates Internal Choice.
2. Marks are written inside the bracket.
3. Number of the questions are written outside the bracket.

केन्द्रीय विद्यालय संगठन, बेंगलूरु संभाग

KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION

SAMPLE QUESTION PAPER 1 2024-25

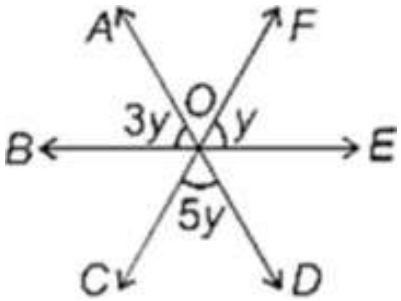
Class: IX Maximum marks: 80

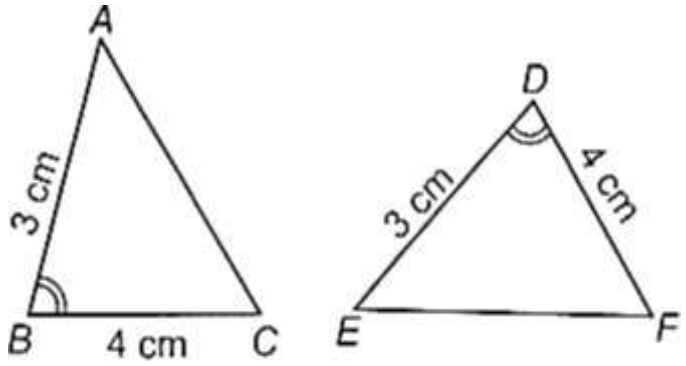
Subject: Mathematics Time : 3 hours

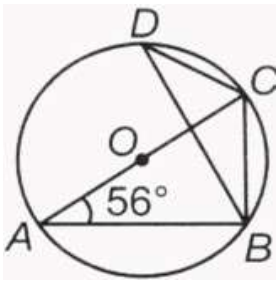
GENERAL INSTRUCTIONS:

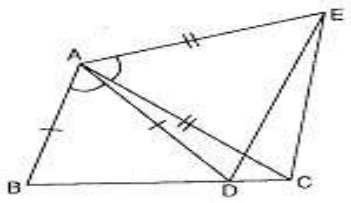
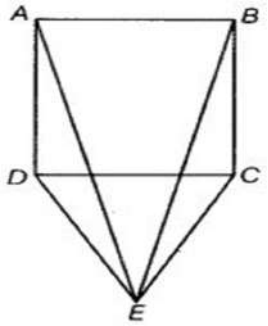
1. The question paper has 5 sections A, B, C, D and E.
2. Section A has 20 multiple choice questions (MCQs) carrying 1 mark each.
3. Section B has 5 short answer – I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 short answer – II (SA-II) type questions carrying 3 marks each.
5. Section D has 4 long answer – II (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 questions of 2 marks, 2 questions in 3 marks and 2 questions in 5 marks has been provided. An internal choice has been provided in the 2 marks questions of section E.
8. Draw neat figure wherever required. Take π = 22/7 wherever required if not stated.

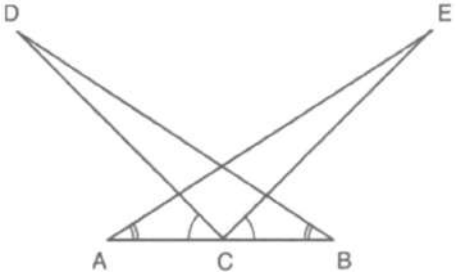
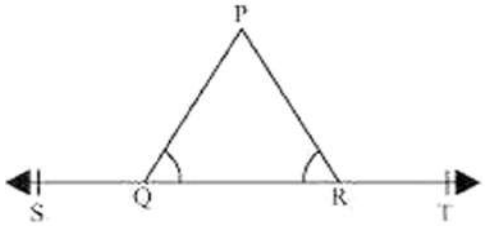
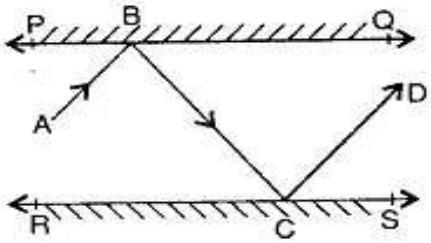
	Section A	
1	After rationalizing the denominator of $\frac{7}{3\sqrt{3}-2\sqrt{2}}$, we get the denominator as___ a) 5 b) 35 c) 19 d) 13	**[1]**

2	The value of $\sqrt[4]{(81)^{-2}}$ is____ a) $\frac{1}{9}$ b) $\frac{1}{81}$ c) 9 d) $\frac{1}{3}$	**[1]**
3	If $a + b + c = 0$, then $a^3 + b^3 + c^3$ is equal to_____ a) 1 b) 3abc c) 2abc d) abc	**[1]**
4	The degree of the zero polynomial is_____ a) 0 b) any natural number c) 1 d) not defined	**[1]**
5	x = 2, y = 5 is a solution of the linear equation_____ a) 5 x + y = 7 b) x + y = 7 c) 5x +2y = 7 d) x + 2y = 7	**[1]**
6	If (2, 0) is a solution of the linear equation 2x + 3y = k, then the value of k is_ a) 2 b) 4 c) 5 d) 6	**[1]**
7	The perpendicular distance of the point P (3, 4) from the y - axis is____ a) 7 b) 4 c) 3 d) 5	**[1]**
8	Abscissa of all points on the x - axis is____ a) - 1 b) 0 c) 1 d) any number	**[1]**
9	In the given figure (not drawn to scale), the value of y is _____.  a) 22° b) 24° c) 10° d) 20°	**[1]**
10	If two complementary angles are in the ratio 7 : 11, then the angles are _____. a) 35°, 55° b) 20°, 60° c) 40°, 50° d) 30°, 50°	**[1]**
11	ABCD is a Parallelogram in which $\angle BAO = 35°$, $\angle DAO = 40°$ and $\angle COD = 105°$. then $\angle ABO$ = _____	**[1]**

	a) 40° b) 30° c) 45° d) 20°	
12	The length of each side of an equilateral triangle having an area of $9\sqrt{3}$ cm^2 is_____ a) 6 cm b) 36 cm c) 4 cm d) 8 cm	**[1]**
13	The volumes of two spheres are in the ratio 125: 64. The ratio of their surface areas is____ a) 25 : 16 b) 16 : 9 c) 16 : 25 d) 9 : 16	**[1]**
14	If the given triangles are congruent, then which of the following options is CORRECT?  a) △ ACB ≅ △ EDF b) △ ABC ≅ △ EDF c) △ ABC ≅ △ ADE d) △ ABC ≅ △ FDE	**[1]**
15	The figure formed by joining the mid - points of the sides of a quadrilateral ABCD, taken in order, is a square only if_____ a) ABCD is a Rhombus b) Diagonals of ABCD are equal and perpendicular c) Diagonals of ABCD are perpendicular d) Diagonals of ABCD are equal	**[1]**
16	If AB = 12 cm, BC = 16 and AB is perpendicular to BC, then the radius of the circle passing through the points A, B and C is_____ a) 10 cm b) 8 cm c) 6 cm d) 12 cm	**[1]**
17	In the given figure, O is the centre of the circle and ∠BAC = 56°. The measure of ∠BDC is _____.	**[1]**

	 a) 50° b) 46° c) 40° d) 56°	
18	The class mark of the class interval 25 - 45 is_____ a) 70 b) 20 c) 35 d) 20	**[1]**
19	**Assertion (A):** The point (1, 1) is a solution of x + y = 2. **Reason (R):** Every point which satisfy the linear equation is a solution of the equation. 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.	**[1]**
20	**Assertion (A):** If P and Q are any two points on a circle, then the line segment PQ is called a chord of the circle. **Reason (R):** Equal chords of a circle subtend equal angles at the centre. 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.	**[1]**
	Section B	
21	State the quadrants of the following points: (i) A (-4, 3) (ii) B (-5, -3) (iii) C (5, 4) (iv) D (-4, 4)	**[2]**

22	In fig., if AC = BD, then prove that AB = CD 	**[2]**
23	The height and the slant height of a cone are 21 cm and 28 cm respectively. Find the volume of the cone. **OR** Find the curved surface area of a right circular cone whose height is 15 cm and base radius is 8 cm. $\left(\text{Use } \pi = \frac{22}{7}\right)$	**[2]**
24	If the volume of a right circular cylinder of height 9 cm is 49π cm^3, find the diameter of its base.	**[2]**
25	In figure, AC = AE, AB = AD and∠ BAD = ∠ EAC. Show that BC = DE.  **OR** CDE is an equilateral triangle formed on a side CD of a square ABCD (Fig.). Show that, △ ADE ≅ △ BCE. 	**[2]**
	Section C	
26	Represent $\sqrt{9.3}$ on the number line. **OR** If $x = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ and $y = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$, then find the value of $x^2 + y^2$.	**[3]**

27	Factorize: $p(x) = 5x^2 + 8x - 4$	**[3]**
28	Find the solution of the linear equation x + 2y = 8 which represents a point on 1. The x - axis 2. The y - axis	**[3]**
29	In figure, AC = BC, ∠DCA = ∠ECB and ∠DBC = ∠EAC. Prove that, triangles DBC and EAC are congruent, and hence DC = EC and BD = AE. 	
30	In the given figure, ∠PQR = ∠PRQ, then prove that ∠PQS = ∠PRT  **OR** In figure, PQ and RS are two mirrors placed parallel to each other. An incident ray AB strikes the mirror PQ at B. The reflected ray moves along the path BC and strikes the mirror RS at C and again reflects back along CD. Prove that AB || CD. 	**[3]**
31	The sides of a triangular farm are in the ratio of 3 : 5 : 7 and its perimeter is 300 m. Find its area.	**[3]**
	Section D	

32 Simplify: $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$. **[5]**

33 Verify that, $x^3 + y^3 + z^3 - 3xyz = \frac{1}{2}(x + y + z)[(x - y)^2 + (y - z)^2 + (z - x)^2]$ **[5]**

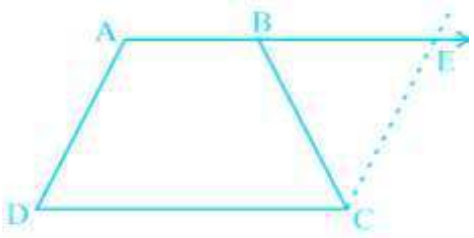
OR

Using factor theorem, factorize the polynomial: $x^3 - 6x^2 + 3x + 10$

34 Draw a histogram with frequency polygon (on same graph sheet) for the following data representing age of the teachers in years and number of teachers: **[5]**

Class	25 – 29	30 – 34	35 – 39	40 – 44	45 – 49	50 – 54
Frequency	5	15	23	20	10	7

35 ABCD is a trapezium in which AB || CD and AD = BC. **[5]**

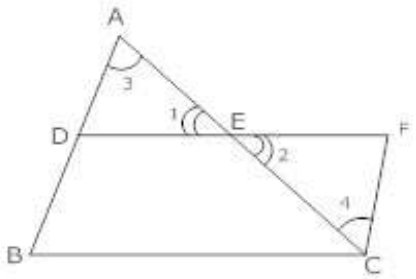


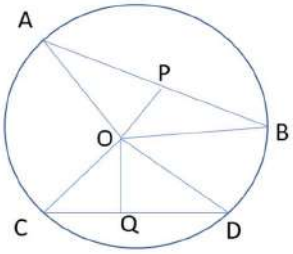
Show that :

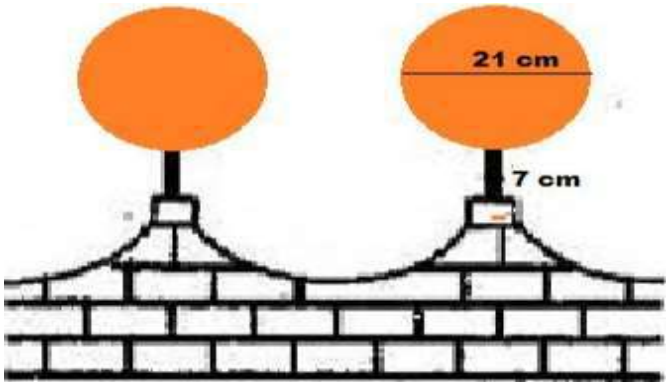
1. ∠ A = ∠ B
2. ∠ C = ∠ D
3. △ ABC ≅ ∠ BAD

OR

Prove that in a triangle, the line segment joining the midpoints of any two sides is parallel to the third side.



	Section E	
36	**Read the text carefully and answer the questions:** In a particular class of x students, $\frac{1}{12}$th times the square of the total number of students planned to visit historical monuments. $\frac{7}{12}$th times the number of students planned to visit old age home while 10 students decided to teach poor children. 1. Write a polynomial in terms of x representing the total number of students in the class? 2. What is the degree of the polynomial obtained? 3. How many students planned to visit the historical monuments if $x = 96$? **OR** How many students are planning to visit old age homes if $x = 96$?	**[1]** **[1]** **[2]**
37	**Read the text carefully and answer the questions:** Rohan draws a circle of radius 10 cm with the help of a compass and scale. He also draws two chords, AB and CD in such a way that the perpendicular distance from the center to AB and CD are 6 cm and 8 cm respectively. Now, he has some doubts that are given below.  1. Show that the perpendicular drawn from the Centre of a circle to a chord bisects the chord. 2. How many circles can be drawn from given three noncollinear points? 3. What is the length of CD? **OR** What is the length of AB?	**[1]** **[1]** **[2]**
38	**Read the text carefully and answer the questions:** The front compound wall of a house is decorated by wooden spheres of diameter 21 cm, placed on small supports as shown in figure. 25 such spheres are used for this purpose and are to be painted orange.	



1. What will be the total surface area of the spheres all around the wall? **[1]**
2. Find the cost of orange paint required if this paint costs 20 paise per cm^2 . **[1]**
3. How much orange paint in liters is required for painting all the spheres if the paint required is 3 ml per cm^2 ? **[2]**

OR

What will be the volume of all spheres all around the wall?

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KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION

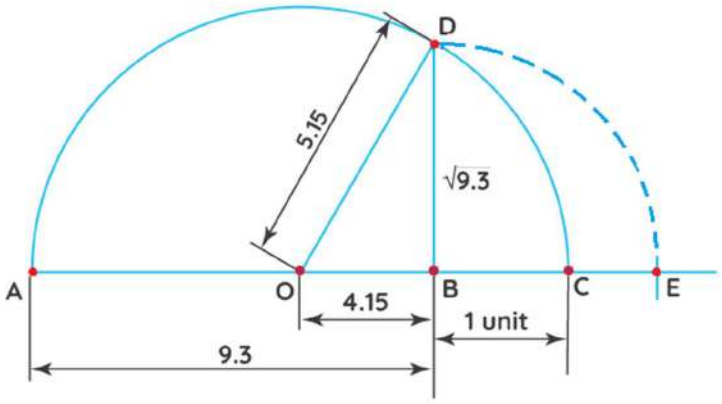
MARKING SCHEME

SAMPLE QUESTION PAPER 1 2024-25

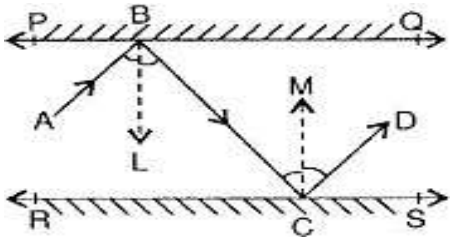
Class: IX Subject : Mathematics

	Section A	
1	c) 19	**[1]**
2	a) $\frac{1}{9}$	**[1]**
3	b) 3abc	**[1]**
4	d) not defined	**[1]**
5	b) x + y = 7	**[1]**
6	b) 4	**[1]**
7	c) 3	**[1]**
8	d) any number	**[1]**
9	d) 20°	**[1]**
10	a) 35°, 55°	**[1]**
11	a) 40°	**[1]**
12	a) 6 cm	**[1]**
13	a) 25: 16	**[1]**
14	b) △ ABC ≅ △ EDF	**[1]**
15	b) Diagonals of ABCD are equal and perpendicular	**[1]**
16	a) 10 cm	**[1]**
17	d) 56°	**[1]**
18	c) 35	**[1]**
19	a) Both A and R are true and R is the correct explanation of A.	**[1]**
20	b) Both A and R are true but R is not the correct explanation of A.	**[1]**
	Section B	
21	(i) A (-4, 3) - II Quadrant (ii) B (-5, -3) - III Quadrant (iii) C (5, 4) - I Quadrant (iv) D (-4, 4) - II Quadrant	$\frac{1}{2} \times 4 = 2$
22	AC = BD . . . [Given] . . . (1) AC = AB + BC . . . [Point B lies between A and C] . . . (2) BD = BC + CD . . . [Point C lies between B and D] . . . (3) Substituting (2) and (3) in (1), we get,	$\frac{1}{2} + \frac{1}{2}$

	AB + BC = BC + CD AB = CD . . . [Subtracting equals from equals]	$\frac{1}{2}+\frac{1}{2}$
23	Given, For Cone, $h = 21$ cm and $l = 28$ cm We know, $l^2 = r^2 + h^2$ $\Rightarrow (28)^2 = r^2 + (21)^2$ $\Rightarrow r^2 = 343$ $\Rightarrow r = 7\sqrt{7}$ cm Now, Volume of Cone $= \frac{1}{3}\pi r^2 h$ $= \frac{1}{3} \times \frac{22}{7} \times 7\sqrt{7} \times 7\sqrt{7} \times 21$ $= 7546$ cm^3 **OR** Given, For Cone, $h = 15$ cm and $r = 8$ cm We know, $l^2 = r^2 + h^2$ $\Rightarrow l^2 = (8)^2 + (15)^2$ $\Rightarrow r^2 = 289$ $\Rightarrow r = 17$ cm Now, CSA of Cone $= \pi rl$ $= \frac{22}{7} \times 8 \times 17$ $= 427.42$ cm^2	**1** **1** **1** **1**
24	Given, For Cylinder, $h = 9$ cm and volume of cylinder $= 49\pi$ cm^3 Now, Volume of Cylinder $= \pi r^2 h$ $\Rightarrow 49\pi = \pi \times r^2 \times 9$ $\Rightarrow r^2 = \frac{49}{9}$ $\Rightarrow r = \frac{7}{3}$ $\Rightarrow d = \frac{14}{3}$ $\Rightarrow d = 4.66$ cm	**1** $\frac{1}{2}$ $\frac{1}{2}$
25	$\angle BAD = \angle EAC$ … [Given] $\Rightarrow \angle BAD + \angle DAC = \angle DAC + \angle EAC$ … [Adding $\angle DAC$ to both sides] $\Rightarrow \angle BAC = \angle DAE$ … (1) In Δ ABC and Δ ADE, AC = AE … [Given] $\angle BAC = \angle DAE$ … [From (1)] AB = AD … [Given] Δ ABC $\cong \Delta$ ADE … [By SAS congruence $\Rightarrow$ BC = DE … [CPCT]	**1** **1**

	OR $\angle ADC = \angle BCD$ … [Angles of a square] …(1) $\angle CDE = \angle DCE$ … [Angles of an equilateral triangle] …(2) Adding (1) and (2) we get, $\angle ADE = \angle BCE$ …(3) In $\triangle ADE$ and $\triangle BCE$, $AD = BC$ …[sides of square] $\angle ADE = \angle BCE$ …[from (3)] $DE = CE$ …[sides of equilateral triangle) $\Rightarrow \triangle ADE \cong \triangle BCE$ …[SAS Criteria]	**1** **1**
	Section C	
26	 For correct construction --- **OR** Given, $x = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}}$ $\Rightarrow x = \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}-\sqrt{2}} \times \frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}} = \frac{(\sqrt{3}+\sqrt{2})^2}{(\sqrt{3})^2-(\sqrt{2})^2} = \frac{3+2+2\sqrt{6}}{3-2} = 5 + 2\sqrt{6}$ $\Rightarrow x^2 = (5 + 2\sqrt{6})^2 = 25 + 24 + 20\sqrt{6} = 49 + 20\sqrt{6}$ …(1) Also, $y = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ $\Rightarrow y = \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}+\sqrt{2}} \times \frac{\sqrt{3}-\sqrt{2}}{\sqrt{3}-\sqrt{2}} = \frac{(\sqrt{3}-\sqrt{2})^2}{(\sqrt{3})^2-(\sqrt{2})^2} = \frac{3+2-2\sqrt{6}}{3-2} = 5 - 2\sqrt{6}$ $\Rightarrow y^2 = (5 - 2\sqrt{6})^2 = 25 + 24 - 20\sqrt{6} = 49 - 20\sqrt{6}$ …(2) Adding (1) and (2), $\Rightarrow x^2 + y^2 = 49 + 20\sqrt{6} + 49 - 20\sqrt{6} = 98$	**3** **1** **1** **1**
27	Given, $p(x) = 5x^2 + 8x - 4$ $\Rightarrow p(x) = 5x^2 + 10x - 2x - 4$ $\Rightarrow p(x) = 5x(x+2) - 2(x+2)$ $\Rightarrow p(x) = (x+2)(5x-2)$	**1** **1** **1**
28	Find the solution of the linear equation x + 2y = 8 which represents a point on 4. The x - axis	

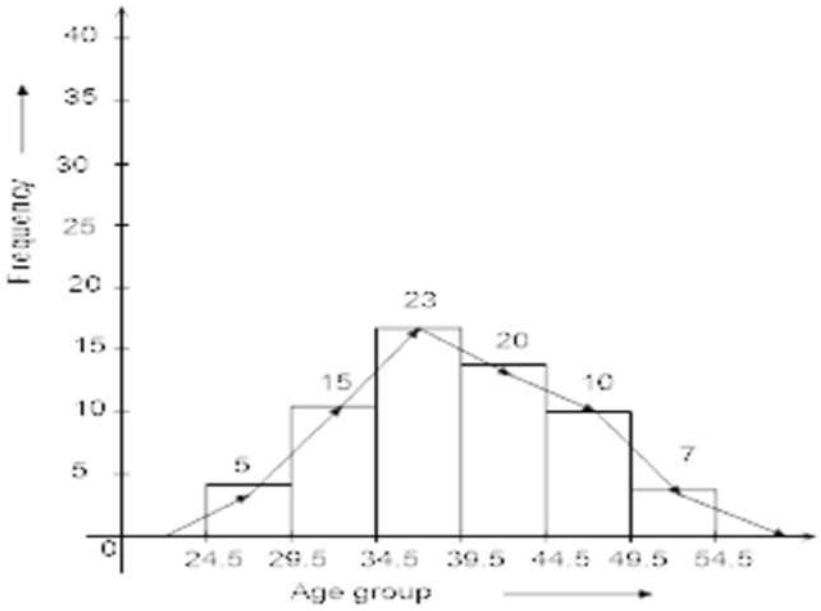
	5. The y – axis Given, $x + 2y = 8$ 1. For the solution representing a point on the x-axis, $y = 0$ ⇒ $x + 2(0) = 8$ ⇒ $x = 8$ ⇒ The point is (8,0) 2. For the solution representing a point on the y-axis, $x = 0$ ⇒ $(0) + 2y = 8$ ⇒ $2y = 8$ ⇒ $y = 4$ ⇒ The point is (0,4)	**$\frac{1}{2}$** **1** **$\frac{1}{2}$** **1**
29	We have, $\angle DCA = \angle ECB$ ⇒ $\angle DCA + \angle ECD = \angle ECB + \angle ECD$ ⇒ $\angle ECA = \angle DCB$ ...(1) Now, In $\triangle DBC$ and $\triangle EAC$, we have $\angle DCB = \angle ECA$ … [From (1)] $BC = AC$ … [Given] $\angle DBC = \angle EAC$ … [Given] ⇒ $\Delta DBC \cong \Delta EAC$ … [ASA criterion] ⇒ $DC = EC$ and $BD = AE$ … [CPCT]	**1** **1** **1** **1**
30	Given, $\angle PQR = \angle PRQ$ … (1) Now, $\angle PQS + \angle PQR = 180^0$ … [Angles in a linear pair] … (2) Also, $\angle PRQ + \angle PRT = 180^0$ … [Angles in a linear pair] … (3) From equation (2) and (3), we can conclude that, $\angle PQS + \angle PQR = \angle PRQ + \angle PRT$ ⇒ $\angle PQS + \angle PRQ = \angle PRQ + \angle PRT$ … [From (1)] ⇒ $\angle PQS = \angle PRT$	**1** **1** **$\frac{1}{2}$** **$\frac{1}{2}$**

	OR Draw ray BL ⊥ PQ and ray CM ⊥ RS  BL ⊥ PQ and CM ⊥ RS and PQ ‖ RS ⇒ BL ‖ CM ⇒ ∠LBC = ∠MCB . . . [Alternate Interior Angles] … (1) We know that, Angle of incident = Angle of reflection ⇒ ∠ABL = ∠LBC … (2) & ∠MCB = ∠MCD … (3) ∠ABL = ∠MCD … [From (1), (2) and (3)] Adding (1) and (3) ∠LBC + ∠ABL = ∠MCB + ∠MCD ⇒∠ABC = ∠BCD ⇒ AB ‖ CD … [Converse of Alternate Angles property]	$\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
31	Let, x be the common factor among the sides. Thus, the sides in metres are 3x, 5x and 7x. ⇒ 3x + 5x + 7x = 300 ⇒ 15x = 300 ⇒ x = 20. So, the sides of the triangles are 3 × 20 m, 5 × 20 m and 7 × 20 m i.e., 60 m, 100 m and 140 m. ⇒ $s = \frac{60+100+140}{2} = 150m$ Now, Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ ⇒ Area of triangle = $\sqrt{150(150-60)(150-100)(150-140)}$ ⇒ Area of triangle = $\sqrt{150 \times 90 \times 50 \times 10}$	 1 $\frac{1}{2}$ $\frac{1}{2}$

	$\Rightarrow$ Area of triangle = $1500\sqrt{3}$ m^2	$\frac{1}{2}$ $\frac{1}{2}$
	Section D	
32	Given, $\frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}}$ $= \frac{7\sqrt{3}}{\sqrt{10}+\sqrt{3}} \times \frac{\sqrt{10}-\sqrt{3}}{\sqrt{10}-\sqrt{3}} - \frac{2\sqrt{5}}{\sqrt{6}+\sqrt{5}} \times \frac{\sqrt{6}-\sqrt{5}}{\sqrt{6}-\sqrt{5}} - \frac{3\sqrt{2}}{\sqrt{15}+3\sqrt{2}} \times \frac{\sqrt{15}-3\sqrt{2}}{\sqrt{15}-3\sqrt{2}}$ $= \frac{7\sqrt{30}-21}{(\sqrt{10})^2-(\sqrt{3})^2} - \frac{2\sqrt{30}-10}{(\sqrt{6})^2-(\sqrt{5})^2} - \frac{3\sqrt{30}-18}{(\sqrt{15})^2-(3\sqrt{2})^2}$ $= \frac{7\sqrt{30}-21}{10-3} - \frac{2\sqrt{30}-10}{6-5} - \frac{3\sqrt{30}-18}{15-18}$ $= \frac{7(\sqrt{30}-3)}{7} - \frac{2\sqrt{30}-10}{1} - \frac{3(\sqrt{30}-6)}{-3}$ $= (\sqrt{30}-3) - (2\sqrt{30}-10) + (\sqrt{30}-6)$ $= \sqrt{30} - 3 - 2\sqrt{30} + 10 + \sqrt{30} - 6$ $= 1$	**1** **1** **1** **1** **1**
33	**RHS** $= \frac{1}{2}(x+y+z)[(x-y)^2+(y-z)^2+(z-x)^2]$ $= \frac{1}{2}(x+y+z)[x^2-2xy+y^2+y^2-2yz+z^2+z^2-2xz+x^2]$ $= \frac{1}{2}(x+y+z)[2x^2+2y^2+2z^2-2xy-2yz-2xz]$ $= \frac{1}{2}(x+y+z) \times 2 \times [x^2+y^2+z^2-xy-yz-xz]$ $= (x+y+z) \times [x^2+y^2+z^2-xy-yz-xz]$ $= x^3+y^3+z^3-3xyz$ $=$ **LHS** Hence proved **OR** Let, $f(x) = x^3 - 6x^2 + 3x + 10$ The factors of 10 are $\pm 1, \pm 2, \pm 5, \pm 10$. Substitute the value $x = -1$ in $f(x)$. $\Rightarrow f(-1) = (-1)^3 - 6(-1)^2 + 3(-1) + 10$ $\Rightarrow f(-1) = -1 - 6 - 3 + 10$ $\Rightarrow f(-1) = 0$ $\Rightarrow (x+1)$ is a factor of $f(x)$. … (1) Substitute the value $x = +2$ in $f(x)$.	**1** **1** **1** **1** **1** **1** **1**

	$\Rightarrow f(2) = (2)^3 - 6(2)^2 + 3(2) + 10$ $\Rightarrow f(2) = 8 - 24 + 6 + 10$ $\Rightarrow f(2) = 0$ $\Rightarrow (x - 2)$ is a factor of $f(x)$. … (2) Substitute the value $x = +5$ in $f(x)$. $\Rightarrow f(5) = (5)^3 - 6(5)^2 + 3(5) + 10$ $\Rightarrow f(2) = 125 - 150 + 15 + 10$ $\Rightarrow f(2) = 0$ $\Rightarrow (x - 5)$ is a factor of $f(x)$. … (3) Since, $f(x)$ is a polynomial having a degree 3, it cannot have more than three linear factors. $\Rightarrow x^3 - 6x^2 + 3x + 10 = (x + 1)(x - 2)(x - 5)$ … from (1), (2) and (3) This is the required factorization of $f(x)$.	**1** **1** **1**
34		**1**

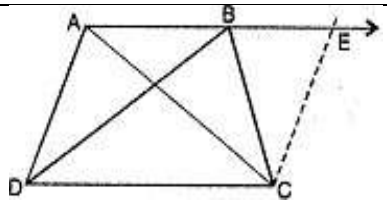
Age in years	frequency
24.5 – 29.5	5
29.5 – 34.5	15
34.5 – 39.5	23
39.5 – 44.5	20
44.5 – 49.5	10
49.5 – 54.5	7



Histogram ---
Frequency polygon ---

2
2

35



Construction: Extend AB and draw a line through C parallel to DA intersecting AB produced at E.

1. AB || CD . . . [Given]

⇒ AD || EC . . . [By construction]

We know that, A quadrilateral is a parallelogram if a pair of opposite sides are parallel and equal.

⇒ AECD is a parallelogram.

⇒ AD = EC … [Opposite sides of a parallelogram]

⇒ EC = BC … [∵ AD = BC]

⇒ ∠CBE = ∠CEB … [Angles opposite to equal sides] … (1)

Now, ∠B + ∠CBE = 180^0 … [Angles in a linear pair] …(2)

Also, ∠A + ∠CEB = 180^0 ⋯ [∵ AD || EC] …

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{2}$

	(3) From (2) and (3), $\angle B + \angle CBE = \angle A + \angle CEB$ But, $\angle CBE = \angle CEB$ … [From (1)] $\Rightarrow \angle A = \angle B$ 2. As, AB $\parallel$ CD $\Rightarrow \angle A + \angle D = 180^o$ and $\angle B + \angle C = 180^o$ $\Rightarrow \angle A + \angle D = \angle B + \angle C$ But $\angle A = \angle B$ … [As proved in (i)] $\Rightarrow \angle C = \angle D$ 3. In $\triangle ABC$ and $\triangle BAD$, AB = BA . . . [Common] $\angle ABC = \angle BAD$ . . .[From (i)] BC = AD . . .[Given] $\Rightarrow \triangle ABC \cong \triangle BAD$ . . .[SAS rule]	**$\frac{1}{2}$** **$\frac{1}{2}$** **$\frac{1}{2}$** **1** **1**
	Section E	
36	(1) Given, the total number of students = x $\Rightarrow$ the students planning to visit historical monuments $= \frac{1}{12}x^2$ and the number of students planned to visit old age home $= \frac{7}{12}x$ Students willing to teach poor students = 10 $\Rightarrow$ Total number of students as a polynomial p(x) $= \frac{1}{12}x^2 + \frac{7}{12}x + 10$ (2) The degree of the polynomial obtained is 2. (3) The number of students planned to visit the historical monuments if x = 96 $= \frac{1}{12}x^2 = \frac{1}{12} \times 96 \times 96 = 768$ OR The number of students are planning to visit old age homes if x = 96 $= \frac{7}{12}x = \frac{7}{12} \times 96 = 56$	**1** **1** **2** **2**

37	(1) In ΔAOP and ΔBOP, $\angle APO = \angle BPO$ … (Given) $OP = OP$ … (Common) $AO = OB$ … (radius of circle) $\Rightarrow \Delta AOP \cong \Delta BOP$ … (RHS congruence criterion) $\Rightarrow AP = BP$ … (CPCT) $\Rightarrow$ The perpendicular drawn from the Centre of a circle to a chord bisects the chord. (2) There is one and only one circle passing through three given non-collinear points. (3) In right ΔCOQ $CO^2 = OQ^2 + CQ^2$ $\Rightarrow (10)^2 = (8)^2 + CQ^2$ $\Rightarrow CQ^2 = 100 - 64 = 36 \quad \Rightarrow CQ = 6$ cm As, $CD = 2CQ$ $\Rightarrow CD = 12$ cm **OR** $AO^2 = OP^2 + AP^2$ $\Rightarrow 10^2 = 6^2 + AP^2$ $\Rightarrow AP^2 = 100 - 36 = 64$ $\Rightarrow AP = 8$ cm As, $AB = 2AP$ $\Rightarrow AB = 16$ cm	**1** **1** **2** **2**
38	1. Given, For a sphere, $d = 21\text{cm} \Rightarrow r = \frac{21}{2}$ cm We know, TSA of a sphere $= 4\pi r^2$ TSA of all 25 spheres around the wall $= 25 \times 4\pi r^2$ $= 25 \times 4 \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2}$ $= 34650\ \text{cm}^2$ 2. The cost of orange paint required at 20 paise per cm^2 $= 34650 \times 0.2 = \text{Rs. } 6930$ 3. The orange paint in liters required for painting all spheres at 3 ml/cm^2 $= 3 \times$ TSA of 25 spheres around the wall $= 3 \times 34650$ $= 103950$ ml $= 103.95$ litres **OR**	**1** **1** **1** **1**

	The volume of all 25 spheres all around the wall $= 25 \times \frac{4}{3}\pi r^3$ $= 25 \times \frac{4}{3} \times \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times \frac{21}{2}$ $= 25 \times 11 \times 21 \times 21$ $= 121275\ \text{cm}^3$	**1** **1**

केन्द्रीय विद्यालय संगठन, बेंगलूरु संभाग

KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION

SAMPLE QUESTION PAPER 2 2024-25

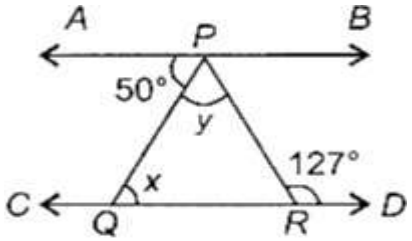
Class: IX | Maximum marks: 80

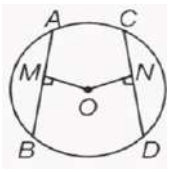
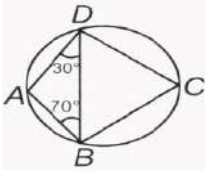
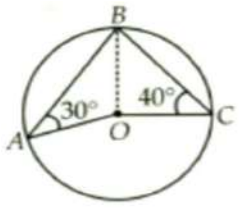
Subject: Mathematics | Time : 3 hours

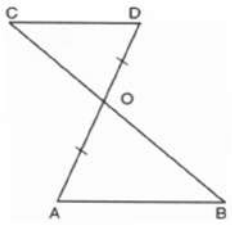
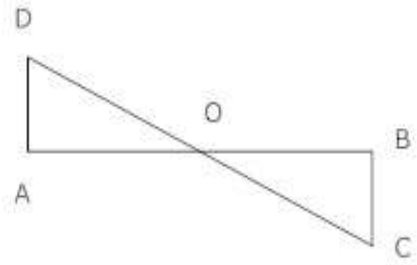
GENERAL INSTRUCTIONS:

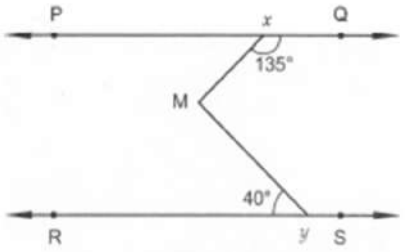
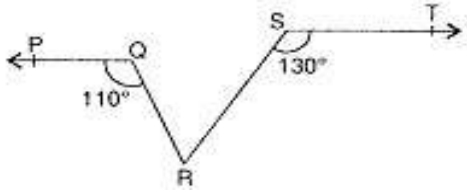
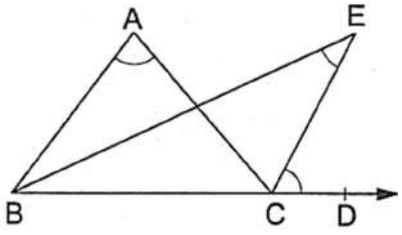
1. The question paper has 5 sections A, B, C, D and E.
2. Section A has 20 multiple choice questions (MCQs) carrying 1 mark each.
3. Section B has 5 short answer – I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 short answer – II (SA-II) type questions carrying 3 marks each.
5. Section D has 4 long answer – II (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 questions of 2 marks, 2 questions in 3 marks and 2 questions in 5 marks has been provided. An internal choice has been provided in the 2 marks questions of section E.
8. Draw neat figure wherever required. Take π = 22/7 wherever required if not stated.

	Section A	
1	The number obtained on rationalizing the denominator of $\frac{1}{\sqrt{7}-2}$ is_____ a) $\frac{\sqrt{7}+2}{45}$ b) $\frac{\sqrt{7}-2}{3}$ c) $\frac{\sqrt{7}+2}{5}$ d) $\frac{\sqrt{7}+2}{3}$	**[1]**
2	Between two rational numbers _____ a) there are only rational numbers and no irrational number b) there are infinitely many rational numbers c) there is exactly one rational number d) there is no rational number	**[1]**

3	The value of the polynomial $5x - 4x^2 + 3$, when $x = -1$ is _____ a) -6 b) 6 c) 1 d) -1	[1]
4	The factorization of $4x^2 + 8x + 3$ is_____ a) (2x – 1) (2x – 3) b) (2x + 2) (2x + 5) c) (x + 1) (x + 3) d) (2x + 1) (2x + 3)	[1]
5	The linear equation 3x – y = x – 1 has_____ a) A unique solution b) Two solutions c) No solution d) Infinitely many solutions	[1]
6	The graph of the linear equation y = x passes through the point_____ a) $\left(\frac{3}{2}, \frac{-3}{2}\right)$ b) $\left(0, \frac{3}{2}\right)$ c) $\left(\frac{-1}{2}, \frac{1}{2}\right)$ d) (1 , 1)	[1]
7	Point (–3, 5) lies in the_____ a) second quadrant b) fourth quadrant c) third quadrant d) first quadrant	[1]
8	If the y co-ordinate of a point is zero, then this point always lies_____ a) in quadrant I b) on y - axis c) on x - axis d) in quadrant II	[1]
9	The angles of a triangle are in the ratio 5: 3: 7, the triangle is_____ a) An isosceles triangle. b) An obtuse angled triangle c) A right triangle d) An acute angled triangle	[1]
10	In the given figure (not drawn to scale), if AB || CD, then x and y respectively are ____.  a) 40°, 30° b) 30°, 45° c) 90°, 30° d) 50°, 77°	[1]
11	It is given that $\triangle ABC \cong \triangle FDE$ and AB = 5 cm, $\angle B = 40°$ and $\angle A = 80°$. Then which of the following is true? a) DE = 5 cm, $\angle E = 60°$ b) DF = 5 cm, $\angle E = 60°$ c) DF = 5 cm, $\angle F = 60°$ d) DE = 5 cm, $\angle D = 40°$	[1]
12	ABCD is a Rhombus such that $\angle ACB = 40°$, then $\angle ADB$ is_____ a) $100°$ b) $40°$ c) $60°$ d) $50°$	[1]
13	Diagonals of a Parallelogram ABCD intersect at O. If $\angle BOC = 90°$, $\angle BDC = 50°$ then $\angle OAB$ is_____ a) $10°$ b) $40°$ c) $90°$ d) $50°$	[1]

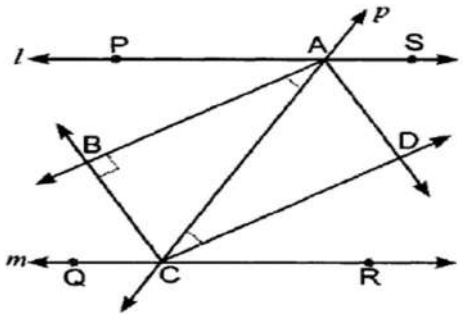
14	The sides of a triangle are 56 cm, 60 cm and 52 cm long. Then the area of the triangle is_____ a) 1311cm^2 b) 1344cm^2 c) 1322cm^2 d) 1392cm^2	**[1]**
15	In the given figure, AB = 8 cm, OM = ON = 4 cm. Then CD is _____.  a) 3.5 cm b) 4.5 cm c) 8 cm d) 3 cm	**[1]**
16	In the given figure, ∠ ABD = 70°, ∠ ADB = 30°. Then, ∠ BCD is _____.  a) 100° b) 90° c) 120° d) 80°	**[1]**
17	If the TSA of a solid hemisphere is 12π sq. cm, then its CSA is_____ a) 16π sq. cm b) 12π sq. cm c) 24π sq. cm d) 8π sq. cm	**[1]**
18	To draw a histogram to represent the following frequency distribution, the adjusted frequency for the class 25 - 45 is_____ Class: 5 – 10 | 10 – 15 | 15 – 25 | 25 – 45 | 45 – 75 Frequency: 6 | 12 | 10 | 8 | 15 a) 6 b) 5 c) 2 d) 3	**[1]**
19	**Assertion (A):** The point (2, −3) lies on the on the line x + y = 5. **Reason (R):** A point which satisfies the linear equation lies on the line representing it. 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.	**[1]**
20	**Assertion (A):** The measure of ∠ AOC = 60 ° **Reason (R):** Angle subtended by an arc of a circle at the centre of the circle is double the angle subtended by arc on the circumference. 	**[1]**

	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	Name the quadrant in which the following points lie: (i) A (2, 9) (ii) B (–3, 5) (iii) C (–4, –7) (iv) D (3, –2)	**[2]**
22	Write any two of the Euclid's Axioms.	**[2]**
23	In Figure, line segment AB is parallel to another line segment CD. O is the mid-point of AD. Show that: 6. △ AOB ≅ △ DOC 7. O is also the mid - point of BC.  **OR** If DA and CB are equal perpendiculars to a line segment AB. Show that CD bisects AB.  	**[2]**
24	Find the capacity in litres of a conical vessel with height 12 cm, slant height 13 cm. **OR** The radii of two cones are in the ratio 2:1 and their volumes are equal. What is the ratio of their heights?	**[2]**
25	A conical tent is 10 m high and the radius of its base is 24 m. Find 1. Slant height of the tent. 2. Cost of the canvas required to make the tent, if the cost of 1 m^2 canvas is ₹ 70.	**[2]**
	Section C	

26	Locate $\sqrt{10}$ on the number line. **OR** Express $0.\overline{125}$ in the $\frac{p}{q}$ form, where p and q are integers and $q \neq 0$.	**[3]**
27	Factorize: $3x^2 - x - 4$	**[3]**
28	Find 3 solutions for the linear equation 2x – 3y + 7 = 0.	**[3]**
29	In figure, if PQ || RS,∠ MXQ = 135° and ∠ MYR = 40°, find ∠ XMY.  **OR** In figure, if PQ || ST, ∠ PQR = 110 º and ∠ RST = 130 º ,find ∠ QRS. 	**[3]**
30	In the given figure, the side BC of △ ABC has been produced to a point D. If the bisectors of ∠ ABC and ∠ ACD meet at point E then prove that ∠ BEC $= \frac{1}{2}$ ∠ BAC . 	**[3]**

31	The triangular side walls of a flyover have been used for advertisements. The sides of the walls are 122 m, 22 m and 120 m (see figure). The advertisements yield earnings of ₹ 5000 per m^2 per year. A company hired one of its walls for 3 months. How much rent did it pay?  	**[3]**
	Section D	
32	Find the values of a and b if, $\frac{7+3\sqrt{5}}{3+\sqrt{5}} - \frac{7-3\sqrt{5}}{3-\sqrt{5}} = a + b\sqrt{5}$.	**[5]**
33	If a + b + c = 5 and ab + bc + ca = 10, then prove that, $a^3 + b^3 + c^3 - 3abc = -25$ **OR** Using factor theorem, factorize the polynomial: $x^3 + 2x^2 - x - 2$	**[5]**

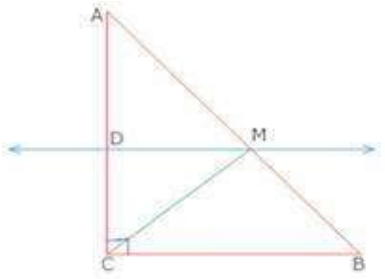
34 Two parallel lines l and m are intersected by a transversal p. Show that the quadrilateral formed by the bisectors of interior angles is a rectangle.



OR

ABC is a triangle right angled at C. A line through the mid-point M of hypotenuse AB and parallel to BC intersects AC at D. show that

8. D is mid - point of AC
9. MD ⊥ AC
10. CM = MA = $\frac{1}{2}$ AB



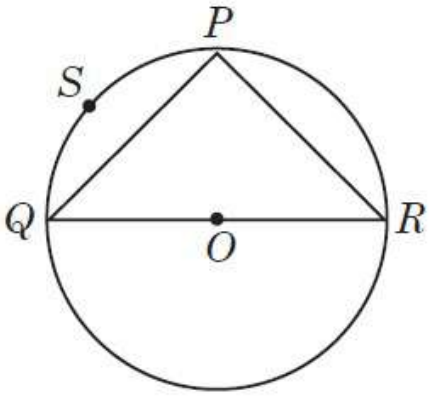
[5]

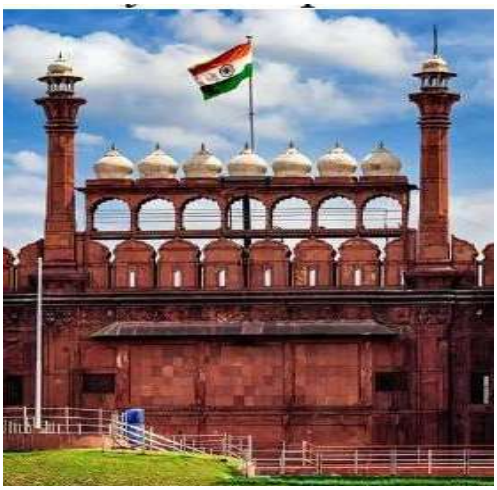
35 The following table gives the distribution of students of two sections according to the marks obtained by them:

Section A		Section B	
Marks	Frequency	Marks	Frequency
0 – 10	3	0 – 10	5
10 – 20	9	10 – 20	19
20 – 30	17	20 – 30	15
30 – 40	12	30 – 40	10
40 – 50	9	40 – 50	1

Represent the marks of the students of both the sections on the same graph by frequency polygons.

Section E

36	**Read the text carefully and answer the questions:** Beti Bachao, Beti Padhao is a personal campaign of the Government of India that aims to generate awareness and improve the efficiency of welfare services intended for girls.  In a school, a group of (x+ y) teachers, $(x^2 + y^2)$ girls and $(x^3 + y^3)$ boys organised a campaign on Beti Bachao, Beti Padhao. 11. How many teachers are there in the group if there are 63 girls (given xy= 9)? 12. What is the value of $(x^2 - y^2)$ if the number of teaches are 10 ? [given $(x - y) = 23$] 13. How many girls are there in the group if there are 10 teachers and 370 boys? **OR** How many boys are there in the group if there are 10 teachers and 58 girls?	**[1]** **[1]** **[2]**
37	**Read the text carefully and answer the questions:** Ankit visited in a mall with his father. He sees that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m and between shop P and R is 6 m.   	

	(i) **Identify the type of quadrilateral formed by joining P, S, Q and R in a sequence.** (ii) **Find measure of ∠QPR.** (iii) **Find the area of ΔPQR.** **OR** **Find the radius of the circle.**	**[1]** **[1]** **[2]**
38	**Read the text carefully and answer the questions:** Mathematics teacher of a school took her 9th standard students to show Red fort. There are 2 pillars which are cylindrical in shape having radius of the base as 7 m and height 10 m. There are also 2 domes at the corners which are hemispherical and 7 smaller domes at the centre. All these domes are identical. Flag hoisting ceremony on Independence Day takes place near these domes.  14. What is the volume of each dome? 15. What is the volume of both the pillars? 16. If the outer side of each of all the domes is to be white-washed and the cost of white-washing is ₹ 50 per m^2, what will be the cost of white-washing all these domes? **OR** Find the curved surface area of each of the pillars.	**[1]** **[1]** **[2]**

केन्द्रीय विद्यालय संगठन, बेंगलूरु संभाग

KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION

MARKING SCHEME

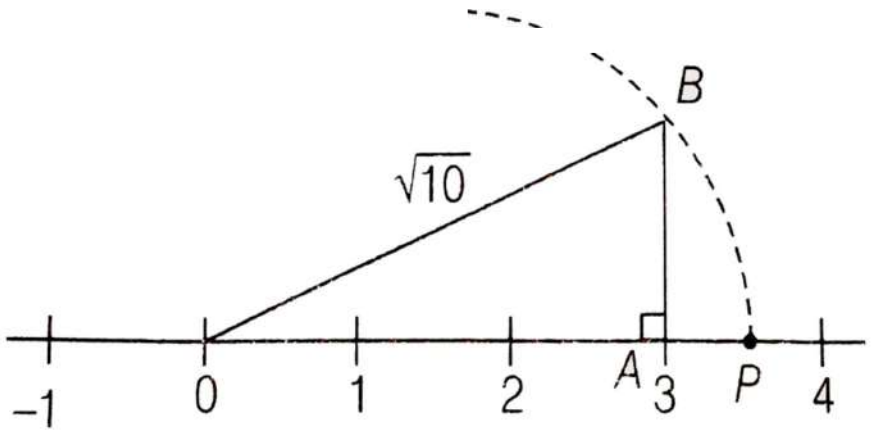
SAMPLE QUESTION PAPER 2 2024-25

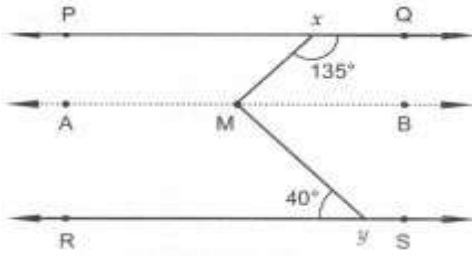
Class: IX Subject : Mathematics

	Section A	
1	d) $\frac{\sqrt{7}+2}{3}$	[1]
2	b) there are infinitely many rational numbers	[1]
3	a) -6	[1]
4	d) (2x + 1) (2x + 3)	[1]
5	d) Infinitely many solutions	[1]
6	d) (1 , 1)	[1]
7	a) second quadrant	[1]
8	c) on x - axis	[1]
9	d) An acute angled triangle	[1]
10	d) 50°, 77°	[1]
11	b) DF = 5 cm, ∠ E = 60°	[1]

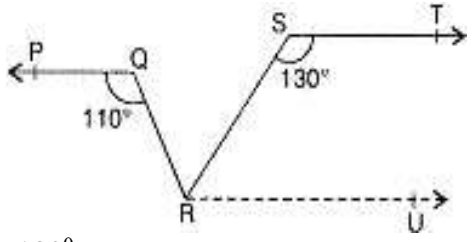
12	d) 50°	[1]
13	b) 40°	[1]
14	b) 1344cm^2	[1]
15	c) 8 cm	[1]
16	a) 100°	[1]
17	d) 8π sq. cm	[1]
18	c) 2	[1]
19	d) A is false but R is true.	[1]
20	d) A is false but R is true.	[1]
	Section B	
21	(i) I Quadrant (ii) II Quadrant (iii) III Quadrant (iv) IV Quadrant	$\frac{1}{2} \times =$
22	Postulate 1 : A straight line may be drawn from any one point to any other point. Postulate 2 : A terminated line can be produced indefinitely. Postulate 3 : A circle can be drawn with any centre and any radius. Postulate 4 : All right angles are equal to one another. Postulate 5 : If a straight line falling on two straight lines makes the interior angles on the same side of it taken together less than two right angles, then the two straight lines, if produced indefinitely, meet on that side on which the sum of angles is less than two right angles. (Any 2 of the above) ----	

		1 + 1
23	Given, AB || CD and BC is the transversal In △ AOB and △DOC, ∠ ABO = ∠ DCO … (Alternate interior angles) ∠ AOB = ∠ DOC … (Vertically opposite angles) OA = OD … (Given) ⇒△AOB ≅△DOC … (AAS rule) ⇒ OB = OC … (CPCT) ⇒ O is the mid-point of BC OR In △AOD and △BOC, AD = BC … (Given) ∠A = ∠B … (Each 90°) and ∠AOD = ∠BOC … (vertically opposite angles) ⇒ △AOD ≅△BOC … (AAS rule) ⇒ **OA = OB** **… (CPCT)** Hence CD bisects AB.	**1** **1** **1** **1**
24	Given, For Cone, $h = 12$ cm and $l = 13$ cm We know, $l^2 = r^2 + h^2$ ⇒ $(13)^2 = r^2 + (12)^2$ ⇒ $r^2 = 25$ ⇒ $r = 5$ cm Now, Volume of Cone $= \frac{1}{3}\pi r^2 h$ $= \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12$ $= 314 \text{ cm}^3$ $= 0.314$ litres **OR** Given, $\frac{r_1}{r_2} = \frac{2}{1}$ ⇒ $r_1 = 2r_2$ … (1)	**1** **1** **1** **$\frac{1}{2}$**

	Also, Volume of Cone 1 = Volume of Cone 2 $\Rightarrow \quad \pi {r_1}^2 h_1 = \pi {r_2}^2 h_2$ $\Rightarrow \quad (2r_2)^2 h_1 = {r_2}^2 h_2$ … from (2) $\Rightarrow \quad 4{r_2}^2 h_1 = {r_2}^2 h_2$ $\Rightarrow \quad h_1 : h_2 = 1 : 4$	$\frac{1}{2}$ 1
25	Given, For Cone, $h = 10$ cm and $r = 24$ cm We know, $l^2 = r^2 + h^2$ $\Rightarrow \quad l^2 = (24)^2 + (10)^2$ $\Rightarrow \quad l^2 = 676$ $\Rightarrow \quad l = 26$ cm Now, Curved surface area of the tent $= \pi rl = \frac{22}{7} \times 24 \times 26$ $\Rightarrow$ Cost of the canvas required to make the tent at the rate of ₹ 70 / m^2 $= \frac{22}{7} \times 24 \times 26 \times 70$ =₹ 137280	1 1
	Section C	
26	 For correct construction ---	3

26	**OR** Let , x = $0.1\overline{25} = 0.12525$ ... --- (1) Multiply both the sides by 10, we get, ⇒10x = 1.2525 ... --- (2) Multiply both the sides by 100, we get, ⇒1000x = 125.2525 ... --- (3) Subtracting equation (2) from equation (3), we get, 990x = 124.0000 ⇒ x = $\frac{124}{990} = \frac{62}{495}$	**1** **1** **1**
27	Given, $p(x) = 3x^2 - x - 4$ ⇒ $p(x) = 3x^2 + 3x - 4x - 4$ ⇒ $p(x) = 3x(x+1) - 4(x+1)$ ⇒ $p(x) = (x+1)(3x-4)$	**1** **1** **1**
28	Given, $2x - 3y + 7 = 0$ (table) Or else any three correct solutions ---	**1 × 3 = 3**
29	 Through point M draw a line AB parallel to the line PQ. ⇒ **AB || PQ || RS** ∠QXM and ∠XMB are interior angles on the same side of transversal XM. ⇒ ∠QXM + ∠XMB = 180^0 … (∵ AB || PQ) ⇒ 135^o + ∠XMB = 180^0 ⇒ ∠XMB = 180^0 - 135^0 = 45^0 Now, AB || RS and ∠BMY and ∠MYR are alternate angles.	**1** **1**

x	-5	-2	1
y	-1	1	3
(x, y)	$(-5, -1)$	$(-2, 1)$	$(1, 3)$

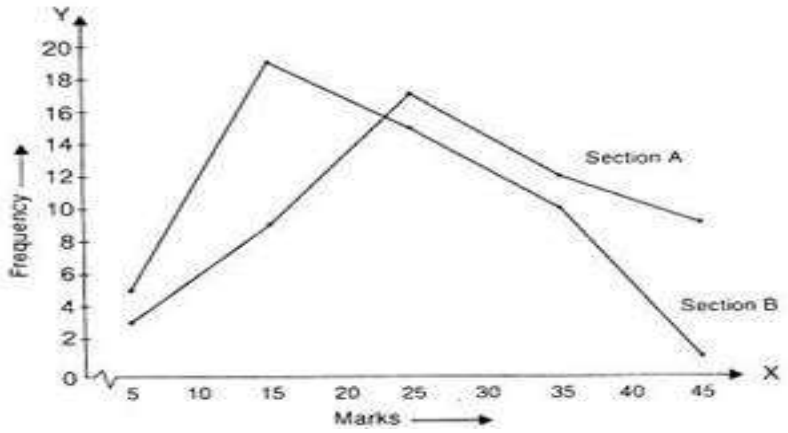
	$\Rightarrow \angle BMY = \angle MYR$ $\Rightarrow \angle BMY = 40^0$ Hence, $\angle XMY = \angle XMB + \angle BMY = 45^0 + 40^0 = 85^0$ **OR** Draw a line RU parallel to ST through point R.  $\angle RST + \angle SRU = 180^0$ $\Rightarrow 130^0 + \angle SRU = 180^0$ $\Rightarrow \angle SRU = 180^0 - 130^0 = 50^0$ … (1) Now, $\angle QRU = \angle PQR = 110^0$ ⋯ [Alternate interior angles] $\Rightarrow \angle QRS + \angle SRU = 110^0$ $\Rightarrow \angle QRS + 50^0 = 110^0$ ⋯ [Using (1)] $\Rightarrow \angle QRS = 110^0 - 50^0 = 60^0$	**1** **1** **1** **1**
30	Side BC of $\triangle ABC$ has been produced to D. $\Rightarrow \angle ACD = \angle BAC + \angle ABC$ $\Rightarrow \frac{1}{2}\angle ACD = \frac{1}{2}\angle BAC + \frac{1}{2}\angle ABC$ $\Rightarrow \angle ECD = \frac{1}{2}\angle BAC + \frac{1}{2}\angle ABC$ … (1) Again, side BC of AEBC has been produced to D $\Rightarrow \angle ECD = \angle CBE + \angle BEC$ $\Rightarrow \angle ECD = \frac{1}{2}\angle ABC + \angle BEC$ … (2) From (i) and (ii), we get, $\frac{1}{2}\angle ABC + \angle BEC = \frac{1}{2}\angle BAC + \frac{1}{2}\angle ABC$ $\Rightarrow \angle BEC = \frac{1}{2}\angle BAC$	**1** **1** **1**

31	Let, $a = 122$ m, $b = 22$ m and $c = 120$ m $\Rightarrow \quad s = \frac{a+b+c}{2} = \frac{122+22+120}{2} = 132$ m Now, Area of triangle $= \sqrt{s(s-a)(s-b)(s-c)}$ $\Rightarrow$ Area of triangle $= \sqrt{132 \times (132-122) \times (132-22) \times (132-120)}$ $\Rightarrow$ Area of triangle $= \sqrt{132 \times 10 \times 110 \times 12}$ $\Rightarrow$ Area of triangle $= \sqrt{11 \times 12 \times 10 \times 10 \times 11 \times 12}$ $\Rightarrow$ Area of triangle $= 1320$ m^2 $\because$ Rent for advertisement on wall for 1 year = Rs. 5000 per m^2 $\Rightarrow$Rent for advertisement on wall for 3 months for 1320 m^2 $= \frac{5000}{4} \times 1320$= Rs.1650000	**$\frac{1}{2}$** **$\frac{1}{2}$** **1** **1**
	Section D	
32	Given, $\frac{7+3\sqrt{5}}{3+\sqrt{5}} - \frac{7-3\sqrt{5}}{3-\sqrt{5}} = a + b\sqrt{5}$ $\Rightarrow \frac{7+3\sqrt{5}}{3+\sqrt{5}} \times \frac{3-\sqrt{5}}{3-\sqrt{5}} - \frac{7-3\sqrt{5}}{3-\sqrt{5}} \times \frac{3+\sqrt{5}}{3+\sqrt{5}} = a + b\sqrt{5}$ $\Rightarrow \frac{21-7\sqrt{5}+9\sqrt{5}-15}{(3)^2-(\sqrt{5})^2} - \frac{21+7\sqrt{5}-9\sqrt{5}-15}{(3)^2-(\sqrt{5})^2} = a + b\sqrt{5}$ $\Rightarrow \frac{6+2\sqrt{5}}{9-5} - \frac{6-2\sqrt{5}}{9-5} = a + b\sqrt{5}$ $\Rightarrow \frac{6+2\sqrt{5}-6+2\sqrt{5}}{4} = a + b\sqrt{5}$ $\Rightarrow \frac{4\sqrt{5}}{4} = a + b\sqrt{5}$ $\Rightarrow 0 + \sqrt{5} = a + b\sqrt{5}$ $\Rightarrow a = 0$ and $b = 1$	 **1** **1** **1** **1** **1**
33	Given, $a + b + c = 5$ and $ab + bc + ca = 10$ $\Rightarrow \quad (a+b+c)^2 = 5^2$ … (Squaring both sides) $\Rightarrow \quad a^2 + b^2 + c^2 + 2ab + 2bc + 2ac = 25$ $\Rightarrow \quad a^2 + b^2 + c^2 + 2(ab + bc + ac) = 25$ $\Rightarrow \quad a^2 + b^2 + c^2 + 2(10) = 25$ $\Rightarrow \quad a^2 + b^2 + c^2 = 25 - 20$ $\Rightarrow \quad a^2 + b^2 + c^2 = 5$	**2**

	As we know,	**1**
	$a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ac)$	**1**
	$\Rightarrow\ a^3 + b^3 + c^3 - 3abc = (a + b + c)\{(a^2 + b^2 + c^2) - (ab + bc + ac)\}$	
	$\Rightarrow\ a^3 + b^3 + c^3 - 3abc = (5)\{5 - 10\}$	**1**
	$\Rightarrow\ a^3 + b^3 + c^3 - 3abc = -25$	
	Hence, proved.	
	OR	
	Let, $f(x) = x^3 + 2x^2 - x - 2$	**1**
	The factors of -2 are $\pm 1, \pm 2$.	
	Substitute the value $x = -1$ in $f(x)$.	
	$\Rightarrow f(-1) = (-1)^3 + 2(-1)^2 - (-1) - 2$	
	$\Rightarrow f(-1) = -1 + 2 + 1 - 2$	
	$\Rightarrow f(-1) = 0$	
	$\Rightarrow (x + 1)$ is a factor of $f(x)$. … (1)	**1**
	Substitute the value $x = +1$ in $f(x)$.	
	$\Rightarrow f(1) = (1)^3 + 2(1)^2 - (1) - 2$	
	$\Rightarrow f(1) = 1 + 2 - 1 - 2$	
	$\Rightarrow f(1) = 0$	
	$\Rightarrow (x - 1)$ is a factor of $f(x)$. … (2)	
	$\Rightarrow f(-2) = (-2)^3 + 2(-2)^2 - (-2) - 2$	**1**
	$\Rightarrow f(-2) = -8 + 8 + 2 - 2$	
	$\Rightarrow f(-2) = 0$	
	$\Rightarrow (x + 2)$ is a factor of $f(x)$. … (3)	
	Since, $f(x)$ is a polynomial having a degree 3, it cannot have more than three linear factors.	
	$\Rightarrow x^3 + 2x^2 - x - 2 = (x + 1)(x - 1)(x + 2)$ … from (1), (2) and (3)	**1**
	This is the required factorization of $f(x)$.	
		1

34	Given that, QR ‖ PS and transversal p intersects them at points A and C respectively. The bisectors of ∠ ACR and ∠ SAC intersect at D and the bisectors of ∠ PAC and ∠ACQ intersect at B. From the given figure, we have, ∠PAC = ∠ACR … [Alternate angles as l ‖ m and p is a transversal] $\Rightarrow \frac{1}{2}\angle PAC = \frac{1}{2}\angle ACR$ ⇒ ∠ BAC = ∠ ACD	**1**
	They form a pair of alternate angles for lines AB and DC with AC as a transversal and they are equal also. ⇒ AB ‖ DC Similarly, BC ‖ AD … [Considering ∠ ACB and ∠ CAD] ⇒ Quadrilateral ABCD is a parallelogram.	**1** **1**
	Also, ∠PAC + ∠CAS = 180^0 … [Angles in Linear pair] $\Rightarrow \frac{1}{2}\angle PAC + \frac{1}{2}\angle CAS = \frac{1}{2} \times 180^0$ ⇒ ∠BAC + ∠CAD = 90^o ⇒ ∠BAD = 90^o	**1**
	Now, ABCD is parallelogram in which one angle is 90^o. ⇒ ABCD is a rectangle.	**1**
	OR Given that, △ABC is right angled at C. 1. M is mid-point of AB And MD ‖ BC We know, A line through midpoint of one side of a parallel to another side bisect the third side. ⇒ D is mid-Point of AC	**2**
	2. Now, MD ‖ BC ⇒ ∠ ADM = ∠ DCB …[Corresponding angles] ⇒∠ADM = 90°	

	$\Rightarrow$ MD $\perp$ AC	**1**
	3. In $\triangle$ADM and $\triangle$CDM, AD = DC … [$\because$ D is mid-point of AC] $\angle$ADM = $\angle$CDM … [Both 90°] DM = DM … [Common] $\Rightarrow \triangle ADM \cong \triangle CDM$ … [SAS congruence rule]	**1**
	$\Rightarrow$ AM = CM … [CPCT] $\Rightarrow$ AM = CM = MB … [$\because$ M is mid-point of AB] $\Rightarrow$ CM = MA = $\frac{1}{2}$ AB	**1**
35	For section A, **Classes** | **Class-Marks** | **Frequency** 0-10 | 5 | 3 10-20 | 15 | 9 20-30 | 25 | 17 30-40 | 35 | 12 40-50 | 45 | 9 For section B, **Classes** | **Class-Marks** | **Frequency** 0-10 | 5 | 5 10-20 | 15 | 19 20-30 | 25 | 15 30-40 | 35 | 10 40-50 | 45 | 1	**1** **1**



3

Section E

36 (1) Given,

Number of girls = $x^2 + y^2 = 63$ and $xy = 9$

we know,

$(x + y)^2 = x^2 + y^2 + 2xy$

$\Rightarrow (x + y)^2 = 63 + 2 \times 9$

$\Rightarrow (x + y)^2 = 81$

$\Rightarrow (x + y) = 9$

Hence, number of teachers in the group is 9. **1**

(2) Given, Number of teachers = $x + y = 10$

We know,

$x^2 - y^2 = (x + y)(x - y)$

$= (10)(23)$

$= 230$ **1**

(3) Given,

Number of teachers = $x + y = 10$ and

Number of Boys = $x^3 + y^3 = 370$

we know,

$\Rightarrow (x + y)^3 = x^3 + y^3 + 3xy\,(x + y)$

$\Rightarrow (10)^3 = 370 + 3xy\,(10)$

$\Rightarrow 1000 = 370 + 30xy$

$\Rightarrow 630 = 30xy$

$\Rightarrow xy = 21$

N **1**

o

	w , $(x + y)^2 = x^2 + y^2 + 2xy$ $\Rightarrow (10)^2 = x^2 + y^2 + 2 \times 21$ $\Rightarrow x^2 + y^2 = 100 - 42 = 58$ Hence, number of girls in the group = 58 **OR** Given, Number of teachers = x + y = 10 and Number of Girls = $x^2 + y^2 = 58$ N o w , $(x + y)^2 = x^2 + y^2 + 2xy$ $\Rightarrow (10)^2 = 58 + 2xy$ $\Rightarrow 2xy = 100 - 58 = 42$ $\Rightarrow xy = 21$ we know, $\Rightarrow (x + y)^3 = x^3 + y^3 + 3xy\,(x + y)$ $\Rightarrow (10)^3 = x^3 + y^3 + 3\times21\times10$ $\Rightarrow 1000 = x^3 + y^3 + 630$ $\Rightarrow x^3 + y^3 = 370$ $\Rightarrow$ Hence, number of girls in the group = 370	**1** **1** **1**
37	1. The quadrilateral formed by joining P, S, Q and R in a sequence is cyclic quadrilateral. 2. As angle subtended by the diameter at a point on the circle is right angle. $\angle QPR = 90°$. 3. Area of triangle PQR = $\frac{1}{2} \times PQ \times PR$ Area of triangle PQR = $\frac{1}{2} \times 8 \times 6 = 24$ sq. m **OR** In right Δ PQR, $QR^2 = PQ^2 + PR^2$ … (Pythagoras Theorem) $QR^2 = (8)^2 + (6)^2$ $QR^2 = 100$ $QR = 10$ m i.e. diameter of the circle is 10 m. Thus, radius is 5 m.	**1** **1** **2** **1** **1**

38	1.	Given, For each dome, $r = 7$ m We know, Volume of a hemisphere $= \frac{2}{3}\pi r^3$ $= \frac{2}{3} \times \frac{22}{7} \times 7 \times 7 \times 7$ $= \frac{44 \times 49}{3}$ $= 718.66\ \text{m}^3$	**1**
	2.	For both the pillars, $r = 7$ m and $h = 10\ m$ We know, Volume of a cylinder $= \pi r^2 h$ $\Rightarrow$ Volume of two pillers $= 2 \times \frac{22}{7} \times 7 \times 7 \times 10$ $\Rightarrow$ Volume of two pillers $= 2 \times \frac{22}{7} \times 7 \times 7 \times 10$ $\Rightarrow$ Volume of two pillers $= 3080\ \text{m}^3$	**1**
	3.	We know, CSA of a hemisphere $= 2\pi r^2$ $\Rightarrow$ The cost of white-washing all these domes $= 50 \times 7 \times 2\pi r^2$ $= 700 \times \frac{22}{7} \times 7 \times 7$ $= ₹107800$ **OR** Find the curved surface area of each of the pillars. $= 2\pi rh$ $= 2 \times \frac{22}{7} \times 7 \times 10$ $= 440\ \text{m}^2$	**2** **2**

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KENDRIYA VIDYALAYA SANGATHAN, BENGALURU REGION

SAMPLE QUESTION PAPER 3 (2024-25)

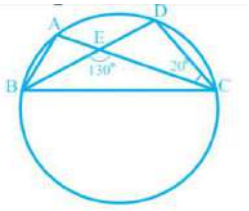
Class: IX Maximum marks: 80

Subject : Mathematics Time : 3 hours

GENERAL INSTRUCTIONS:

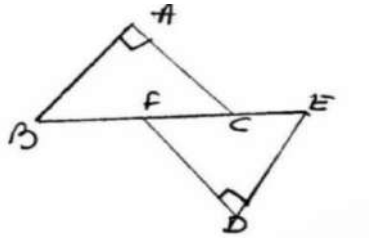
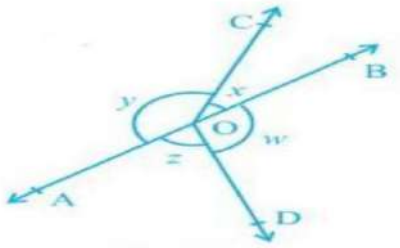
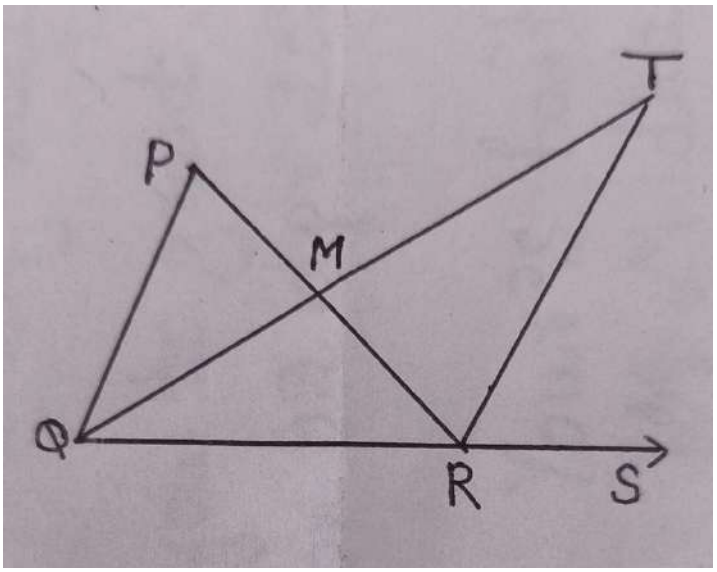
1. The question paper has 5 sections A, B, C, D and E.
2. Section A has 20 multiple choice questions (MCQs) carrying 1 mark each.
3. Section B has 5 short answer – I (SA-I) type questions carrying 2 marks each.
4. Section C has 6 short answer – II (SA-II) type questions carrying 3 marks each.
5. Section D has 4 long answer – II (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 questions of 2 marks, 2 questions in 3 marks and 2 questions in 5 marks has been provided. An internal choice has been provided in the 2 marks questions of section E.
8. Draw neat figure wherever required. Take $\pi = 22/7$ wherever required if not stated.

	Section A	
1	$3\sqrt{6} + 4\sqrt{6}$ is equal to: a) $6\sqrt{6}$. b)$7\sqrt{6}$. c)$4\sqrt{12}$. d)$7\sqrt{12}$	[1]
2	Which of the following is an irrational number? a) 0.14. b) 0.1416. c) 0. 1416. d)0.40140014000014…	[1]
3	$\sqrt{6} \times \sqrt{27}$ is equal to: a) $9\sqrt{2}$. b)$3\sqrt{3}$. c)$2\sqrt{2}$. d)$9\sqrt{3}$	[1]
4	The degree of the polynomial $\sqrt{2}$ is_____ a) 0 b) any natural number c) 2 d) not defined	[1]
5	If p(x) = x + 3, then p(x) + p(–x) is equal to : (a) 3. (b) 2x. (c) 0. (d) 6	[1]
6	The linear equation 2x – 5y = 7 has (A) unique solution (B) Two solutions (C) Infinitely many solutions (D) No solution	[1]
7	If the coordinates of a point are (-3, 4), then it lies in: a. First quadrant. b. Second quadrant. c. Third quadrant. d. Fourth quadra	[1]
8	If x coordinate of a point is zero, then the point lies on: a. First quadrant. b. Second quadrant. c. X-axis. d. Y-axis	[1]
9	The measure of Complementary angle of 63º is: (a) 27º. (b)37º. (c)127º. (d) none of there	[1]
10	If two supplimentry angles are in the ratio 7 : 11, then the angles are _____. a) 35°, 55° b) 70°, 110° c) 40°, 50° d) 30°, 50°	[1]

11	ABCD is rhombus such that $\angle ACB = 40°$ then $\angle ADB$ is : (A)40°. (B) 45°. (C) 50°. (D) 60°	**[1]**
12	The length of each side of an equilateral triangle having an area of $4\sqrt{3}\ cm^2$ is_____ a) 6 cm b) 36 cm c) 4 cm d) 8 cm	**[1]**
13	The surface area of two spheres are in the ratio 25: 64. The ratio of their radii is____ a) 5 : 8 b) 16 : 9 c) 16 : 25 d) 9 : 16	**[1]**
14	The exterior angle of a triangle is equal to the (a) sum of the two interior opposite angles. (b) sum of the three interior angles. (c) difference of two interior angles. (d) opposite of the interior angle.	**[1]**
15	In a ΔABC, P,Q,R, are the midpoints of the sides BC, CA and AB respectively. If AC = 21cm, BC= 29cm, AB=30cm.Find the perimeter of quadrilateral ARPQ. (A)20 cm. (B) 52cm. (C) 51cm. (D) 80cm	**[1]**
16	In Fig. ,A, B, C and D are four points on a circle. AC and BD intersect at a point E such that ∠BEC=130° And ∠ ECD = 20°.  Value of ∠ BAC is. (a) 50°. (b) 40°. (c) 90°. (d) 110⁰	**[1]**
17	Two concentric circles with centre O have A, B, C and D as points of intersection with a line l as shown in the figure. If AD =12 cm and BC = 8 cm, find the length of AB and CD. (a) 4 cm. (b) 6 cm. (c) 10 cm. (d) 2 cm	**[1]**
18	The class mark of the class interval 120 - 140 is_____	**[1]**

	a) 170 b)120 c) 135 d) 130	
19	**Assertion: (2,4) is a solution of 2x + 3y = 16** **Reason: If Ordered pair (p, q) lies on the line then it is one of the solutions of line ax + by + c = 0.** 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.	**[1]**
20	Assertion: A chord of a circle, which is twice as long as its radius, is a diameter of the circle. Reason: As we know that any chord whose length is twice as long as the radius of the circle always passes through the centre of the circle 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.	**[1]**
	Section B	
21	State the quadrants of the following points: (i) A (4, 3) (ii) B (-3, 3) (iii) C (6, 2) (iv) D (-4, -6)	**[2]**
22	Solve the equation a – 15 = 25 and state which axiom do you use here.	**[2]**

23	How many square meter of canvas is required for a conical tent whose height is3.5 m and the radius of the base is 12 m?. OR The radius of a hemispherical balloon increases from 6 cm to 12 cm as air is being pumped into it. Find the ratio of the surface areas of the balloon in the two cases.	**[2]**
24	A hemispheric dome of radius 3.5m is to be painted at a rate of Rs.600/m^2. What is the cost of painting it? (Take $\pi = 22/7$)	**[2]**
25	In a parallelogram PQRS, If angle P = (3x -5) and angle Q = (2x + 15). Find the value of x **OR** If in a parallelogram ABCD, AB= x+5 and BC= x+11 and perimeter is 40cm. Find the value of x.	**[2]**
	Section C	
26	Represent $\sqrt{9.3}$ on the number line. **OR** Express $0.4323232\cdots$ in the form p/q, where p and q are integers and $q \neq 0$.	**[3]**
27	Expand: $(3a+5b)^3$	**[3]**
28	Find the solution of the linear equation 2x + 4y = 12 which represents a point on	**[3]**

	1. The x - axis 2. The y – axis	
29	In the given figure BA is perpendicular to AC , DE is perpendicular to DF such that BA = DE and BF  = EC. Show that ΔABC ≅ ΔDEF.	**[3]**
30	In Fig. if x+y = w+z, then prove that AOB is a line.  **OR** In Fig. , the side QR of ΔPQR is produced to a point S. If the bisectors of ∠PQR and ∠PRS meet at point T, then prove that ∠QTR = ½ ∠QPR.  	**[3]**

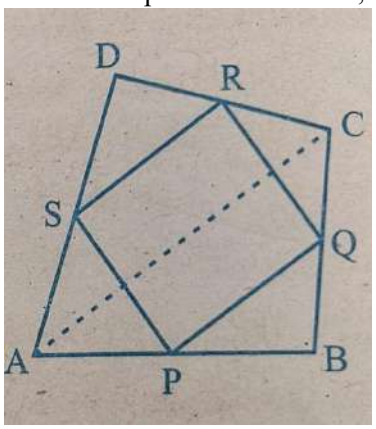
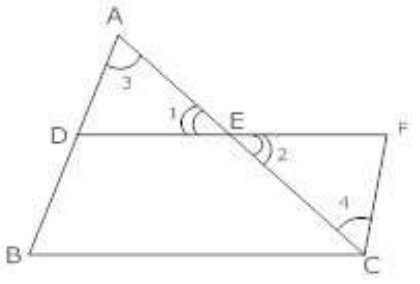
<table>
<tr><td>31</td><td>Three sides of a triangular field are 41m, 40m, and 9m. Find the area of triangle.</td><td>[3]</td></tr>
<tr><td></td><td>Section D</td><td></td></tr>
<tr><td>32</td><td>A. Simplify: $\frac{7+3\sqrt{5}}{7-3\sqrt{5}}$

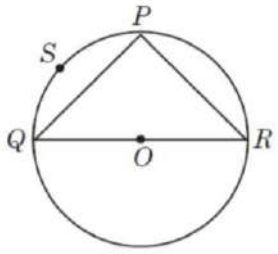
B. Simplify: $[\{(625)^{1/2}\}^{1/4}]^2$</td><td>[5]</td></tr>
<tr><td>33</td><td>Find the value of $x^3 + y^3 + z^3 - 3xyz$ if $x^2 + y^2 + z^2 = 83$ & $x + y + z = 15$.

OR

Factorise: $9x^2 + 4y^2 + 16z^2 + 12xy - 16yz - 24xz$</td><td>[5]</td></tr>
<tr><td>34</td><td>Draw a histogram with frequency polygon (on same graph sheet) for the following data:

<table>
<tr><td>Class</td><td>20 – 30</td><td>30 – 40</td><td>40 – 50</td><td>50 – 60</td><td>60 – 70</td><td>70 – 80</td></tr>
<tr><td>Frequency</td><td>8</td><td>12</td><td>20</td><td>15</td><td>10</td><td>6</td></tr>
</table>
</td><td>[5]</td></tr>
</table>

35	ABCD is a quadrilateral in which P, Q, R and S are mid-points of sides AB, BC, CD and DA  respectively. AC is the diagonal. Show that: (i) SR ∥ AC and SR = (1/ 2) AC (ii) PQ = SR (iii) PQRS is a parallelogram **OR** Prove that in a triangle, the line segment joining the midpoints of any two sides is parallel to the third side. 	**[5]**
	Section E	
36	**Read the text carefully and answer the questions:** In class IX mathematics teacher asked the students about polynomials, which has variables x and y. Then , out of these polynomials, following are represented by $p(x) = 4x^2-2x+2$ at x=2, $q(y) = y^2-2y+1$ at y=1 and $r(t) = t^2+6t+8$ at t = 2. Then students solved these equations to get best appreciation from teacher side and to enhance themselves practice for doing excellent performance in half yearly exams. **(i)** Calculate the value of polynomial $4x^2-2x+2$ at x=2. **(ii)** Is y=1 a zero of polynomial y^2-2y+1	**[1]** **[1]** **[2]**

	(iii) Factorise polynomial y^2-2y+1 OR Factorise polynomial = t^2+6t+8	
37	**Read the text carefully and answer the questions:** Ankit visited in a mall with his father. He sees that three shops are situated at P, Q, R as shown in the figure from where they have to purchase things according to their need. Distance between shop P and Q is 8 m, that of between shop Q and R is 10 m and between shop P and R is 6 m. **(i) Find the radius of the circle.** **(ii) Measure of ∠QPR is** **(iii) Length of the longest chord of the circle is** **(iv) In figure, PSQP is known as**  	**[1]** **[1]** **[2]**
38	**Read the text carefully and answer the questions:** Sangita had a hemispherical bowl of radius r. She made a conical vessel of radius r with a tin sheet. (i) find the height of the conical vessel so that it can hold the water same as that of the hemispherical bowl. (ii) If the radius of hemispherical bowl is 7cm find it's surface area. (iii) if the radius of the cone formed in the above part is 14 cm, then find how much sheet is used? OR if the height of the conical vessel is doubled, how much more water can it hold	**[1]** **[1]** **[2]**

	than the hemispherical bowl?	

	Section A	
1	b) $7\sqrt{6}$	**[1]**
2	d) 0.4014001400014…	**[1]**
3	a)$9\sqrt{2}$	**[1]**
4	a) 1	**[1]**
5	d) 6	**[1]**
6	c) Infinitely many solutions	**[1]**
7	b) In second quadrant	**[1]**
8	d) y-axis	**[1]**
9	a) 27^{o}	**[1]**
10	b) 70^{o},110^{o}	**[1]**
11	a) 40°	**[1]**
12	c) 4 cm	**[1]**
13	a) 5: 8	**[1]**
14	a) △ Sum of the two interior opposite angles	**[1]**
15	c) 51cm	**[1]**
16	d) 110^{o}	**[1]**
17	d) 2cm	**[1]**
18	d) 130	**[1]**
19	a) Both A and R are true and R is the correct explanation of A.	**[1]**
20	b) Both A and R are true but R is not the correct explanation of A.	**[1]**
	Section B	
21	(i) A - I Quadrant (ii) B - II Quadrant (iii) C - I Quadrant (iv) D - III Quadrant	$\frac{1}{2} \times 4 = 2$
22	a-15=25 a-15+15=25+15 (equals are added on both sides)	**1**

	a+0=40 a=40 Second axiom of Euclid's is used here.	**1**
23	Sol. $l^2= h^2+r^2$ $l^2= 3.5^2+12^2$ $l =12.25$ Total canvas required= πrl $= 22/7\times12\times12.5$ $=471m^2$ **OR** **Surface area of hemispherical balloon = $2\pi r^2$** **Surface area in first condition. $2\times\pi\times6^2$** ● **——---------- = ——-------** **Surface area in second condition $2\times\pi\times12^2$** **=36/144=1/4**	½ ½ **1** **1** **1**
24	Surface area of hemispherical dome = $2\pi r^2$ $=2\times22/7\times3.5\times3.5$ $=77m^2$ Rate of painting the dome =600rs/m^2 Total cost of painting = 77×600 = 46200rs.	**1** $\frac{1}{2}$ $\frac{1}{2}$

25	Given, angle P=3x-5 and Q=2x+15 Since P and Q are consecutive angles of parallelogram hence P+Q=180º (3x-5)+(2x+15)=180º Or 5x+10 =180º Or 5x=170º Or x= 170º/5 x =34º OR	½ ½ 1
	Given sides of parallelogram ABCD AB=x+5 and BC =x+11 Given perimeter AB + BC + CD + DA In parallelogram AB=CD and BC =DA 2 (x +5 +x+ 11) = 40 2x+16=20 x =2	1 1
	Section C	
26	Correct representation on number line. OR. Let x= 0.4323232……. =0.4323 On multiplying both sides by 100 100x =43.2323232… Subtract x from both sides	**3** **1**

	100x-x =43.23232… -(0.4323232) 99x =42.8 x = 42.8/99 x= 428/99	 **1** **1**
27	. Since $(a+b)^3 = a^3+b^3+3ab(a+b)$ Hence $(3a+5b)^3 = (3a)^3+ (5b)^3 + 3(3a)(5b)(3a+5b)$ $= 9a^3+ 25b^3 + 45ab(3a+5b)$ $=9a^3+ 25b^3 + 135a^2b + 225ab^2$	 **1** **1** **1**
28	1. When one point is on x-axis i.e y=0 Putting y=0 in given equation 2x+4y= 12 2x+4×0=12 2x=12 x=6 Solution is (6,0) 2. When point is on y-axis x=0 Putting x=0 in given equation 2×0+4y=12 4y =12 y= 3	 **1 ½** **1 ½**

29	Given BA=DE, BF=EC ,angle BAC=90º, angle EDF=90º Since BF=EC (given) BF +FC = EC + FC Or BC= EF Now In Δs ABC and DEF AB = DE (Given) ang. BAC = ang. EDF (Given) BC = EF (proved above) Hence by RHS congruency rule ΔABC and Δ DEF are congruent.	½ ½ 1 1
30	Given x+y= w+z To prove = AOB is a line Proof: Since $x+y+w+z = 360^0$ or $x+y+(x+y) = 360^0$ (given) $2(x+y) = 360^0$ $x+y =180^0$ or. $\angle AOC+ \angle COB =180^o$ or. $\angle AOB =180^o$ Hence AOB is a line . Proved. **OR** Let $\angle PQR =x^o$ and $\angle PRS =y^o$ So $\angle TQR =x/2^o$ and $\angle PRT =y/2^o$ (QT and RT are angle bisectors) Using exterior angle theorem in tri. PQR $\angle PRS= \angle PQR+\angle QPR$ $y^o = x^o + \angle QPR$	½ ½ ½ ½ ½

	$\angle QPR = y^0 - x^0$ By Exterior angle theorem in ΔPQM $\angle PMT = \angle QPM + \angle MQP$ $\angle PMT = (y - x) + x/2 = y - x/2$ By Exterior angle theorem in ΔMTR $\angle PMT = \angle MTR + \angle TRM$ $\angle PMT = \angle MTR + y/2$ $y - x/2 = \angle MTR + y/2$ or $\angle MTR = y/2 - x/2 = \frac{1}{2}(y-x)$ or $\angle MTR = \frac{1}{2}(\angle QPR)$. Proved	$\frac{1}{2}$ $\frac{1}{2}$ ½ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
31	Sides of triangle are 41m, 40m, 9m $\Rightarrow \quad s = \frac{41+4}{2} = 45m$ Now, Area of triangle = $\sqrt{s(s-a)(s-b)(s-c)}$ $\Rightarrow$ Area of triangle = $\sqrt{45(45-41)(45-40)(45-9)}$rea of triangle = $\sqrt{45 \times 4 \times 5 \times 36} = 180m^2$	**1** $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$ $\frac{1}{2}$
	Section D	
32	A)Given, $\frac{7+3\sqrt{5}}{7-3\sqrt{5}} = \frac{7+3\sqrt{5}}{7-3\sqrt{5}} \times \frac{7+3\sqrt{5}}{7+3\sqrt{5}}$ $= \frac{(7+3\sqrt{5})^2}{7^2-(3\sqrt{5})^2} = \frac{7^2+9\times5+2\times7\times3\sqrt{5}}{49-45}$	**1** **1**

	$= (49 + 45 + 42\sqrt{5})\ /4$ $= (94 + 42\sqrt{5})/4$ $= (47 + 21\sqrt{5})/2$ B) $[\ \{\ (625)^{1}\div^{2}\}^{1}\div^{4}]^{2} =\ (\ 5^{4})^{1}\div^{2}\times^{1}\div^{4}\times^{2}$ $= 5^{1}$	**1** **1** **1**
33	Since $x^3+y^3+z^3-3xyz = (x+y+z)(x^2+y^2+z^2-xy-yz-zx)$ Given $x+y+z = 15$, and $x^2+y^2+z^2 = 83$ on putting values $x^3+y^3+z^3-3xyz = 15 \times 83$ $= 1245$ OR $9x^2+4y^2+16z^2+12xy-16yz-24xz$ $= (3x)^2+(2y)^2+(-4z)^2+2\times3x\times2y+2\times(2y)(-4z)+2\times(-4z)(3x)$ $= (3x+2y-4z)^2$	**2** **2** **1** **1** **2** **2**

34

Age in years	frequency
20 – 30	8
30 – 40	12
40 – 50	20
50 – 60	15
60 – 70	10
70 – 80	6

To find correct class marks. **1**

Drawing correct histogram **2**

Drawing frequency polygon. **2**

35	Given ABCD is a quadrilateral P,Q,R and S are mid points of sides AB,BC,CD and DA respectively. To prove: (i) SR ∥ AC and SR = (1/ 2) AC (ii) PQ = SR (iii) PQRS is a parallelogram Proof:(i) In Δ ADC S is mid point of AD and R is mid point of DC By mid point theorem SR||AC and SR = 1/2AC …….(1) (ii) In Δ ABC P is mid point of AB and Q is mid point of BC By mid point theorem PQ||AC and PQ = 1/2AC ……(2) From 1 and 2 PQ = SR and PQ||SR ……(3)	**1** **1** **1** **1**

	(ii) From 3 PQRS is quadrilateral. OR Given, To prove , correct diagram Correct proof.	**1** **1** **1** **1** **2** **3**
	Section E	
36	1) $p(2) = 4(2)^2 - 2\times2 + 2$ $= 14$ 2) $q(1) = 1^2 - 2\times1 + 1$ $= 0$ Yes, 1 is a zero of polynomial $y^2 - 2y + 1$ 3) Given polynomial. $q(y) = y^2 - 2y + 1$	1 1

	$= y^2 - y - y + 1$ $= y(y-1) - 1(y-1) = (y-1)^2$ OR Given polynomial. $t^2 + 6t + 8 = t^2 + 2t + 4t + 8$ $= t(t+2) + 4(t+2)$ $= (t+2)(t+4)$	**2** **2**
37	1) Given, distance is 8m, 10m and 6m $8^2 + 6^2 = 10^2$ So it is a right angle triangle at angle P Angle in semicircle is 90^0 so QR is a diameter QR =2 radius Radius = 5m. 2) Angle QPR = 90^0 3) Since we know that longest chord in a circle is it's diameter 4) Hence QR is longest chord 5) QR = 10m. 6) OR Given triangle is a right angle triangle So area of triangle PQR = ½ ×base × height $= ½ \times 6 \times 8$ $= 24m^2$	**1** **1** **2** **2**
38	Given, radius of hemispherical ball =r radius of conical vessel=r	

	1) $2/3\pi r^3 = 1/3\pi r^2 h$ $2r = h$ Height of conical vessel is 2r	**1**
	2) Surface area of hemisphere = $2\pi r^2 = 2\times22/7\times7^2$ $=308cm^2$	
	3) Radius of cone =14 So height of cone =2r = 28 Surface area of cone = sheet used to make it =πrl	**1**
	$l^2 = r2+h^2$ $l^2 = 196+784$ $l^2 = 980$ $l = \sqrt{980}$ Sheet used = $22/7\times14\times\sqrt{980}$ $=22/7\times14\times14\sqrt{5}$ $= 616\sqrt{5}cm^2$ OR When height of conical vessel is doubled then H =2×h =2×2r =4r Now volume of vessel = $1/3\pi r^2H$ $= 1/3\pi r^2\times4r$ $= 4/3\pi r^3$ Differenence of volume = volume of conical vessel - volume of hemispherical bowl $= 4/3\pi r^3 - 2/3\pi r^3$ $= 2/3\pi r^3$	**2** **2**