

DIRECTORATE OF EDUCATION
Govt. of NCT, Delhi

SUPPORT MATERIAL
(2018-2019)

Class : IX

MATHEMATICS

Under the Guidance of

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PREFACE

It gives me immense pleasure to present the Support Material for various subjects. The material prepared for students of classes IX to XII has been conceived and developed by a team comprising of the Subject Experts, Members of the Academic Core Unit and teachers of the Directorate of Education.

The subject wise Support Material is developed for the betterment and enhancement of the academic performance of the students. It will give them an insight into the subject leading to complete understanding. It is hoped that the teachers and students will make optimum use of this material. This will help us achieve academic excellence.

I commend the efforts of the team who have worked with complete dedication to develop this matter well within time. This is another endeavor of the Directorate to give complete support to the learners all over Delhi.


(SANDEEP KUMAR)
SECRETARY

Sanjay Goel, IAS



D.O. No. PS/DE/2018/343

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Date : 8/8/2018

DIRECTOR'S MESSAGE

Dear Students,

Through this Support Material, I am getting an opportunity to communicate directly with you and I want to take full advantage of this opportunity.

In Delhi, there are approximately 1020 other government schools like yours, which are run by Directorate of Education. The Head Quarters of Directorate of Education is situated at Old Secretariat, Delhi-54.

All the teachers in your school and officers in the Directorate work day and night so that the standard of our govt. schools may be uplifted and the teachers may adopt new methods and techniques to teach in order to ensure a bright future for the students.

Dear students, the book in your hand is also one such initiative of your Directorate. This material has been prepared specially for you by the subject experts. A huge amount of money and time has been spent to prepare this material. Moreover, every year, this material is reviewed and updated as per the CBSE syllabus so that the students can be updated for the annual examination.

Last, but not the least, this is the perfect time for you to build the foundation of your future. I have full faith in you and the capabilities of your teachers. Please make the fullest and best use of this Support Material.

DIRECTOR (EDUCATION)

Dr. (Mrs.) Saroj Bala Sain

Addl. Director of Edn. (School)/Exam



सत्यमेव जयते

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D.O. No. PA/ADD/DECSM/80

Date : 16/07/2018

It gives me immense pleasure and a sense of satisfaction to forward the support material for classes IX to XII in all subjects. The support material is continuously revised redesigned and updated by a team of subject experts, members of Core Academic Unit and teachers from various schools of DOE.

Consistent use of support material by the students and teachers will make the year long journey seamless and enjoyable. The purpose of providing support material has always been to make available ready to use material which is matchless and most appropriate.

My commendation for all the team members for their valuable contribution.

Dr. Saroj Bala Sain
Addl.DE (School)

DIRECTORATE OF EDUCATION
Govt. of NCT, Delhi

SUPPORT MATERIAL
(2018-2019)

MATHEMATICS
Class : IX
(English Medium)

NOT FOR SALE

PUBLISHED BY : DELHI BUREAU OF TEXTBOOKS

MATHEMATICS

Class (IX)

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CONTENTS

S.No.	Chapters	Page No.
1.	Number Systems	11
2.	Polynomials	24
3.	Coordinate Geometry	34
4.	Linear Equations in two variables	42
5.	Introduction to Euclid's Geometry	52
6.	Lines & Angles	59
7.	Triangles	72
8.	Quadrilaterals	83
9.	Areas of Parallelograms and Triangles	92
10.	Circles	102
11.	Constructions	115
12.	Heron's Formula	119
13.	Surface Areas and Volumes	126
14.	Statistics	135
15.	Probability	145
	Solved Practice Question Paper-1	155
	Solved Practice Question Paper-2	166

COURSE STRUCTURE

MATHEMATICS (IX) (Code No. 041)

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 softwares.
- 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	08
II	ALGEBRA	17
III	COORDINATE GEOMETRY	04
IV	GEOMETRY	28
V	MENSURATION	13
VI	STATISTICS & PROBABILITY	10
	Total	80

UNIT I: NUMBER SYSTEMS

1. REAL NUMBERS

1. Review of representation of natural numbers, integers, rational numbers on the number line. Representation of terminating / non-

terminating recurring decimals on the number line through successive magnification. 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 n^{th} root of a real number.
4. Existence of \sqrt{x} for a given positive real number x and its representation on the number line with geometric proof.
5. 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.
6. 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

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

Recall of linear equations in one variable. Introduction to the equation in two variables.

Focus on linear equations of the type $ax+by+c=0$. Prove 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. Graph of linear equations in two variables. Examples, problems from real life, including problems on Ratio and Proportion and with algebraic and graphical solutions being done simultaneously.

UNIT III: COORDINATE GEOMETRY

COORDINATE GEOMETRY

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

UNIT IV: GEOMETRY

1. INTRODUCTION TO EUCLID'S GEOMETRY

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. Equivalent versions of the fifth postulate. 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

1. (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is 180° and the converse.

2. (Prove) If two lines intersect, vertically opposite angles are equal.
3. (Motivate) Results on corresponding angles, alternate angles, interior angles when a transversal intersects two parallel lines.
4. (Motivate) Lines which are parallel to a given line are parallel.
5. (Prove) The sum of the angles of a triangle is 180° .
6. (Motivate) If a side of a triangle is produced, the exterior angle so formed is equal to the sum of the two interior opposite angles.

3. TRIANGLES

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.
7. (Motivate) Triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

4. QUADRILATERALS

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 both pair of its opposite

sides are 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 is half of it and (motivate) its converse.

5. AREA

Review concept of area, recall area of a rectangle.

1. (Prove) Parallelograms on the same base and between the same parallels have the same area.
2. (Motivate) Triangles on the same (or equal base) base and between the same parallels are equal in area.

6. CIRCLES

Through examples, arrive at definition of circle and related concepts- radius, circumference, diameter, chord, arc, secant, sector, segment, subtended angle.

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) There is one and only one circle passing through three given non-collinear points.
4. (Motivate) Equal chords of a circle (or of congruent circles) are equidistant from the center (or their respective centers) and conversely.
5. (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.
6. (Motivate) Angles in the same segment of a circle are equal.
7. (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.

8. (Motivate) The sum of either of the pair of the opposite angles of a cyclic quadrilateral is 180° and its converse.

7. CONSTRUCTIONS

1. Construction of bisectors of line segments and angles of measure 60° , 90° , 45° etc., equilateral triangles.
2. Construction of a triangle given its base, sum/difference of the other two sides and one base angle.
3. Construction of a triangle of given perimeter and base angles.

UNIT V: MENSURATION

1. AREAS

Area of a triangle using Heron's formula (without proof) and its application in finding the area of a quadrilateral.

2. SURFACE AREAS AND VOLUMES

Surface areas and volumes of cubes, cuboids, spheres (including hemispheres) and right circular cylinders/cones.

UNIT VI: STATISTICS & PROBABILITY

1. STATISTICS

Introduction to Statistics: Collection of data, presentation of data — tabular form, ungrouped / grouped, bar graphs, histograms (with varying base lengths), frequency polygons. Mean, median and mode of ungrouped data.

2. PROBABILITY

History, Repeated experiments and observed frequency approach to probability.

Focus is on empirical probability. (A large amount of time to be devoted to group and to individual activities to motivate the concept; the experiments to be drawn from real - life situations, and from examples used in the chapter on statistics).

QUESTIONS PAPER DESIGN 2018-19 CLASS-IX

Mathematics (Code No. 041)

Marks: 80

S. No.	Typology of Questions	Very Short Answer (VSA) (1 Mark)	Short Answer -I (SA) (2 Marks)	Short Answer -II (SA) (3 Marks)	Long Answer (LA) (4 Marks)	Total Marks	% Weightage (approx.)
1	Remembering (Knowledge based- Simple recall questions, to know specific facts, terms, concepts, principles or theories; Identify, define, or recite, information)	2	2	2	2	20	25%
2	Understanding (Comprehension- to be familiar with meaning and to understand conceptually, in-terpet, compare, contrast, ex-plain, paraphrase, or interpret information)	2	1	1	4	23	29%
3	Application (Use abstract information in concrete situation, to apply knowledge to new situation; Use given content to interpret a situation, provide an example, or solve a problem)	2	2	3	1	19	24%
4	Higher Order Thinking Skills (Analysis & Synthesis- Classify, compare, contrast, or differentiate between different pieces of information; Organize and / or integrate unique pieces of information from variety of sources)	-	1	4	-	14	17%
5	Evaluation (Judge, and/or justify the value or worth of a decision or outcome, or to predict outcomes based on values)	-	-	-	1	4	5%
	Total	6x1=6	6x2=12	10x3=30	8x4=32	80	100%

INTERNAL ASSESSMENT

- Periodical Test
- Note Book Submission
- Lab Practical (Lab activities to be done from the prescribed books)

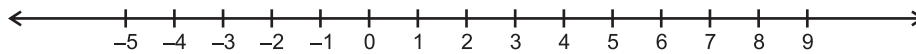
20 Marks

10 Marks

05 Marks

05 Marks

CHAPTER-1
NUMBER SYSTEMS
KEY POINTS



- 1, 2, 3, are natural numbers which are represented by N.
- 0, 1, 2, 3, are whole numbers which are represented by W.
- -3, -2, -1, 0, 1, 2, 3, are Integers which are represented by Z or I.
- A number is rational number if
 - (a) it can be represented in the form of $\frac{p}{q}$ where p and q are integers and $q \neq 0$.
 - or
 - (b) its decimal expansion is terminating (e.g. $\frac{2}{5} = 0.4$)
 - or
 - (c) its decimal expansion is non-terminating recurring (repeating)
 (e.g. $0.\overline{1234} = 0.1\dot{2}3\dot{4} = 0.1234234.....$)
- A number is irrational number if
 - (a) it can not be represented in the form of $\frac{p}{q}$ where p and q are integers and $q \neq 0$.
 - or
 - (b) its decimal expansion is non-terminating non-recurring (e.g. 0.1010010001.....)
- All rational and irrational numbers collectively form real numbers.
- There are infinite rational numbers between any two rational numbers.
- There is a unique real number corresponding to every point on the number line. Also, corresponding to each real number, there is a unique point on the number line.
- Rationalisation of a denominator means to change the Irrational denominator to rational form.
- 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.

- Laws of Exponents : Let $a > 0$ be a real number and m and n are rational numbers, then

$$1) \quad a^m \cdot a^n = a^{m+n}$$

$$2) \quad a^m \div a^n = a^{m-n}$$

$$3) \quad (a^m)^n = a^{mn}$$

$$4) \quad a^m \cdot b^m = (ab)^m$$

$$5) \quad a^0 = 1$$

$$6) \quad a^{-m} = \frac{1}{a^m}$$

- For positive real number a and b , the following Identities hold

$$1) \quad \sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$$

$$2) \quad \sqrt{a} \div \sqrt{b} = \sqrt{\frac{a}{b}}$$

$$3) \quad (\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b}) = a - b$$

$$4) \quad (\sqrt{a} + \sqrt{b})^2 = a + 2\sqrt{ab} + b$$

$$5) \quad (a + \sqrt{b})(a - \sqrt{b}) = a^2 - b$$

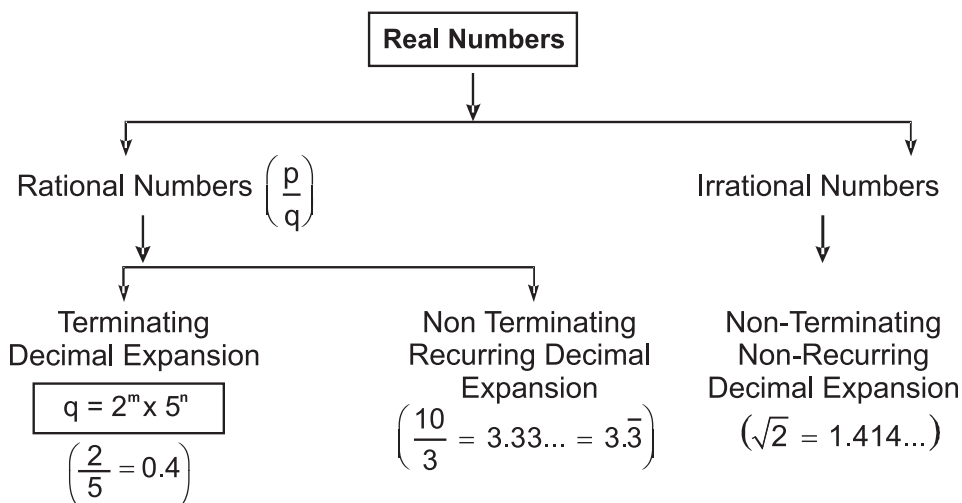
All natural numbers, whole numbers and integers are rational

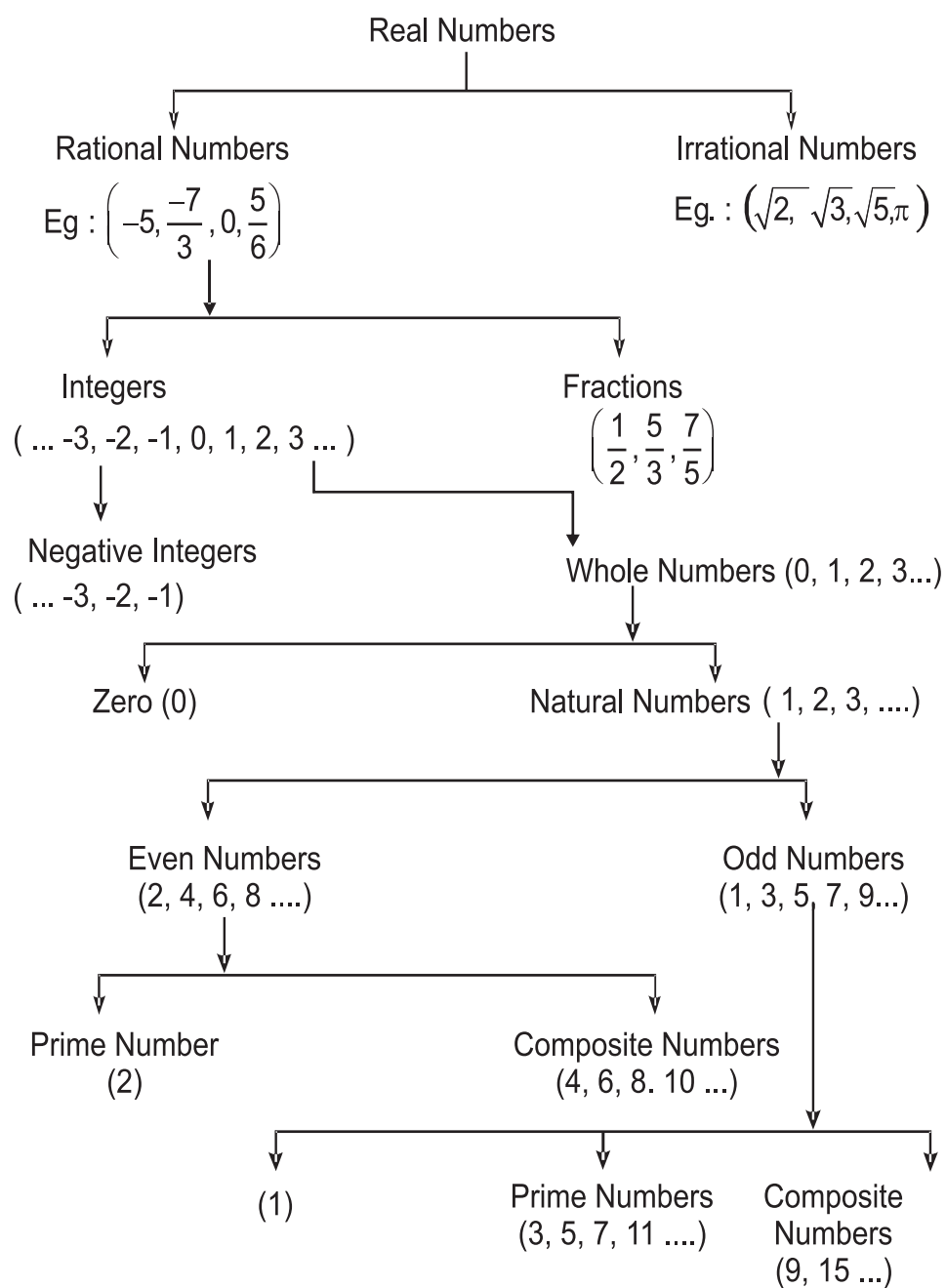
Prime Numbers : All natural numbers that have exactly two factors (i.e., 1 and itself) are called prime numbers. e.g., 2, 3, 5, 7, 11, 13, 17, 19, 23, ... etc.

Composite Numbers : Those natural numbers which have more than two factors are known as composite numbers. e.g., 4, 6, 8, 10, 12, ...

1 is neither prime nor composite.

Types of Numbers





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

where 'a' is a positive real number and n is a positive integer.

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

where 'a' is a positive real number, m and n are co prime integers, and $n > 0$.

Part (A)

1. Write first five whole numbers in $\frac{p}{q}$ form, where p and q are integers and $q \neq 0$
2. Find decimal expansion of $\frac{17}{8}, \frac{3}{15}, \frac{2}{7}, \frac{50}{3}$.
3. Find four rational numbers between $\frac{2}{9}$ and $\frac{3}{7}$.
4. Find decimal form of $\sqrt{23}$ and $\sqrt{24}$ upto 3 decimal places.
5. Find two Irrational numbers between $\sqrt{23}$ and $\sqrt{24}$.
6. Find one Irrational and one rational number between 2 and $\sqrt{5}$.
7. Write two numbers whose decimal expansions are terminating.
8. What can be the maximum number of digits in the repeating block of digits in the decimal expansion of $\frac{5}{7}$?
9. Write two numbers whose decimal expansions are non-terminating non-repeating (non-recurring).
10. Find the value of $(256)^{0.16} \times (256)^{0.09}$
11. Find two Irrational numbers between 2016 and 2017.

Part (B)

12. Represent $-\frac{7}{5}$ on the number line.
13. Represent following on number line
 - i) $\sqrt{5}$
 - ii) $\sqrt{13}$
 - iii) $\sqrt{9.3}$
 - iv) $\sqrt{2}$
14. Represent $3 + \sqrt{2.6}$ on the number line.
15. Insert two Irrational numbers between $\frac{2}{3}$ and $\frac{3}{2}$
16. Simplify : $\frac{\sqrt{5} + \sqrt{3}}{\sqrt{80} + \sqrt{48} - \sqrt{45} - \sqrt{27}}$
17. Find the value of $[1^3 + 2^3 + 3^3 + 8^2]^{-5/2}$
18. Find the value of x if $x^{1/2} = (36)^{0.5}$
19. Find the value of x if $(\sqrt{3})^x = 3^7$

20. If $2^{5x} \div 2^x = \sqrt[5]{32}$. Then find the value of x.
21. Evaluate $a^{x-y} \cdot a^{y-z} \cdot a^{z-x}$.
22. Simplify $12^{\frac{2}{5}} \cdot 5^{\frac{2}{5}}$.
23. Which of the following rational numbers will have a terminating decimal expansion or a non-terminating repeating (recurring) decimal expansion ?
- (i) $\frac{135}{50}$ (ii) $\frac{4}{11}$ (iii) $\frac{8}{7}$ (iv) $6\frac{3}{8}$
- (v) $\frac{55}{9}$ (vi) $\frac{5^2 \times 3^3}{2 \times 5^3 \times 27}$ (vii) $\frac{51}{60}$.
24. Classify the following numbers as terminating decimal or non-terminating recurring decimal or non-terminating non-recurring decimal :
- (i) 0.1666... (ii) 0.250 (iii) 1.01001000100001....
- (iv) 0.27696 (v) 2.142857142857.... (vi) $0.\overline{3}$
- (vii) 0.2359872785... (viii) 0.484848848.... (ix) 2.502500250002.....
- (x) $4.\overline{123456789}$

Also classify these given numbers as Rational and Irrational numbers.

25. Classify the following numbers as rational or Irrational number :
- (i) $\sqrt{27}$ (ii) $\sqrt{36}$ (iii) $\sqrt{5} \times \sqrt{125}$ (iv) $2\sqrt{3}$
- (v) $\frac{7\sqrt{7}}{\sqrt{343}}$ (vi) $2 + \sqrt{21}$ (vii) $5 + 2\sqrt{23} - (\sqrt{25} + \sqrt{92})$
- (viii) $\frac{22}{7}$ (ix) π (x) $\sqrt[3]{27}$
26. Express the following numbers in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.
- (i) 0.0875 (ii) 2.123456789 (iii) 0.181818.....

(iv) $0.4\overline{37}$ (v) $3.65\overline{1}$

27. Do as directed :

(i) Add : $\sqrt{125} + 2\sqrt{27}$ and $-5\sqrt{5} - \sqrt{3}$

(ii) Add : $\sqrt{7} - \sqrt{11}$ and $\sqrt{5} - \sqrt{11} + \sqrt{13}$

(iii) Multiply : $2\sqrt{2}$ by $5\sqrt{2}$.

(iv) Multiply : $(-3 + \sqrt{5})$ by 3.

(v) Divide : $7\sqrt{5}$ by $-14\sqrt{125}$

(vi) Divide : $2\sqrt{216} - 3\sqrt{27}$ by 3.

Part (C)

28. Simplify :

(i) $(2\sqrt{2} + 3\sqrt{3})(2\sqrt{2} - 3\sqrt{3})$ (ii) $(2\sqrt{8} - 3\sqrt{2})^2$

(iii) $(\sqrt{7} + \sqrt{6})^2$ (iv) $(6 - \sqrt{2})(2 + \sqrt{3})$

29. Evaluate :

(i) $\frac{2^{38} + 2^{37} + 2^{36}}{2^{39} + 2^{38} + 2^{37}}$ (ii) $\left[\left(64^{\frac{1}{2}} \right)^{\frac{1}{6}} \right]^2$

30. Find the value of a if $\frac{6}{3\sqrt{2} - 2\sqrt{3}} = 3\sqrt{2} - a\sqrt{3}$.

31. Simplify : $\left[5(8^{1/3} + 27^{1/3})^3 \right]^{\frac{1}{4}}$

32. Simplify : $\frac{(25)^{3/2} \times (243)^{3/5}}{(16)^{5/4} \times (8)^{4/3}}$

33. If $5^{2x-1} - (25)^{x-1} = 2500$, then find the value of x.

Part (D)

34. Express $0.6 + 0.\overline{7} + 0.4\overline{7}$ in the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$.

35. Rationalise the denominator of $\frac{1}{\sqrt{3} + \sqrt{5} + \sqrt{7}}$

36. Find a and b if $\frac{7 + 3\sqrt{5}}{2 + \sqrt{5}} - \frac{7 - 3\sqrt{5}}{2 - \sqrt{5}} = a + b\sqrt{5}$

37. If $x = (3 - 2\sqrt{2})$, show that $\left(\sqrt{x} - \frac{1}{\sqrt{x}}\right) = \pm 2$

38. If $xyz = 1$, then simplify

$$(1 + x + y^{-1})^{-1} \times (1 + y + z^{-1})^{-1} \times (1 + z + x^{-1})^{-1}$$

39. Find the value of x if

(i) $25^{2x-3} = 5^{2x+3}$

(ii) $(4)^{2x-1} - (16)^{x-1} = 384$

40. Evaluate : $\frac{64^{\frac{a}{6}}}{4^a} \times \frac{2^{2a+1}}{2^{a-1}}$

41. Simplify : $\frac{1}{1 + x^{b-a} + x^{c-a}} + \frac{1}{1 + x^{a-b} + x^{c-b}} + \frac{1}{1 + x^{a-c} + x^{b-c}}$

42. Simplify : $\left(\frac{x^a}{x^{-b}}\right)^{a-b} \times \left(\frac{x^b}{x^{-c}}\right)^{b-c} \times \left(\frac{x^c}{x^{-a}}\right)^{c-a}$

43. Show that :

$$\frac{1}{(3 - \sqrt{8})} - \frac{1}{(\sqrt{8} - \sqrt{7})} + \frac{1}{(\sqrt{7} - \sqrt{6})} - \frac{1}{(\sqrt{6} - \sqrt{5})} + \frac{1}{(\sqrt{5} - 2)} = 5$$

44. If $a = \frac{\sqrt{7} - \sqrt{6}}{\sqrt{7} + \sqrt{6}}$ and $b = \frac{\sqrt{7} + \sqrt{6}}{\sqrt{7} - \sqrt{6}}$, then find the value of $a^2 + b^2 + ab$.

45. Simplify : $\frac{2\sqrt{6}}{\sqrt{2} + \sqrt{3}} + \frac{6\sqrt{2}}{\sqrt{6} + \sqrt{3}} - \frac{8\sqrt{3}}{\sqrt{6} + \sqrt{2}}$

46. If $x = 9 - 4\sqrt{5}$, then find

(i) $x + \frac{1}{x}$

(ii) $x - \frac{1}{x}$

(iii) $x^2 + \frac{1}{x^2}$

(iv) $x^2 - \frac{1}{x^2}$

(v) $x^3 + \frac{1}{x^3}$

(vi) $x^3 - \frac{1}{x^3}$

(vii) $\sqrt{x} + \frac{1}{\sqrt{x}}$

(viii) $\sqrt{x} - \frac{1}{\sqrt{x}}$

$$(ix) \ x^4 + \frac{1}{x^4} \quad (x) \ x^6 + \frac{1}{x^6} \quad (xi) \ x + \frac{14}{x}$$

47. If $a = 1 + \sqrt{7}$, find the value of $\frac{-6}{a}$

48. If $p = 5 - 2\sqrt{6}$, Find $p^2 + \frac{1}{p^2}$

49. Express $0.\overline{3178}$ in the form of p/q where p and q are integers and $q \neq 0$.

50. If $\sqrt{2} = 1.414$, then find the value of $\sqrt{8} + \sqrt{50} + \sqrt{72} + \sqrt{98}$

51. Find the value of

$$\frac{4}{(216)^{\frac{-2}{3}}} + \frac{1}{(256)^{\frac{-3}{4}}} + \frac{2}{(243)^{\frac{-1}{5}}}$$

CHAPTER-1

NUMBER SYSTEMS

ANSWERS

- 1) $\frac{0}{1}, \frac{1}{1}, \frac{2}{1}, \frac{3}{1}, \frac{4}{1}$
- 2) $\frac{17}{8} = 2.125, \frac{3}{15} = 0.2, \frac{2}{7} = 0.\overline{285714}, \frac{50}{3} = 16.\bar{6}$
- 3) $\frac{15}{63}, \frac{16}{63}, \frac{17}{63}, \frac{18}{63}$ (other answers are possible).
- 4) $\sqrt{23} = 4.795, \sqrt{24} = 4.898$
- 5) 4.8010010001, 4.8020020002, (other answers are possible)
- 6) 2.1, 2.010010001, (other answers are possible).
- 8) 6
- 10) 4
- 11) 2016.1010010001 ; 2016.2020020002; (other answers are possible)
- 15) 0.909009000; 1.10100100010000 (other answers are possible)
- 16) 1 17) $\frac{1}{10^5}$ 18) 36 19) 14
- 20) $x = \frac{1}{4}$ 21) 1 22) $(60)^{2/5}$
- 23) (i) Terminating Decimal (ii) Non Terminating Repeating Decimal
 (iii) Non-Terminating Repeating Decimal
 (iv) Terminating Decimal (v) Non-Terminating Repeating Decimal
 (vi) Terminating Decimal (vii) Terminating Decimal

24. (i) Non-Terminating Repeating Decimal (Rational).
(ii) Terminating Decimal (Rational).
(iii) Non-Terminating Non-Repeating Decimal (Irrational).
(iv) Terminating Decimal (Rational)
(v) Non-Terminating Repeating Decimal (Rational)
(vi) Non-Terminating Repeating Decimal (Rational)
(vii) Non-Terminating Non-Repeating Decimal (Irrational)
(viii) Non-Terminating Non-Repeating Decimal (Irrational)
(ix) Non-Terminating Non-Repeating Decimal (Irrational)
(x) Non-Terminating Repeating Decimal (Rational).
25. (i) Irrational (ii) Rational (iii) Rational (iv) Irrational
(v) Rational (vi) Irrational (vii) Rational (viii) Rational
(ix) Irrational (x) Rational
26. (i) $0.0875 = \frac{7}{80}$ (ii) $\frac{2123456789}{1000000000}$ (iii) $\frac{2}{11}$
(iv) $\frac{433}{990}$ (v) $\frac{1643}{450}$
27. (i) $5\sqrt{3}$ (ii) $\sqrt{5} - 2\sqrt{11} + \sqrt{7} + \sqrt{13}$ (iii) 20
(iv) $-9 + 3\sqrt{5}$ (v) $-\frac{1}{10}$ (vi) $4\sqrt{6} - 3\sqrt{3}$
28. (i) -19 (ii) 2 (iii) $13 + 2\sqrt{42}$
(iv) $12 + 6\sqrt{3} - 2\sqrt{2} - \sqrt{6}$
29. (i) $\frac{1}{2}$ (ii) 2
30. $a = -2$ 31. 5 32. $\frac{3375}{512}$
33. $x = 3$ 34. $\frac{167}{90}$

35. $\frac{1}{59} (9\sqrt{3} + 5\sqrt{5} + \sqrt{7} - 2\sqrt{105})$

36. $a=0, b=2$

38. $\frac{1}{(1+y+xy)(1+z+yz)(1+x+zx)}$

39. (i) $\frac{9}{2}$ (ii) $\frac{11}{4}$

40. 4

41. 1

42. 1

44. $a^2 + b^2 + ab = 675$

45. 0

46. (i) 18 (ii) $-8\sqrt{5}$ (iii) 322

(iv) $-144\sqrt{5}$ (v) 5778 (vi) $-2584\sqrt{5}$

(vii) $2\sqrt{5}$ (viii) 4 (ix) 103682

(x) 33385282 (xi) $8\sqrt{3} - 14\sqrt{2}$

47. $1-\sqrt{7}$ 48. 98 49. $\frac{635}{1998}$

50. 28.28 51. 214

Practice Test

NUMBER SYSTEMS

Time : 50 Min.

M.M. 20

1. If $\frac{4}{a} = \frac{a^2}{16}$, then find a is rational or irrational number. (1)
2. Find two irrational numbers between $\sqrt{2}$ and $\sqrt{3}$. (1)
3. Simplify:

$$4\sqrt{3} + 3\sqrt{48} - \frac{5}{2}\sqrt{\frac{4}{3}}$$
 (2)
4. If $\sqrt{3} = 1.732$, find the value of $\frac{2}{\sqrt{3}-1}$ (2)
5. Find the value of x and y (3)

$$\frac{\sqrt{11} - \sqrt{7}}{\sqrt{11} + \sqrt{7}} = a - b\sqrt{77}$$
6. Represent $(2 + \sqrt{3})$ on the number line. (3)
7. Simplify : (4)

$$\frac{16 \times 2^{a+1} - 4 \times 2^a}{16 \times 2^{a+2} - 2 \times 2^{a+2}}$$
8. Express the following in the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$ (4)
 $0.\overline{4} + 0.1\overline{8}$

CHAPTER-2

POLYNOMIALS

KEY POINTS

1. A Polynomial $p(x)$ in one variable x is an algebraic expression in x of the form $p(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \dots + a_2 x^2 + a_1 x + a_0$, where
 - (i) $a_0, a_1, a_2, \dots, a_n$ are constants and $a_n \neq 0$
 - (ii) $a_0, a_1, a_2, \dots, a_n$ are respectively the coefficients of x^0, x, x^2, \dots, x^n ,
 - (iii) Each of $a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^{n-2} + \dots + a_2 x^2 + a_1 x + a_0$, is called a term of the polynomial.
 - (iv) n is called the degree of the polynomial where n is a non-negative integers.
2. **Degree of the Polynomial** : Highest power of x in the algebraic expression is called the degree of the polynomial.
3. **Different types of polynomials** :

Generally, we divide the polynomials in the following categories :

(i) Based on degrees

	Degree	Polynomial	General form	Examples
(a)	1	Linear	$ax + b$,	$x + 1, 2x$ etc.
(b)	2	Quadratic	$ax^2 + bx + c$,	$4x^2 + 5x + \frac{2}{3}$ etc.
(c)	3	Cubic	$ax^3 + bx^2 + cx + d$,	$x^3 - 3x^2 + 5$ etc.
(d)	4	Biquadratic	$ax^4 + bx^3 + cx^2 + dx + e$,	$x^4 - 16$ etc.

a, b, c, d, e are real constants and $a \neq 0$.

Note : A polynomial of degree five or more than five does not have any particular name. Such a polynomial usually called a polynomial of degree five or six or ... etc.

(ii) Based on Number of Terms:

	No. of Terms	Polynomial	Examples
(a)	1	Monomial	$5, 3x, \frac{1}{3}y$ etc.
(b)	2	Binomial	$\sqrt{3} + 6x, x - 5y, x^2 + 2$ etc.
(c)	3	Trinomial	$\sqrt{2}x^2 + 4x + 2, 5y^4 + 2y + 6$ etc.

Note : A polynomial having four or more than four terms does not have particular name. These are simply called polynomials.

(iii) Zero degree polynomial or non-zero constant polynomial.

Any non-zero number (constant) is regarded as polynomial of degree zero or zero degree polynomial. i.e., $p(x) = a$ where $a \neq 0$ is a zero degree polynomial, since we can write $p(x) = a$,

as $p(x) = ax^0$
 e.g., $5 = 5x^0$, $\frac{\sqrt{7}}{2} = \frac{\sqrt{7}}{2}x^0$

(iv) Zero Polynomial : A polynomial whose all coefficients are zero is called as zero polynomial i.e., $p(x) = 0$. The degree of zero polynomial is not defined or we can not determine the degree of zero polynomial.

4. For a polynomial $p(x)$ if $p(a) = 0$ where a is a real number we say that ' a ' is a zero of the polynomial.
5. If $p(x)$ is any polynomial of degree greater than or equal to 1 and $p(x)$ is divided by a linear polynomial $x - a$, then the remainder is $p(a)$. This is called remainder theorem.
6. If $p(x)$ is a polynomial of degree ≥ 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 $p(x)$.

This is called factor theorem.

7. A polynomial of degree ' n ' can have at most n zeroes.

• Some algebraic identities :—

(i) $(x+y)^2 = x^2 + 2xy + y^2$

(ii) $(x-y)^2 = x^2 - 2xy + y^2$

(iii) $x^2 - y^2 = (x+y)(x-y)$

(iv) $(x+a)(x+b) = x^2 + (a+b)x + ab$

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

$$(vi) \quad (x+y)^3 = x^3 + y^3 + 3xy(x+y) = x^3 + y^3 + 3x^2y + 3xy^2$$

$$(vii) \quad (x-y)^3 = x^3 - y^3 - 3xy(x-y) = x^3 - y^3 - 3x^2y + 3xy^2$$

$$(viii) \quad x^3 + y^3 = (x+y)(x^2 - xy + y^2)$$

$$ix) \quad x^3 - y^3 = (x-y)(x^2 + xy + y^2)$$

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

$$= \frac{1}{2} (x+y+z) \{(x-y)^2 + (y-z)^2 + (z-x)^2\}$$

$$xi) \quad \text{If } x+y+z=0, \text{ then } x^3 + y^3 + z^3 = 3xyz$$

Part-A

1. Write the coefficient of y^3 in $5y^3 + 2y^2 - y + 5$
2. Find the coefficient of x^2 in $(x^2 - 1)(x - 2)$
3. If $(x - 2)$ is one of the factor of $3x - 2a$, then find the value of a .
4. Find the degree of polynomial $\frac{x^3 + 3x - 1}{5} - \frac{5}{2}x^2 - x^5$
5. If $p(x) = x^3 - 3x^2 + 2x - 3$ find the value of $p(1) + p(-1)$.
6. Find zeros of the polynomial $z^2 - 8$
7. Dividend = Divisor \times Quotient + _____.
8. Give an example of Trinomial of degree 3.
9. Give one example each of monomial, binomial and quadratic polynomial.
10. Check whether $x = 3$ is a zero of polynomial $x^2 - 3x + x - 3$.
11. Write the degree of the polynomial $\sqrt{7}$
12. If one of the zero of polynomial $3x^2 + 5x + k$ is -1 , then find out the value of k .
13. Express $4x^2 - 4x + 1$ as a square of binomial.

Part – B

14. Check whether $q(x)$ is a multiple of $r(x)$ or not.
If $q(x) = 2x^3 - 11x^2 - 4x + 5$, $r(x) = 2x + 1$
15. Show that $(x - 5)$ is a factor of $x^3 - 3x^2 - 4x - 30$.
16. Evaluate by using suitable identity : $(997)^3$

17. Find the zeroes of the polynomial $p(x) = x(x-2)(x+3)$
18. Find the quotient when $3x^2 - 7x - 6$ is divided by $(x-3)$
19. Factorise $8x^3 + \sqrt{27}y^3$.
20. If $p(x) = x + 9$, then find $p(x) + p(-x)$.
21. Find the product without multiplying directly
 106×94
22. IF $36x^2 - b = \left(6x + \frac{1}{5}\right)\left(6x - \frac{1}{5}\right)$ then find the value of b .
23. Expand using suitable identity $(2x - 3y + z)^2$
24. Find the value of $(351)^2 - (350)^2$.

Part – C

25. Factorise : $64a^2 + 96ab + 36b^2$
26. Factorise : $x^3 + 6x^2 + 11x + 6$
27. If $x^2 + y^2 = 49$ and $x - y = 3$, then find the value of $x^3 - y^3$.
28. Simplify : $(5a - 2b)(25a^2 + 10ab + 4b^2) - (2a + 5b)(4a^2 - 10ab + 25b^2)$
29. Find the sum of remainders when $x^3 - 3x^2 + 4x - 4$ is divided by $(x - 1)$ and $(x + 2)$.
30. Find the product $\left(p - \frac{1}{p}\right)\left(p + \frac{1}{p}\right)\left(p^2 + \frac{1}{p^2}\right)\left(p^4 + \frac{1}{p^4}\right)$
31. Factorise : $7\sqrt{2}k^2 - 10k - 4\sqrt{2}$.
32. Simplify : $(3x - 4y)^3 - (3x + 4y)^3$
33. Expand : $\left(\frac{1}{2}x - \frac{1}{4}y + 2\right)^2$ using suitable identity.
34. Simplify : $(x + y + z)^2 - (x - y - z)^2$.

Part – D

35. Factorise : $125x^3 + 8y^3 + z^3 - 30xyz$.
36. $x + 2$ is a factor of polynomial $ax^3 + bx^2 + x - 2$ and the remainder 4 is obtained by dividing this polynomial by $(x - 2)$. Find the value of a and b .
37. Check whether
 $p(t) = 6t^3 + 3t^2 + 3t + 18$ is a multiple of $(2t + 3)$.
38. Find the value of k if $(x + k)$ is a factor of the polynomial $x^3 + kx^2 - 2x + k + 4$ and factorise $x^4 - x$.
39. If $(x - 3)$ and $\left(x - \frac{1}{3}\right)$ are factors of the polynomial $px^2 + 3x + r$, show that $p = r$.
40. (i) Using Identity, find the value of $(-7)^3 + (5)^3 + (2)^3$.
(ii) Find dimensions of cube whose volume is given by expression $4x^3 + 14x^2 + 6x$
41. Give possible expression for the length and breadth of each of the following rectangles if.
(i) Area = $(x^2 + 5\sqrt{5}x + 30)$ sq. unit.
(ii) Area = $(24x^2 - 26x - 8)$ sq. unit.
42. A literacy campaign was organised by Class IX girl students under NSS. Students made $(x - 5)$ rows and $(3x - 4)$ columns for the rally.
Write the total number of students in the form of a polynomial.
43. Under tree plantation programme students of Class IX planted total $(3x^2 - 4x - 4)$ trees in school.
If total number of students in the class are $(x - 2)$ then find out number of trees planted by each student. (Assuming each student planted equal number of trees).

44. If $a + b + c = 0$, find the value of

$$\frac{(b+c)^2}{bc} + \frac{(c+a)^2}{ca} + \frac{(a+b)^2}{ab}$$

45. Simplify :

$$\frac{(a^2-b^2)^3 + (b^2-c^2)^3 + (c^2-a^2)^3}{(a-b)^3 + (b-c)^3 + (c-a)^3}$$

46. Factorise :

$$(2a-b-c)^3 + (2b-c-a)^3 + (2c-a-b)^3$$

47. If the polynomial $4x^3 - 16x^2 + ax + 7$ is exactly divisible by $x-1$, then find the value of a . Hence factorise the polynomial.

48. Factorise: $x^2 - \frac{13}{24}x - \frac{1}{12}$

49. Factorise: $9x^3 - 27x^2 - 100x + 300$

50. Factorise: $x^4 - 5x^2 + 4$

51. If $\frac{x}{y} + \frac{y}{x} = -1$ where $x \neq 0$, $y \neq 0$ then find the value of $x^3 - y^3$.

52. Simplify: $\frac{155 \times 155 + 155 \times 55 + 55 \times 55}{155 \times 155 \times 155 - 55 \times 55 \times 55}$

CHAPTER-2 POLYNOMIALS

ANSWERS

1. 5 2. -2 3. $a = 3$
4. 5 5. -12 6. $+\sqrt{8}, -\sqrt{8}$
7. Remainder 8. $x^3 - 3x^2 + 2$ or any other example
9. $2x, 2x^2 + 3, x^2 + 2x - 3$ or any other examples
10. Yes 11. Degree = 0 12. $k = 2$
13. $(2x - 1)^2$ 14. No. 15. Hint put $x = 5$
16. 991026973 17. 0, 2, -3 18. $3x + 2$
19. $(2x + \sqrt{3}y)(4x^2 - 2\sqrt{3}xy + 3y^2)$ 20. 18
21. Hint $(100 + 6)(100 - 6)$ 22. $\frac{1}{25}$
23. $4x^2 + 9y^2 + z^2 - 12xy - 6yz + 4xz$ 24. 701
25. $(8a + 6b)^2$ 26. $(x + 1)(x + 2)(x + 3)$
27. 207 28. $117a^3 - 133b^3$ 29. -34
30. $p^8 - \frac{1}{p^8}$ 31. $(k - \sqrt{2})(7\sqrt{2}k + 4)$
32. $-8y(16y^2 + 27x^2)$ or $-128y^3 - 216x^2y$
33. $\frac{x^2}{4} + \frac{y^2}{16} + 4 - \frac{1}{4}xy - y + 2x$ 34. $4xy + 4zx$
35. $(5x + 2y + z)(25x^2 + 4y^2 + z^2 - 10xy - 2yz - 5zx)$
36. $a = 0, b = 2$ 37. Yes
38. $k = \frac{4}{3}, x(x - 1)(x^2 + x + 1)$
40. (i) -210; (ii) 2, $(x + 3), (2x + 1)$

41. (i) $(x + 2\sqrt{5}), (x + 3\sqrt{5})$ (ii) $(4x + 1), (6x - 8)$
42. $3x^2 - 19x + 20$
43. $(3x + 2)$
44. 3 45. $(a+b)(b+c)(c+a)$
46. $3(2a-b-c)(2b-c-a)(2c-a-b)$ 47. $a=5, (x-1)(2x+1)(2x-7)$
48. $\frac{1}{24}(3x-2)(8x+1)$
49. $(3x+10)(x-3)(3x-10)$
50. $(x-1)(x+1)(x-2)(x+2)$
51. 0
52. 0.01

Practice Test
POLYNOMIALS

Time : 50 Min.

M.M. 20

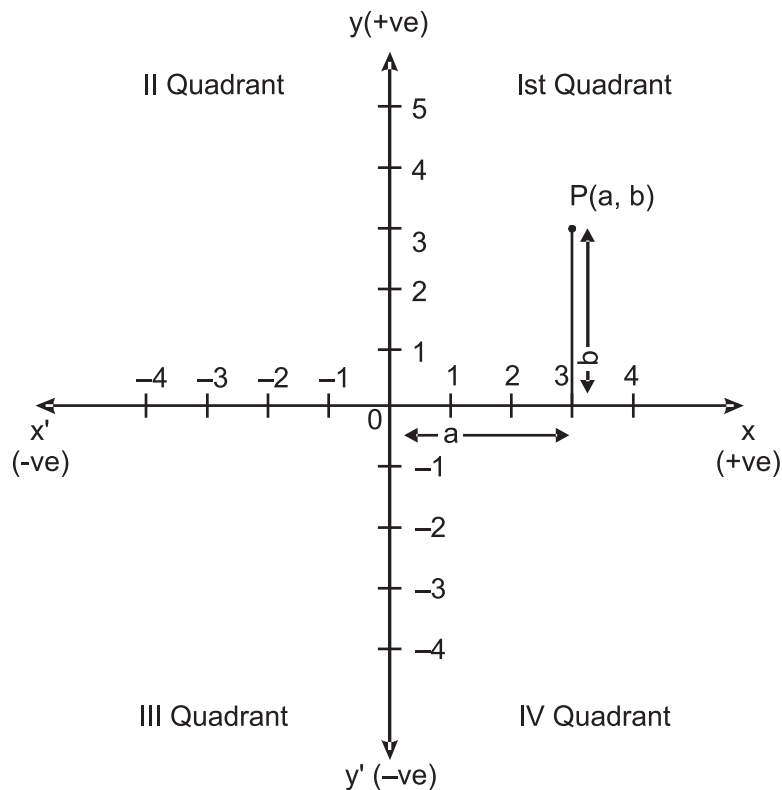
1. Is $(x^2)^{\frac{1}{2}} + 2\sqrt{5}a$ a polynomial? (1)
2. Show that $x = 1$ is a zero of the polynomial $3x^3 - 4x^2 + 8x - 7$. (1)
3. Find the zeroes of the polynomial $x^2 - 4x + 3$ (2)
4. If $x + y + z = 6$, $xy + yz + zx = 11$. Find the value of $x^2 + y^2 + z^2$. (2)
5. If $3x - 4$ is a factor of the polynomial $p(x) = 2x^3 - 11x^2 + kx - 20$, (3)
find the value k
6. Factorise : $a^2 + b^2 + 2(ab + bc + ca)$ (3)
7. If $a + b + c = 0$ then find the value of (4)
 $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab}$
8. Factorise $x^3 - 23x^2 + 142x - 120$ by using factor theorem. (4)

CHAPTER-3

CO-ORDINATE GEOMETRY

KEY POINTS

- **Coordinate Axes** : The position of a point in a plane is determined with reference to two fixed mutually perpendicular lines, called coordinate axes.



The horizontal line xox' is called x-axis.

The vertical line yoy' is called y-axis.

The intersection point of these two lines is called origin. It is represented by O.

- **Coordinates** : Location of a point P in cartesian system, written in the form of ordered pair say $P(a, b)$ as shown in figure above.
a is the length of perpendicular of P (a, b) from y-axis and is called abscissa of P.

b is the length of perpendicular of P (a,b) from x-axis and is called ordinate of P.

- Location of a point P (a, b) on graph with sign convention –

where a and b are such that —

	Value of Point	Sign of Point	Location of Point
(i)	$a = 0, b = 0$	—	origin
(ii)	$a > 0, b > 0$	(+, +)	Ist Quadrant
(iii)	$a < 0, b > 0$	(–, +)	IInd Quadrant
(iv)	$a < 0, b < 0$	(–, –)	IIIrd Quadrant
(v)	$a > 0, b < 0$	(+, –)	IVth Quadrant

Note : If a point lie on x-axis or y-axis it does not lie in any quadrant.

- Coordinate of a point on x-axis are of the form (x, o)
- Coordinate of a point on y-axis are of the form (o, y).

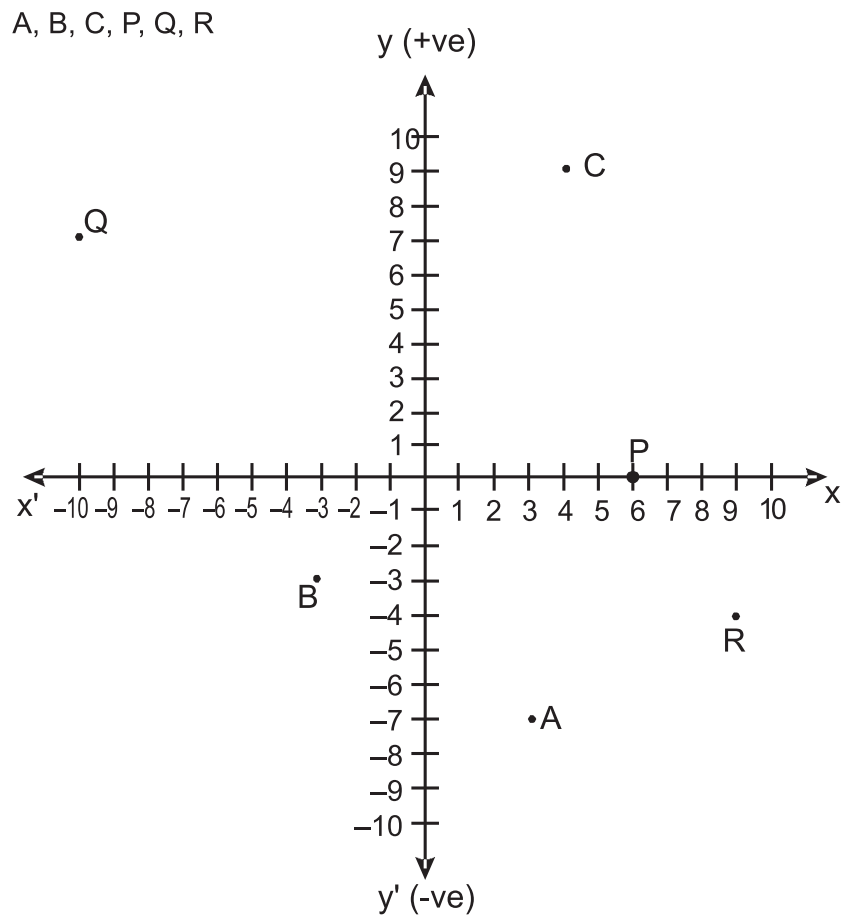
Part-A

1. In which quadrant do the given points lie.
(i) $(3, -2)$ (ii) $(17, -30)$ (iii) $(-2, 5)$
(iv) $(-50, -20)$ (v) $(10, 100)$ (vi) $(-81, 80)$
2. On which axis do the given points lie.
(i) $(11, 0)$ (ii) $(-11, 0)$ (iii) $(0, 14)$
(iv) $(0, -100)$
3. The abscissa and ordinate of a point A are -3 and -5 respectively then write down the coordinate of A.
4. Write the name of the point where both axes intersect?
5. Is $P(7, 0)$ and $Q(0, 7)$ represent the same point?
6. In which quadrants x coordinate is negative?
7. Name the figure formed when we plot the points $(0, 0)$, $(4, 4)$ and $(0, 4)$ on a graph paper.
8. In which quadrant, does the point A (x, y) with values $x > 0$ and $y > 0$ exists.
9. If Q is a point on x -axis then its ordinate will definitely be _____.
10. Write the coordinates of the fourth vertex of a square when three of its vertices are given by $(1, 2)$ $(5, 2)$ $(5, -2)$.
11. The perpendicular distance of the point P $(5, 2)$ from x -axis is _____ and from y -axis is _____.
12. The perpendicular distance of the point Q $(-116, -80)$ from x -axis is _____ and from y -axis is _____.
13. If abscissa of a point A is positive & ordinate is negative then in which quadrant do A lie?
14. Write the coordinates of a point whose perpendicular distance from x -axis is 5 units & perpendicular distance from y -axis is 3 & it lies in II quadrant.

15. Draw the Cartesian plane on a graph paper and plot the given points.

- | | | |
|-----------------|----------------------|-----------------|
| (i) A (3, 5) | (ii) B ($-7/2$, 0) | (iii) C (2, -6) |
| (iv) D (-6, -4) | (v) E (0, $-5/2$) | (vi) F (8, 0) |

16. Write the coordinates of each of points in the given figure.



17. Point P (4, 3) is in the first quadrant. Find the coordinate of the point Q, opposite to P in fourth quadrant.

18. Find the distance of point (8, 3) from x axis.

19. Write the name of the figure formed by joining the points A (-3, 0), B (0, 3) and C (3, 0) in the cartesian plane.

20. Write the coordinates of the point that lies on y-axis and is at a distance of 2 units in upward direction.

Part – B

21. If the mirror image of a point (x, y) about x-axis is $(x, -y)$ then the mirror image of the point S $(-5, 7)$ about x-axis is _____.
22. Find the distance of the point P $(4, 0)$ from origin.
23. Write the mirror image of $(4, -3)$ about y-axis.

Part – C

24. Draw a line segment on a graph paper whose end points lies in first quadrant and third quadrant. Write the coordinates of its end points and mid point of line segment.
25. Plot the points A $(2, 4)$ & B $(2, -5)$ whose x-coordinates are same. Is this line AB parallel to any of the axes. If yes, to which axis is it parallel ?
26. Plot the points P $(2, -3)$ & Q $(-5, -3)$ whose ordinates are same. To which axis the line P Q is parallel ?
27. Plot the points A $(7, 6)$ & B $(7, -6)$ on graph paper. Join them & answer the following :
- (i) Write the coordinate of the point where line AB cuts the x-axis?
 - (ii) To which axis, line AB is parallel ?
28. Draw a triangle ABC on graph paper having the coordinates of its vertices as A $(-2, 0)$, B $(4, 0)$ and C $(1, 5)$. Also find the area of triangle.
29. If we plot the points P $(5, 0)$, Q $(5, 5)$, R $(-5, 5)$ and S $(-5, 0)$, which figure will we get? Name the axis of symmetry of this figure?
30. Find the coordinates of a point which is equidistant from the two points $(-4, 0)$ and $(4, 0)$. How many of such points are possible satisfying the condition?
31. Draw a quadrilateral with vertices A $(4, 3)$, B $(-4, 3)$, C $(-4, -3)$ and D $(4, -3)$. Draw its diagonals and write the coordinates of the point where the diagonals cut each other?

Part – D

32. A rectangular field is of length 10 units & breadth 8 units. One of its vertex lie on the origin. The longer side is along x-axis and one of its vertices lie in first quadrant. Find all the vertices.
33. Plot the points B (5, 3), E(5, 1), S (0, 1) and T(0, 3) and answer the following :
- (i) Join the points and name the figure obtained.
 - (ii) Find the area of figure.

CHAPTER-3
COORDINATE GEOMETRY

ANSWERS

1. (i) IV Quadrant (ii) IV Quadrant (iii) II Quadrant
(iv) III Quadrant (v) I Quadrant (vi) II Quadrant
2. (i) x-axis (ii) x-axis (iii) y-axis
(iv) y-axis
3. $(-3, -5)$ 4. Origin 5. No
6. II and III Quadrant 7. Right Angle Triangle
8. Ist Quadrant 9. 0 10. $(1, -2)$
11. x-axis -2 units; y-axis -5 units
12. x-axis -80 units; y-axis -116 units 13. IV
14. $(-3, 5)$
16. $A(3, -7), B(-3, -3), C(4, 9), P(6, 0), Q(-10, 7), R(9, -4)$
17. $(4, -3)$ 18. 3 units
19. Triangle or isosceles Triangles 20. $(0, 2)$
21. $(-5, -7)$ 22. 4 units 23. $(-4, -3)$
25. Yes, y-axis 26. x-axis
27. (i) $(7, 0)$ (ii) Parallel to y-axis
28. 15 square units 29. Rectangle, y-axis
30. Any point on y-axis, infinite 31. At origin $(0, 0)$
33. (i) Rectangle (ii) 10 units

Practice Test

COORDINATE GEOMETRY

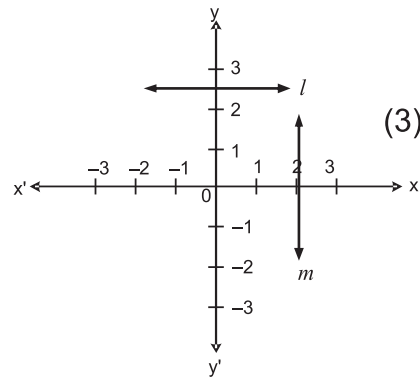
Time : 50 Min.

M.M. 20

1. In which quadrant, the point (x, y) will lie? (Where x is a positive and y is a negative number). (1)
2. Write the y -coordinate of a point which lies on x -axis. (1)
3. Find the value of x and y if: (2)
 - (a) $(x - 4, 7) = (4, 7)$
 - (b) $(1, 2y - 3) = (1, 7)$
4. What is the distance of a point $(7, 6)$ from x -axis and y -axis? (2)
5. Plot the following points in a Cartesian plane. (3)

$(-3, 5), (-2, 0), (-4, 0)$
6. Write the equations of lines l and m as shown in the figure. (3)

Also name the line which is represented by $x = 0$.
7. Plot the points $O(0, 0), A(4, 0)$ and $C(0, 6)$. Find the coordinates of the fourth point B such that $OABC$ forms a rectangle. (4)
8. The base AB of two equilateral triangle ABC and ABD with side $2a$, lies along the x -axis such that the mid point of AB is at the origin. Find the coordinates of two vertices C and D of the triangles. (4)



CHAPTER-4

LINEAR EQUATIONS IN TWO VARIABLES

KEY POINTS

- **Linear equation in one variable** – An equation which can be put in the form $ax+b=0$, $a \neq 0$ and a, b are real numbers is called a linear equation in one variable.
- **Linear equation in two variables** – Any equation which can be put in the form $ax+by+c=0$, where a, b , and c are real numbers and $a, b \neq 0$, is called a linear equation in two variables.

Linear equation in one variable has a unique solution

$$ax + b = 0 \Rightarrow x = -\frac{b}{a}$$

- Linear equation in two variables has infinitely many solutions.
- The graph of every linear equation in two variables is a straight line.
- Every point on the line satisfies the equation of the line.
- Every solution of the equation is a point on the line. Thus, a linear equation in two variables is represented geometrically by a line whose points make up the collection of solutions of the equation.

Graph :

- * The pair of values of x and y which satisfies the given equation is called solution of the equation in two variables.

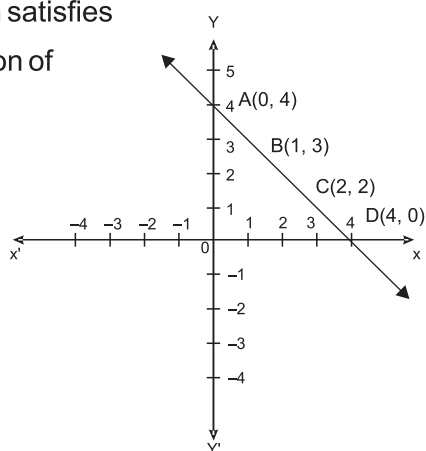
Example : $x + y = 4$

Solutions of equation

$x+y = 4$ are

$(0,4) (1,3) (2,2) (4,0)$

and many more

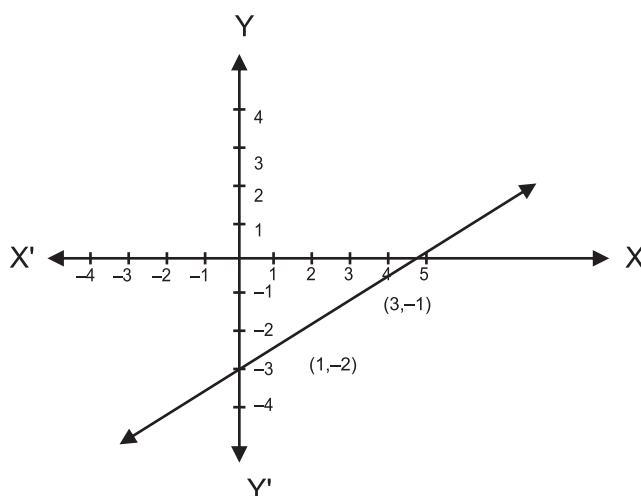


Part – A

1. Express the linear equation $\sqrt{2}x - 4 = 5y$ in the form of $ax + by + c = 0$ and thus indicate the values of a , b and c .
2. Express x in terms of y for the equation $3x + 4y = 7$
3. Express y in the terms of x .
 $3y + 5x = 9$
4. Point $(9, 0)$ lie on which axis?
5. Write the equation of x axis.
6. Express the equation $5y = 9$ as linear equation in two variables.
7. Write the linear equation which is parallel to x -axis and is at a distance of 2 units from the origin in upward direction.
8. Check whether $(1, -2)$ is a solution of $2x - y = 6$.
9. Check whether $x = 2$ & $y = -2$ is a solution of $2x - y = 6$.
10. How many solutions are there for equation $y = 5x + 2$.
11. Find the value of K , if $x = -1$ & $y = 1$ is a solution of equation $Kx - 2y = 0$.
12. If the graph of equation $2x + Ky = 10$ intersects x -axis at point $(5, 0)$ find the value of K .
13. The graph of the linear equation $4x = 6$ is parallel to which axis?
14. At what point the graph of $2x - y = 6$, cuts x -axis?
15. Check whether $(0, 0)$ is a point on $y = mx + c$ or $y = mx$.
16. On which side of y -axis, $x + 3 = 0$, lies.
17. Find any two solutions of equation
 $2x + y = x + 5$.
18. Find the value of P if $x = 2$, $y = 3$ is a solution of equation $5x + 3Py = 4a$
19. If the points $A(3, 5)$ and $B(1, 4)$ lies on the graph of line $ax + by = 7$, find the value of a .

20. Write the coordinates of the point where the graph of the equation $5x+2y=10$ intersect both the axes.
21. Write the equations of two lines passing through $(3, 10)$.
22. The cost of coloured paper is ₹ 7 more than $\frac{1}{3}$ of the cost of white paper. Write this statement in linear equation in two variables.
23. Draw the graph of equation $x+y=5$.
24. From the choices given below, choose the equation whose graph is given in figure –

- (i) $x+2y = 5$
(ii) $x-2y = 5$
(iii) $y + 2x = 5$



25. The graph of linear equation $2x - y = 6$ will pass through which quadrant(s).
26. How many solutions of the equation $3x - 2 = x - 3$ are there on the
(i) Number line
(ii) Cartesian plane..
27. Find the points where the graph of $x + y = 4$ meets line which is
(i) parallel to x-axis at 3 units from origin in positive direction of y-axis.
(ii) parallel to y-axis at 2 units on left of origin.
28. If the points A $(4,6)$ and B $(1,3)$ lie on the graph of $ax+by=8$ then find the value of a and b.
29. Find the value of 'a' if $(1, -1)$ is the solution of the equation $2x + ay = 5$. Find the two more solutions of the equation.

30. Find two solutions of the equation $4x + 5y = 28$. Check whether $(-2, 10)$ is solution of the given equation.
31. Write the equation of line passing through $(3, -3)$ & $(6, -6)$.
32. If $x = 3k - 2$, $Y = 2k$ is a solution of equation $4x - 7y + 12 = 0$, then find the value of K .
33. If $(m - 2, 2m + 1)$ lies on equation $2x + 3y - 10 = 0$, find m .
34. $F = (9/5)C + 32$.
 - (i) If the temperature is 35°C , what is the temperature in Fahrenheit?
 - (ii) If the temperature is 30°C , what is the temperature in Fahrenheit?
35. Draw the graph of the linear equation $2x + 3y = 6$. Find out the coordinates of the points where the line intersects at x axis and y -axis.
36. Draw the graph for the linear equations
 $3x - 4y = 12$. If $x = 8$, find the value of y with the help of graph.
37. Draw the graph of $y = x$ & $2y = -5x$ on the same graph.
38. Give the geometrical representation of $5x + 7 = 0$ as equation.
 - (i) in one variable
 - (ii) in two variables
39. Draw the graph of the linear equations $2y - x = 7$. With the help of graph check whether $x = 3$ and $y = 2$ is the solution of the equation?

Part – D

40. Write $3y = 8x$ in the form of $ax + by + c = 0$. Write x in terms of y . Find any two solutions of the equation. How many solutions you can find out?

41. Rohan and Ramita of Class IX decided to collect ₹ 25 for class cleanliness. Write it in linear equations in two variables. Also draw the graph.
42. Sarika distributes chocolates on the occasion of children's Day. She gives 5 chocolates to each child and 20 chocolates to adults. If no. of children is represented by 'x' and total distributed chocolates as 'y'.
- Write it in the form of linear equation in two variables.
 - If she distributed 145 chocolates in total, find no. of children?
43. Priyanka and Arti decided to donate ₹ 1600 for the Army widows. Priyanka's share as 'x' and Arti share as 'y'.
- Form a linear equation in two variables.
 - If Priyanka donates thrice the amount donated by Arti, then find out the amount donated by both.
44. Riya participates in Diwali Mela with her friends for the charity to centre of handicapped children. They donate ₹ 3600 to the centre from the amount earned in Mela. If each girl donates ₹ 150 and each boy donates ₹ 200.
- Form the linear equation in two variables.
 - If no. of girls are 8, find no. of boys.
45. Akool is driving a car with uniform speed of 60 km/hr. Assuming total distance to be y km & time taken as x hours, form a linear equation. Draw the graph. From the graph read the following:
- distance travelled in 90 minutes.
 - Time taken to cover a distance of 150 km.
46. The parking charges of a car in a private parking is ₹ 20 for the first hour and ₹ 10 for subsequent hours. Taking total parking charges to be y & total parking time as x hours form a linear equation. Write it in standard form & hence find, a, b & c. Draw the graph also.

47. We know that $C = 2\pi r$, taking $\pi = 22/7$, circumference as y units, radius as x units, form a linear equation. Draw the graph. Check whether the graph passes through $(0, 0)$. From the graph read the circumference when radius is 2.8 units.

CHAPTER-4
LINEAR EQUATIONS IN TWO VARIABLES

ANSWERS

1. $\sqrt{2}x - 5y - 4 = 0$, Where $a = \sqrt{2}$, $b = -5$, $c = -4$
2. $x = \frac{7 - 4y}{3}$
3. $y = \frac{9 - 5x}{3}$
4. x-axis
5. $y = 0$
6. $0.x + 5.y = 9$
7. $y = 2$
8. No
9. Yes
10. Infinitely many solutions
11. $k = -2$
12. $K = 1$
13. Parallel to y-axis.
14. $(3, 0)$
15. $y = mx$
16. On left side
17. $(1, 4)(0, 5)$ (or any other two possible solutions)
18. $P = \frac{4a - 10}{9}$
19. $a = -1$
20. $(0, 5)$ and $(2, 0)$

21. $3x - y + 1 = 0$ (or any other possible solution)
 $12x + 7y = 106$.
22. $3x - y = 21$ (Let the cost of coloured paper be ₹ x cost of white paper by ₹ y).
24. $x - 2y = 5$
25. I, II, III
26. (i) One Solution (ii) Infinitely many
27. (i) (3, 1) (ii) (6, -2)
28. $a = -4, b = 4$
29. $a = -3$ (any two solutions)
30. (2, 4), (7, 0), No
32. $k = 2$
33. $m = 11/8$
34. $95^\circ \text{F}, 86^\circ \text{F}$
35. (3, 0), (0, 2)
36. $y = 3$
39. No
40. $8x - 3y + 0 = 0$
 $a = 8, b = -3, c = 0$
 Infinitely many solutions.
41. $x + y = 25$

42. (i) $5x + 20 = y$

(ii) 25

43. (i) $x + y = 1600$

(ii) Priyanka = ₹1200, Arti = ₹400

44. (i) $150x + 200y = 3600$, (ii) Boys = 12

45. $y = 60$, (i) 90 km (ii) $2\frac{1}{2}$ hours

46. $y = 20 + 10x$

Standard form $10x - y + 20 = 0$

$a = 10$, $b = -1$, $C = 20$

PRACTICE TEST
LINEAR EQUATIONS IN TWO VARIABLES

Time : 50 Min.

M.M. 20

1. The graph of linear equation $2y = 5$ is parallel to which axis? (1)
2. Write the linear equation the graph of which is parallel to y-axis and is at a distance 3 units on left from the origin. (1)
3. If the point $(5, 2)$ lies on the graph of the linear equation $kx + 5y = 10$, Find k . (2)
4. Write two linear equations the graph of which passes through $(2, -3)$. the from of (2)
5. Write the linear equation $x + \sqrt{3}y = 4$ in the form of $ax + by + c = 0$ & hence write the values of a, b & c . Write x in terms of y . (3)
6. Find the solutions of linear equation $2x + y = 4$ which represents a point on (3)
 - (i) x-axis,
 - (ii) y-axis.
 - (iii) parallel to x-axis at a distance 3 units from origin.
7. Give the geometrical representation of $2x + 5 = 0$ as a linear-equation in (4)
 - (a) one variable
 - (b) two variables.
8. In a Residential Society, Rain water is stored in underground water tank. The water is stored at the rate of 30 cubic cm per second. If water stored is y cubic cm in x second, write a linear equation in two variables. Draw its graph. (4)

From the graph read the following:

 - (i) Total water stored in 3 seconds.
 - (ii) In how many seconds water stored is 120 cm^3 ?

CHAPTER-5
INTRODUCTION TO EUCLID'S GEOMETRY
KEY POINTS

- **Introduction** : Euclidean geometry, which is taught today is named after Euclid - he is known as "the father of geometry". Euclid also studied and contributed in other areas of mathematics, including number theory and astronomy.
- **Axiom or Postulates** : Axiom or Postulates are the assumptions which are obvious universal truths. They are not proved.
- **Theorems** : Theorems are statements which are proved using definitions, axioms, previously proved statements and deductive reasoning.

SOME OF EUCLID'S AXIOMS

1. Things which are equal to the same thing are equal to one another.
2. If equals are added to equals the whole are equal.
3. If equals are subtracted from equals the remainders are equal.
4. Things which coincide with one another are equal to one another.
5. The whole is greater than the part.
6. Things which are double of the same things are equal to one another.
7. Things which are halves of the same things are equal to one another.

EUCLID'S POSTULATES AND DEFINITIONS

- **Postulates 1** : A straight line may be drawn from any one point to any other points.
- **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 two straight lines if produced indefinitely, meet on that side on which the sum of angles is less than two right angles.

DEFINITIONS

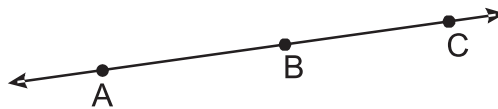
1. A Point is that which has no part.
2. A line is breadth less length.
3. The ends of a line are points.
4. A straight line is a line which lies evenly with the points on it self.
5. A surface is that which contain length and breadth only.
6. The edges of a surface are lines.
7. A plane surface is a surface which lies evenly with the straight lines on it self.
8. Two distinct lines can not have more than one point in common.

Part – A

1. Write the number of dimensions, that a surface contain.
2. A proof is required for _____ (Postulate, Axioms, Theorem).
3. The number of line segments determined by three collinear points is _____ (Two, three, only one).
4. Euclid stated that if Equals are subtracted from Equal then the remainders are equal in the form of _____ (an axiom, a definition, a postulate).
5. In given figure $AD = BC$ then AC and BD are equal or not?

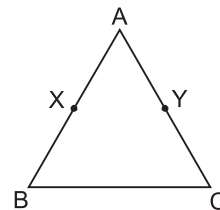


6. How many lines can pass through a single point ?
7. State Euclid's first postulate.
8. Write Euclid's fifth postulate.
9. If $a + b = 15$ and $a + b + c = 15 + c$
which axiom of Euclid does the statement illustrate?
10. If A, B and C are three points on a line and B is between A and C then prove that $AC - BC = AB$.

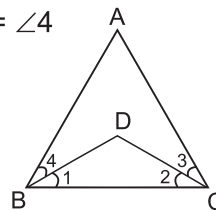


Part – B

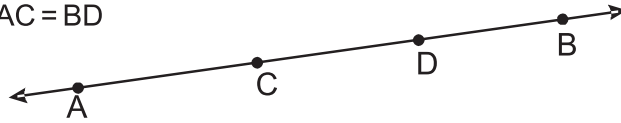
11. If $x + y = 10$ and $x = z$ then show that $z + y = 10$
12. In given figure $AX = AY$, $AB = AC$
Show that : $BX = CY$



13. In given figure $\angle ABC = \angle ACB$ and $\angle 3 = \angle 4$
Show that $\angle 1 = \angle 2$



14. In the given figure of $AD = CB$
then prove that $AC = BD$



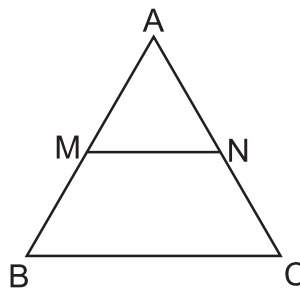
15. Solve the equation $x - 10 = 15$, State which axiom do you use here.
16. If a point C lies between two points A and B such that $AC = BC$ then prove that

$$AC = \frac{1}{2} AB$$

17. In the given figure

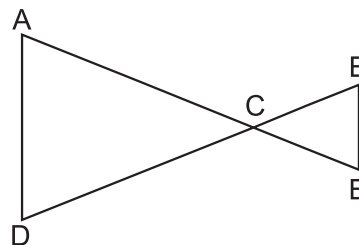
$$AM = \frac{1}{2} AB$$

$$AN = \frac{1}{2} AC$$



show that $AB = AC$

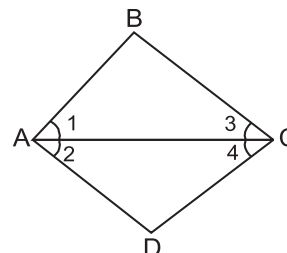
18. In the given figure $AC = DC$, $CB = CE$
then show that $AB = DE$



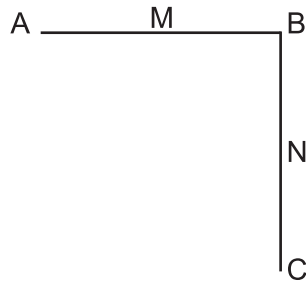
19. Prove that every line segment has one and only one mid point.
20. State true or false
(a) only one line can pass through a single point.
(b) There are infinitely many number of lines which passes through the two distinct point.
(c) Euclid belongs to Greece.

Part – C

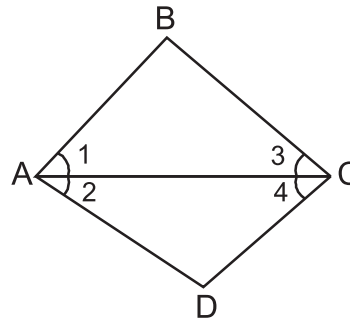
21. In the given figure $\angle 1 = \angle 2$ and $\angle 2 = \angle 3$
then show that $\angle 1 = \angle 3$



22. In the give figure $AB = BC$, M is the mid point of AB and N is the mid point of BC. Show that $AM = NC$



23. In the given figure $\angle 1 = \angle 3$ and $\angle 2 = \angle 4$
then show that $\angle BAD = \angle BCD$



24. An equilateral triangle is a polygon made up of three line segments out of which two line segments are equal to the third one and all the angles are 60° each.

Can you justify that all sides and all angles are equal in equilateral triangle?

25. RAM and Shyam are two students of Class IX. They give equal donation to a blind school in the month of March. In April each student double their donation.
- compare their donation in April.
 - which mathematical concept have been covered in this question?
26. Monika and Vasu have the same weight if they both gain weight by 2kg. How will their new weights be compared?
- What mathematical concept have been covered in this question?

CHAPTER-5
INTRODUCTION TO EUCLID'S GEOMETRY

ANSWERS

- | | | |
|--|------------------|-------------|
| 1. Two | 2. Theorem | 3. Only One |
| 4. Axiom | 5. Equal | 6. Infinite |
| 9. Second axiom | 15. Second Axiom | |
| 20. (a) false | (b) false | (c) true |
| 25. (a) Donation amount is same in April | | |
| (b) Euclid's axiom | | |
| 26. (a) Euclid's axiom | | |

PRACTICE TEST

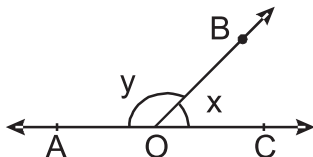
Introduction To Euclid's Geometry

Choose the correct option:

1. Through two points :
 - (a) A unique line can be drawn
 - (b) No line can be drawn
 - (c) More than one line can be drawn
2. Through a fixed point :
 - (a) A unique line can be drawn
 - (b) No line can be drawn
 - (c) More than one line can be drawn
3. Number of line segments required to form a closed figure :
 - (a) 2
 - (b) 3
 - (c) 4
4. Two lines having a common point is called :
 - (a) Parallel lines
 - (b) Intersecting lines
 - (c) Coincident lines
5. Euclid arranged all known work in the field of mathematics in his treatise called :
 - (a) Elements
 - (b) Axioms
 - (c) Postulates
6. The thing which are double the same thing are :
 - (a) Halves of the same thing
 - (b) Double of the same thing
 - (c) Equals
7. Axioms are assumed :
 - (a) Universal truth specific of geometry
 - (b) Universal truths in all branches of mathematics
 - (c) Definitions
8. A mathematics statement whose truth has been logically established is called :
 - (a) An Axiom
 - (b) A Postulates
 - (c) A Theorem

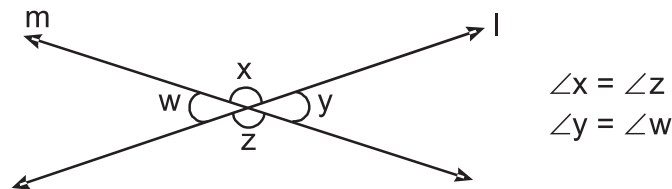
CHAPTER-6
LINES AND ANGLES
KEY POINTS

- Line is a collection of points which has only length neither breadth nor thickness.
- **Line Segment** : A part of portion of a line with two end points.
- **Ray** : A part of a line with one end point.
- **Collinear points** : Three or more points lying on the same line.
- **Angle** : An angle is formed when two rays originate from the same end point. The rays making an angle are called the arms and the end point is the vertex.
- **Acute angle** : An angle measure between 0° and 90°
- **Right angle** : Angle exactly equal to 90°
- **Obtuse angle** : An angle greater than 90° but less than 180°
- **Straight angle** : An angle exactly equal to 180°
- **Reflex Angle** : An angle greater than 180° but less than 360°
- **Complimentary Angles** : A pair of angles whose sum is 90°
- **Supplementary angle** : A pair of angles whose sum is 180°
- **Complete Angle** : An angle whose measure is 360° .
- **Adjacent angles** : Two angles are adjacent if
 - (i) They have a common vertex.
 - (ii) a common arm
 - (iii) Their non common arms are on opposite sides of common arm.
- **Linear pair of angle** : A pair of adjacent angles whose sum is 180°



$\angle AOB$ & $\angle COB$ are forming linear pair.

- **Vertically opposite angles** : Angles formed by two intersecting lines on opposite side of the point of intersection.



- **Intersecting line** : Two lines are said to be intersecting when the perpendicular distance between the two lines is not same every where. They meet at one point.
- **Non Intersecting lines** : Two lines are said to be non-intersecting lines when the perpendicular distance between them is same every where. They do not meet. If these lines are in the same plane these are known as **Parallel lines**.
- **Transversal line** : In the given figure $l \parallel m$ and t is transversal then

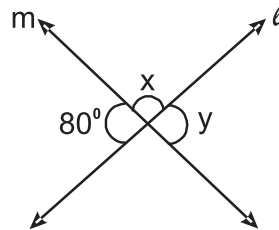
<p>(a)</p> $\left. \begin{array}{l} \angle 1 = \angle 3 \\ \angle 2 = \angle 4 \\ \angle 5 = \angle 7 \\ \angle 6 = \angle 8 \end{array} \right\}$	<p>Vertically opposite angle</p>	
<p>(b)</p> $\left. \begin{array}{l} \angle 1 = \angle 5 \\ \angle 2 = \angle 6 \\ \angle 3 = \angle 7 \\ \angle 4 = \angle 8 \end{array} \right\}$	<p>Corresponding angle</p>	
<p>(c)</p> $\left. \begin{array}{l} \angle 3 = \angle 5 \\ \angle 4 = \angle 6 \end{array} \right\}$	<p>Alternate Interior angle</p>	
<p>(d)</p> $\left. \begin{array}{l} \angle 3 + \angle 6 = 180^\circ \\ \angle 4 + \angle 5 = 180^\circ \end{array} \right\}$	<p>Angles on the same sides of a transversal are supplementary.</p>	

$\angle 3, \angle 6$ and $\angle 4, \angle 5$ are called co-interior angles or allied angles or consecutive interior angles.

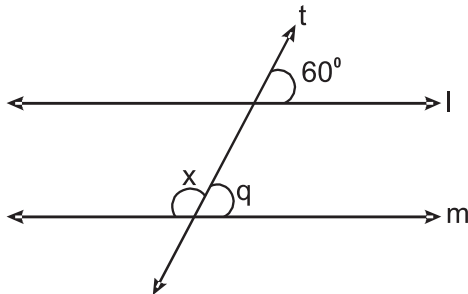
- Sum of all interior angles of a triangle is 180° .
- Two lines which are parallel to the third line are also parallel to each other.

Part – A

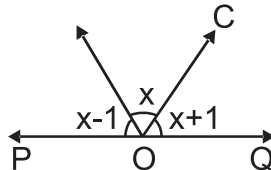
1. From the figure find x and y



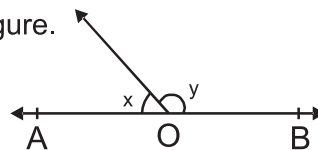
2. If an angle is equal to its complement find the angle.
3. In the adjoining figure if $l \parallel m$ and t is transversal, find the value of x .



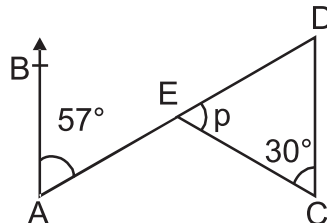
4. In the figure POQ is a straight line. The three adjacent angles are consecutive numbers. What are the measure of these angles?



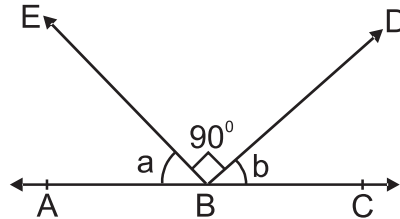
5. Twice of x is 30° less than y , find x & y from figure.



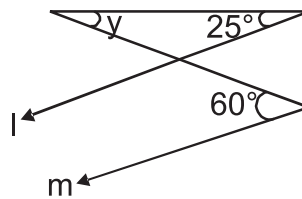
6. In the adjoining figure if $AB \parallel CD$ what is the value of p ?



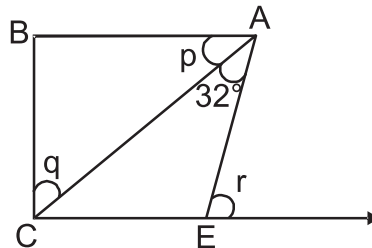
7. In the adjoining figure find the value of $a + b$ if $\angle DBE = 90^\circ$



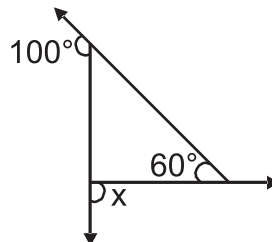
8. In the figure $l \parallel m$ find $\angle y$



9. If $p : q = 11 : 19$, $AB \parallel CE$ what are the values of p , q & r .



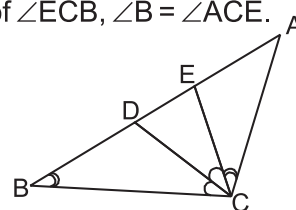
10. What is x in the figure?



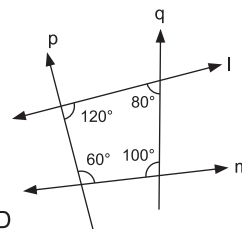
11. One of the angle of a pair of supplementary angles is 2° more than its supplement, find the angles.

12. In the figure CD is the angle bisector of $\angle ECB$, $\angle B = \angle ACE$.

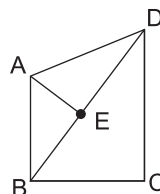
Prove that $\angle ADC = \angle ACD$



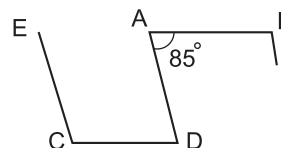
13. From the figure, tell which pair of lines are parallel and why? Explain the reason



14. In figure, if $\angle AED = \angle BDC + \angle BAE$, then show that : $AB \parallel CD$.

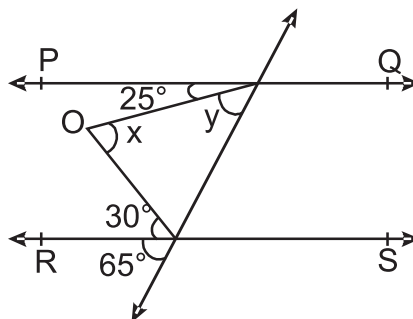


15. In figure, $AB \parallel CD$ and $EC \parallel AD$, find x -

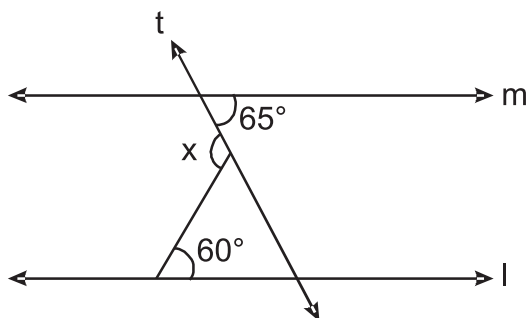


PART-B

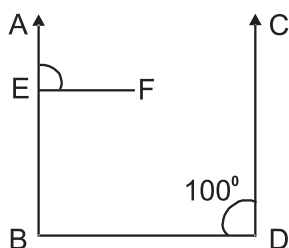
16. In the adjoining figure $PQ \parallel RS$ find x and y.



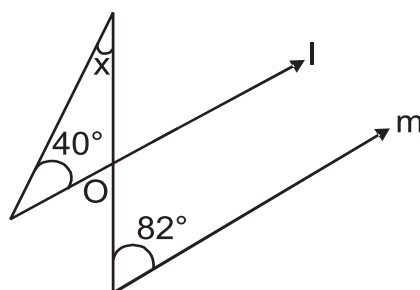
17. By contributing money, 5 friends bought pizza. They want to divide it equally among themselves. But one of them was given double piece, as he was very hungry. Find the angle of the piece of pizza each one received.
18. BO and CO are external bisector of $\angle B$ and $\angle C$ of a $\triangle ABC$ Intersecting at O. If $\angle A = 60^\circ$ $\angle ABC = 70^\circ$, find $\angle BOC$.
19. In the above question 18, if internal bisector of $\angle B$ and $\angle C$ intersect at P, prove that $\angle PBO = 90^\circ$ and $\angle BOC + \angle BPC = 180^\circ$
20. In the given figure if $l \parallel m$ and 't' is the transversal find x.



21. An exterior angle of a triangle is 103° and two of its interior opposite angles are equal, find the angles.
22. Prove that vertically opposite angles are equal.
23. In the figure $AB \parallel CD$ and $EF \parallel BD$ if $\angle CDB = 100^\circ$, find $\angle AEF$

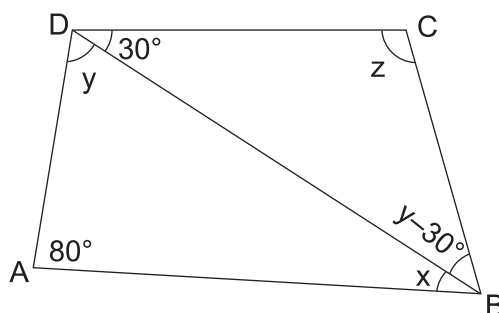


24. In the given figure $l \parallel m$ find the value of x .



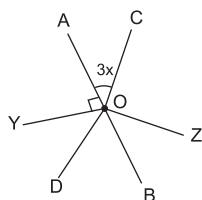
25. The angles of a triangle are $(x - 40^\circ)$, $(x - 20^\circ)$, $(\frac{x}{2} - 10^\circ)$
Find the value of x and then find the angles of the triangle.

26. In the given figure if $AB \parallel DC$ and $\angle BDC = 30^\circ$ $\angle BAD = 80^\circ$ find $\angle x$, $\angle y$, $\angle z$.

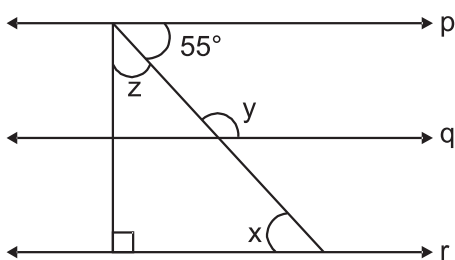


Part – C

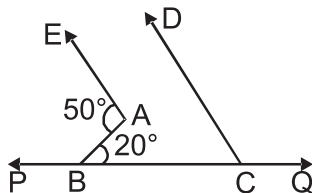
27. If one of the angle of two intersecting lines is right angle then prove that other three angles will also be right angles.
28. AB and CD are intersecting lines. OD is bisector of $\angle BOY$. Find x .



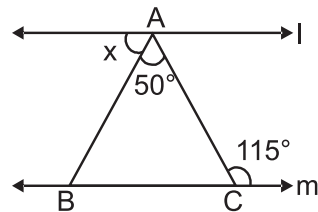
29. If $p \parallel q \parallel r$, find x , y , z from given figure.



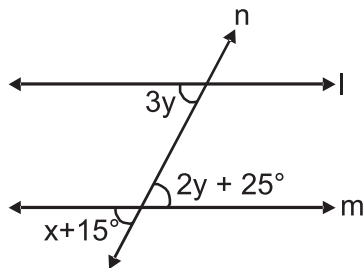
30. In the given figure find $\angle DCB$ if $AE \parallel CD$.



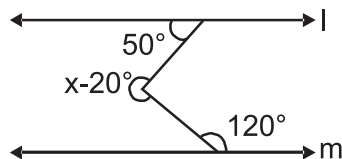
31. In the given figure $l \parallel m$ find x .



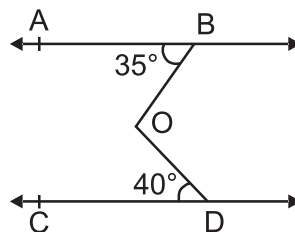
32. In the given figure $l \parallel m$ and n is the transversal, find x .



33. For what value of x , $l \parallel m$.

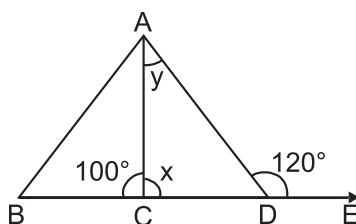


34. From the figure find reflex angle $\angle BOD$ if $AB \parallel CD$.

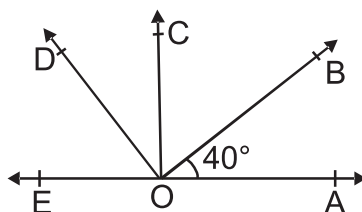


35. If the angles of a triangle are in the ratio $5 : 3 : 7$ then show that the triangle is acute angled triangle.
36. Two lines are respectively perpendicular to two parallel lines show that they are parallel to each other.

37. As shown in the figure find x & y if $\angle ACB = 100^\circ$, $\angle ADE = 120^\circ$.



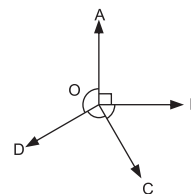
38. In the given figure $\angle DOB = 85^\circ$, $\angle COA = 85^\circ$, $\angle BOA = 40^\circ$, find $\angle COB$ and $\angle DOC$.



39. Prove that the bisectors of the angles of a linear pair are at right angle.
40. If two complementary angles are such that two times the measure of one is equal to three times the measure of the other. Find the measure of larger angle.
41. Prove that the sum of all exterior angles of a triangle is 360° .
42. If the bisectors of $\angle Q$ and $\angle R$ of a triangle $\triangle PQR$ meet at point S , then prove that

$$\angle QSR = 90^\circ + \frac{1}{2} \angle P$$

43. In figure, O is the mother dairy booth which supplies milk to four centers A , B , C and D .
If ratio of the angles between B and C , C and D and D and A is $2 : 1 : 3$ then find the angles.



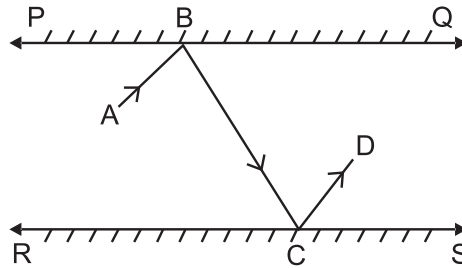
44. Show that if sum of the two angles of a triangle is equal to the third angle then the triangle is right angled triangle.

Part – D

45. If a transversal intersects two parallel lines prove that internal bisectors of the angle on the same side of a transversal meet at right angles.

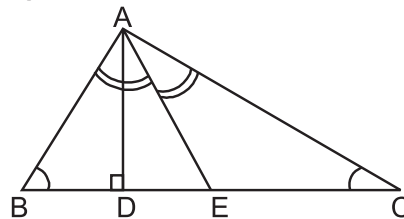
46. In the given figure PQ, RS are two mirrors placed parallel to each other. An incident ray AB strikes the mirror PQ at B; the reflected ray moves along the path BC again strikes the mirror RS at C and reflects back along CD.

Prove that $AB \parallel CD$.



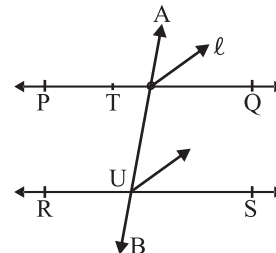
47. In the figure AE is the bisector of $\angle A$, $AD \perp BC$. Show that

$$2(\angle ADE - \angle EAC) = \angle B + \angle C$$



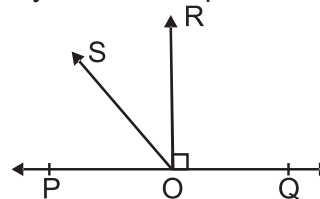
48. Prove that quadrilateral formed by the intersection of bisectors of interior angles made by a transversal on two parallel lines is a rectangle.

49. In the given figure $\ell \parallel m$ where ℓ and m are the bisectors of corresponding angles $\angle ATQ$ and $\angle TUS$. Respectively Prove that $PQ \parallel RS$.



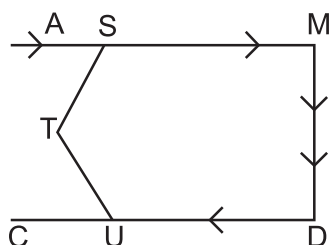
50. POQ is a straight line $RO \perp PQ$, SO is a ray from O then prove that

$$\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$$



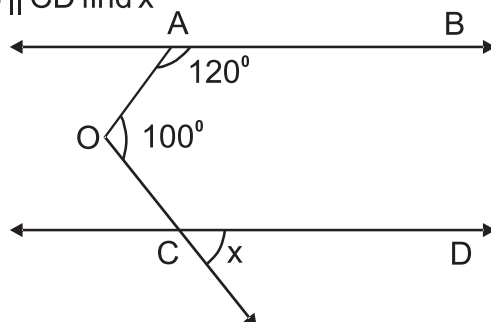
51. A route for going from place A to place C is shown in the adjoining figure. To avoid traffic on the highway AM, a road is cut through S via T

to reach C, by authorities. If $\angle MST = 125^\circ$, $\angle CUT = 50^\circ$, what will be the measure of angle $\angle STU$.

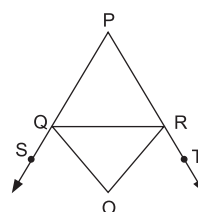


52. In a Co-Educational School a teacher conduct a mathematical quiz to solve a question on black board. She needs two students and prize will be given to the students who solve the question first. For this purpose she chooses a boy and a girl. The problem is given in the figure.

(i) If $AB \parallel CD$ find x



53. In $\triangle PQR$, sides PQ and PR are extended to S and T respectively. OQ and OR are bisector of $\angle RQS$ and $\angle QRT$ meeting at O . Show that



$$2\angle QOR = \angle PQR + \angle QRP$$

CHAPTER-6
LINES & ANGLES

ANSWERS

- | | | |
|---|---|-----------------------------------|
| 1. $x = 100^\circ, y = 80^\circ$ | 2. 45° | 3. 120° |
| 4. $59^\circ, 60^\circ, 61^\circ$ | 5. $50^\circ, 130^\circ$ | 6. 93° |
| 7. $a + b = 90^\circ$ | 8. 35° | 9. $33^\circ, 57^\circ, 65^\circ$ |
| 10. 140° | 11. $86^\circ, 94^\circ$ | 12. $l \parallel m$ |
| 15. 95° | 16. $x = 55^\circ, y = 40^\circ$ | |
| 17. 4 friends = 60° , 1 friend = $60^\circ \times 2 = 120^\circ$ | 18. 60° | |
| 20. 125° | 21. $51\frac{1}{2}^\circ, 51\frac{1}{2}^\circ$ | 23. 80° |
| 24. 42° | 25. $x = 100^\circ, 60^\circ, 80^\circ, 40^\circ$ | |
| 26. $x = 30^\circ, y = 70^\circ, z = 110^\circ$ | 28. $x = 15^\circ$ | |
| 29. $x = 55^\circ, y = 125^\circ, z = 35^\circ$ | 30. 30° | |
| 31. 65° | 32. 60° | 33. 270° |
| 34. 285° | 37. $80^\circ, 40^\circ$ | 38. $45^\circ, 40^\circ$ |
| 40. 54° | 43. $90^\circ, 45^\circ, 135^\circ$ | 47. 17.5° |
| 51. 105° | 52. 40° | |

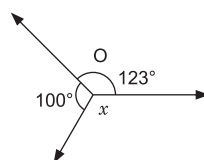
PRACTICE TEST LINES AND ANGLES

Time : 50 Min.

M.M. 20

1. If $\angle ABC = 142^\circ$, find reflex $\angle ABC$. (1)
2. Two angles form a linear pair. If one of the angle is acute, what is the type of other angle? (1)

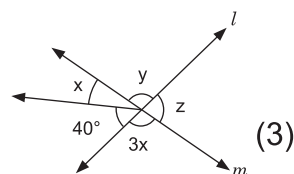
3. Find x in the given figure :



(2)

4. If two parallel lines intersected by a transversal, then name the pair of angles formed that are equal. (2)
5. In a $\triangle ABC$, $\angle A + \angle B = 125^\circ$ and $\angle B + \angle C = 150^\circ$. Find all the angle of $\triangle ABC$. (3)

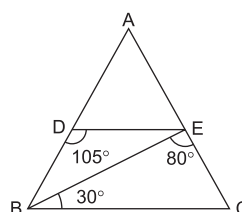
6. l and m are the intersecting lines in the given figure. Find x , y and z .



(3)

7. If two parallel lines are intersected by a transversal, then prove that the bisectors of the interior angles on both sides of transversal form a rectangle. (4)

8. ABC is a triangle in which $DE \parallel BC$. Find $\angle A$.



(4)

CHAPTER-7
TRIANGLES
KEY POINTS

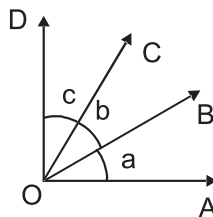
- Two figures having the same shape and size are called congruent figures.
- Two plane figures are congruent, if each one when superimposed on the other, covers the other exactly.
- Two line segments are congruent, if they are of equal lengths.
- Two angles of equal measures are congruent.
- Two circles of the same radii are congruent.
- Two squares of the same sides are congruent.
- Two rectangles are congruent, if they have the same length and breadth.
- If two triangles ABC and DEF are congruent under the correspondence $A \longleftrightarrow D$, $B \longleftrightarrow E$ and $C \longleftrightarrow F$, then symbolically, it is expressed as $\triangle ABC \cong \triangle DEF$.
- There are four congruent conditions for triangles.
 - (a) **Side-Angle-Side (SAS) congruent rule** : Two triangles are congruent, if two sides and the included angle of the one triangle respectively equal to the two sides and the included angle of the other triangle.
 - (b) **Angle-Side-Angle (ASA) congruence rule** : Two triangles are congruent, if two angles and the included side of the one triangle are respectively equal to the two angles and the included side of the other triangle.
 - (c) **Side-Side-Side (SSS) congruence rule** : Two triangles are congruent, if the three sides of one triangle are respectively equal to the three sides of the other triangle.
 - (d) **Right angle-Hypotenuse-Side (RHS) congruence rule** : Two right triangles are congruent, if the hypotenuse and one side of one triangle are respectively equal to the hypotenuse and one

side of the other triangle.

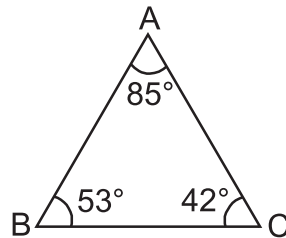
- Angles opposite to equal sides of a triangle are equal.
- Sides opposite to equal angles of a triangle are equal.
- In a triangle, angle opposite to the longer side is larger (greater).
- In a triangle, side opposite to the larger (greater) angle is longer.
- Sum of any two sides of a triangle is greater than the third side.

Part – A

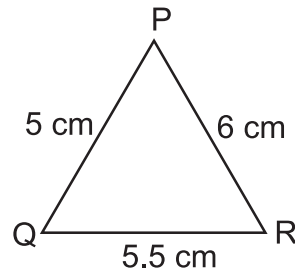
1. Which of the following is not a congruence criterion for triangles?
(a) SSS (b) RHS
(c) AAA (d) SAS
2. If $AB \cong CD$ then
(a) $AB < CD$ (b) $AB + CD = 0$
(c) $AB = CD$ (d) $AB > CD$
3. If $\triangle ABC \cong \triangle DEF$ then
(i) $AB =$ _____ (ii) $BC =$ _____
(iii) $CA =$ _____ (iv) $\angle E =$ _____
(v) $\angle EDF =$ _____ (vi) $\angle BCA =$ _____
4. Circle $O_1 \cong$ Circle O_2 . If radius of circle $O_1 = 6$ cm then diameter of circle O_2 is _____.
5. In the given figure, if $a = b = c$ then $\angle AOC \cong$ _____



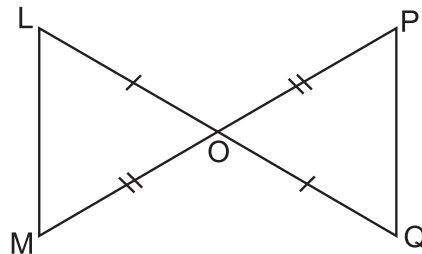
6. If $\triangle PQR \cong \triangle DEF$ then $Q \longleftrightarrow$ _____
7. Which is the longest side of the triangles given in the figure?



8. Which is the largest angle in the $\triangle PQR$?



9. Which two triangles are congruent in the given figure. Write them in symbolic form.

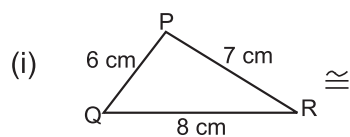


10. Two squares are congruent if they have _____.

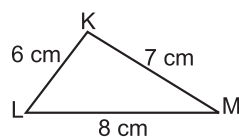
Part – B

11. Match the columns :

Column A

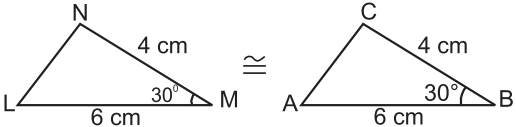
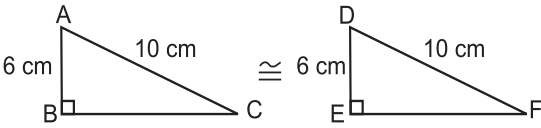
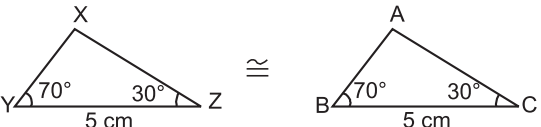


\cong



Column B


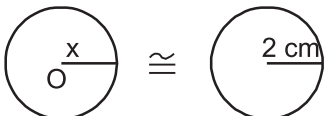
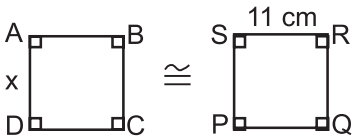
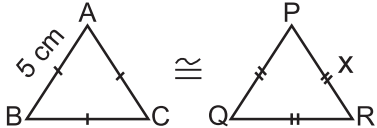
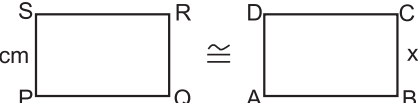
(a) SAS congruence

- (ii)  (b) SSS congruence
- (iii)  (c) ASA congruence
- (iv)  (d) RHS congruence

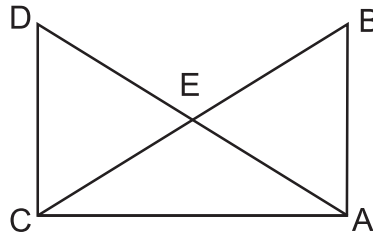
12. Match the columns :

Column A

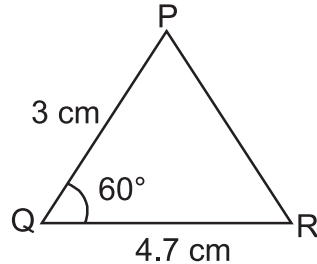
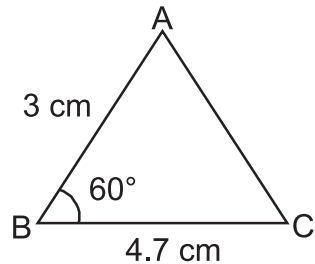
Column B

- (i)  $x = ?$ (a) 2 cm
- (ii)  $x = ?$ (b) 5 cm
- (iii)  $x = ?$ (c) 10 cm
- (iv)  $x = ?$ (d) 4 cm
- (v)  $x = ?$ (e) 11 cm

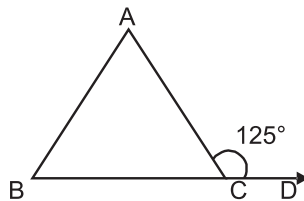
13. In the given figure. If $AB = CD$, $AD = BC$ then prove that $\triangle ADC \cong \triangle CBA$



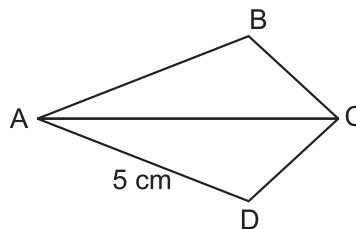
14. If $\triangle ABC$ is an isosceles triangle such that $AB = AC$, then prove that altitude AD from A on BC bisects it.
15. Which criteria of congruence of triangles is satisfied in the given figure.



16. In a $\triangle PQR$, $\angle P = 110^\circ$, $PQ = PR$. Find $\angle Q$ and $\angle R$.
17. In the given figure $AB = AC$ and $\angle ACD = 125^\circ$. Find $\angle A$



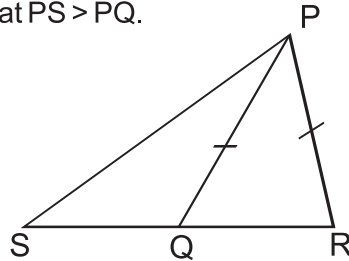
18. In $\triangle ABC$, if $\angle A = 55^\circ$, $\angle B = 75^\circ$ then find out the smallest and longest side of the triangle.
19. In the given figure, AC bisects $\angle A$ and $\angle C$. If $AD = 5$ cm find AB .



20. The vertex angle of an isosceles triangle is 80° . Find out the measure of base angles.

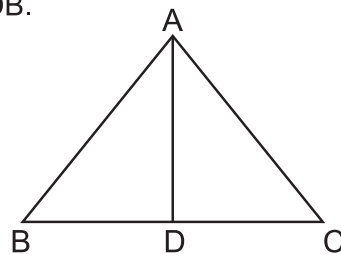
Part – C

21. In the given figure, Q is a point on the side SR of $\triangle PSR$ such that $PQ = PR$. Prove that $PS > PQ$.

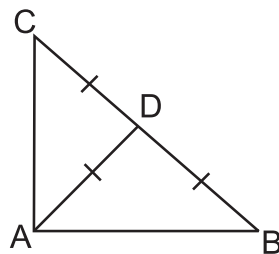


22. ABC is a triangle and D is the mid-point of BC. The perpendicular from D to AB and AC are equal. Prove that triangle is isosceles.
23. Prove that angles opposite to the equal sides of an isosceles triangle are equal.
24. In the given figure, $AC > AB$ and AD bisects $\angle BAC$.

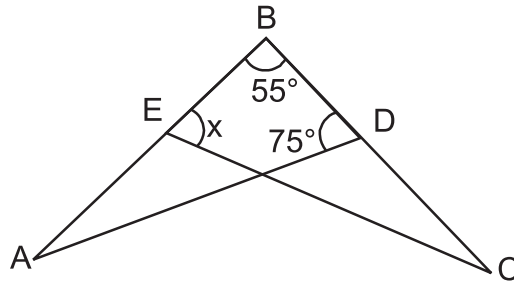
Prove that $\angle ADC > \angle ADB$.



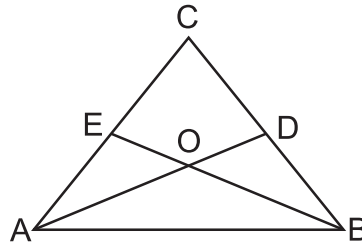
25. S is any point in the interior of a $\triangle PQR$. Prove that $SQ + SR < PQ + PR$.
26. In the given figure, if $AD = BD = CD$. Find $\angle BAC$.



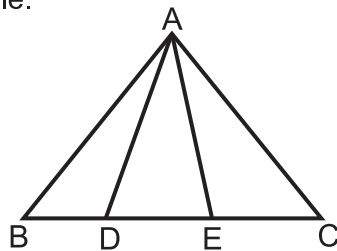
27. In the given figure, if $AB = BC$ and $\angle A = \angle C$ then find the value of x .



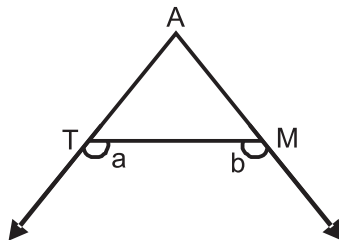
28. In the given figure, $\angle ABC = \angle BAC$, D and E are points on BC and AC respectively such that $DB = AE$. If AD and BE intersect at O then prove that $OA = OB$.



29. In the given figure, if $AB = AC$, $\angle BAD = \angle CAE$ then prove that $\triangle ADE$ is an isosceles triangle.

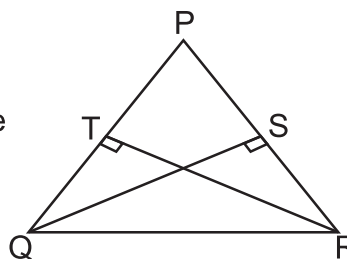


30. In $\triangle DEF$, $\angle E = 2\angle F$. DM is the angle bisector of $\angle EDF$ that intersects EF at M. If $DM = MF$, then prove that $\angle EDF = 72^\circ$.
31. Prove that the angles of an equilateral triangle are 60° each.
32. In the given figure, $\angle a > \angle b$, show that $\angle ATM < \angle AMT$.

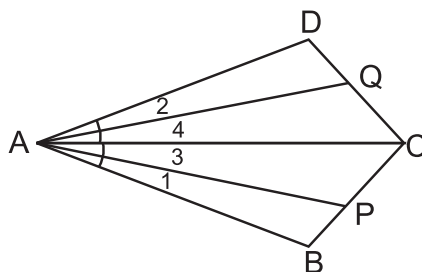


Part – D

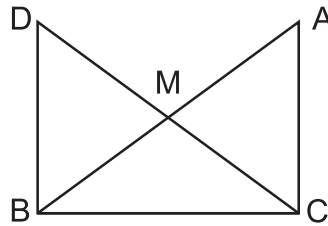
33. AF, BD and CE altitudes of $\triangle ABC$ are equal. Prove that $\triangle ABC$ is an equilateral triangle.
34. Prove that two triangles are congruent if two angles and the included side of one triangle are equal to the two angles and the included side of the other triangle.
35. O is any point in the interior of a $\triangle ABC$. Prove that $OA + OB + OC > \frac{1}{2}(AB + BC + CA)$.
36. Prove that the perimeter of a triangle is greater than the sum of its three altitudes.
37. Two sides AB, BC and median AM of one $\triangle ABC$ are respectively equal to sides PQ, QR and median PN of $\triangle PQR$. Show that :
- $\triangle ABM \cong \triangle PQN$
 - $\triangle ABC \cong \triangle PQR$
38. In the given figure, PQR is a triangle in which altitudes QS and RT to sides PR and PQ are equal. Show that
- $\triangle PQS \cong \triangle PRT$
 - PQR is an isosceles triangle



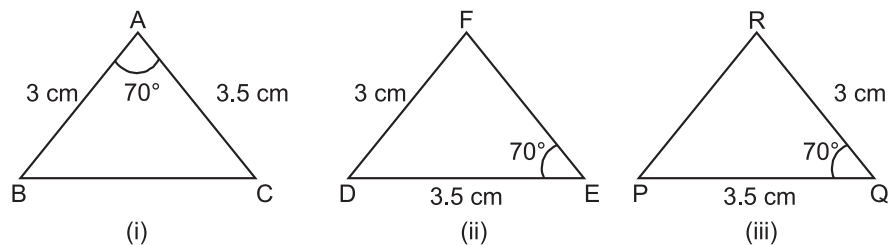
39. In the given figure, $AB = AD$, $\angle 1 = \angle 2$ and $\angle 3 = \angle 4$. Prove that $AP = AQ$.



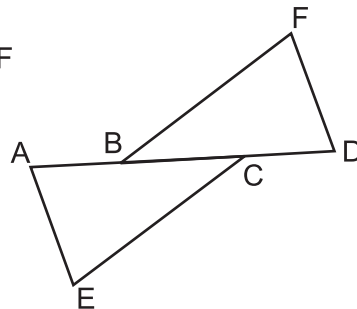
40. In the given figure, ABC is a right angled triangle, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. D is joined to B. Prove that $CM = \frac{1}{2} AB$



41. Prove that the sum of any two sides of a triangle is greater than its third side.
42. Vandana wishes to literate the poor children of the nearby slum area. She makes flash cards for them as shown in the given figure.



- (a) Which two flash cards are congruent?
- (b) Which criteria of congruency is satisfied here?
- (c) Write the third side of both the triangles which are equal by CPCT.
43. Prove that the sum of any two sides of a triangle is greater than twice the median drawn to the third side.
44. In the given figure, $AB = CD$, $CE = BF$ and $\angle ACE = \angle DBF$. Prove that
- (i) $\triangle ABD = \triangle DBF$
- (ii) $AE = DF$



CHAPTER-7 TRIANGLES

ANSWERS

- | | | |
|--|--------------------------------------|--|
| 1. (c) | 2. (c) | |
| 3. (i) DE | (ii) EF | (iii) FD |
| (iv) $\angle B$ | (v) $\angle BAC$ | (vi) $\angle EFD$ |
| 4. 12 cm | 5. $\angle BOD$ | 6. E |
| 7. BC | 8. $\angle Q$ | 9. $\triangle LOM \cong \triangle QOP$ |
| 10. same sides length | | |
| 11. (i) (b) | (ii) (a) | (iii) (d) |
| (iv) (c) | | |
| 12. (i) (c) | (ii) (a) | (iii) (e) |
| (iv) (b) | (v) (d) | |
| 15. SAS | 16. $\angle Q = \angle R = 35^\circ$ | 17. $\angle A = 70^\circ$ |
| 18. Smallest side = AB | | |
| Longest side = AC | | |
| 19. AB = 5 cm | 20. $50^\circ, 50^\circ$ | 26. $\angle BAC = 90^\circ$ |
| 27. 75° | | |
| 42. (a) (i) and (iii) | | |
| (b) $\triangle ABC \cong \triangle QRP$ (SAS Congruency) | | |
| (c) BC = PR | | |
| 43. (a) BD | | |

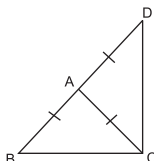
PRACTICE TEST

Time : 50 Min.

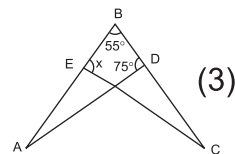
Triangles

M.M. 20

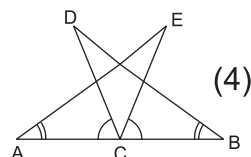
1. Find the measure of each exterior angle of an equilateral triangle. (1)
2. Which of the following is not a criterion for congruence of triangles? (1)
 - (a) SSA
 - (b) SAS
 - (c) ASA
 - (d) SSS
3. In a $\triangle ABC$, If $AB = AC$ and $\angle A = 70^\circ$. Find $\angle B$ and $\angle C$. (2)
4. The vertical angle of an isosceles triangle is 100° . Find its base angle. (2)
5. In the given figure, ABC is a triangle in which $AB = AC$, side BA is produced to D such that $AB = AD$. Prove that $\angle BCD = 90^\circ$. (3)



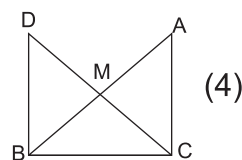
6. In the given figure, if $AB = BC$ and $\angle A = \angle C$. Then find the value of x .



7. In the given figure, C is the midpoint of AB , if $\angle DCA = \angle ECB$ and $\angle DBC = \angle EAC$, Prove that $DC = EC$ and $BD = AE$.



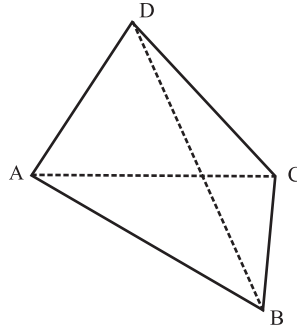
8. In the given figure ABC is a right angled triangle, right angled at C . M is the mid-point of hypotenuse is joined to M and produced to a point D such that $DM = CM$. D is joined to B .



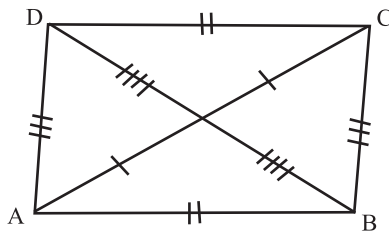
Show that $CM = \frac{1}{2}AB$.

CHAPTER-8
QUADRILATERALS
KEY POINTS

1. Quadrilateral : - A closed figure bounded by four line segments. In a quadrilateral are

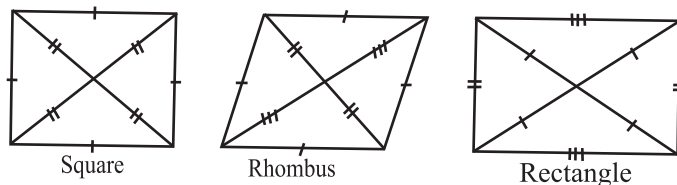


- i) Two pairs of opposite side (no common point)
e.g. AB & CD, BC & AD
 - ii) Two pairs of opposite angles $\angle A$ & $\angle C$ and $\angle B$ & $\angle D$.
 - (iii) Four pairs of adjacent sides AB & BC, BC & CD, CD & AD and AD & AB (one common point)
 - (iv) Four pairs of adjacent angles $\angle A$ & $\angle B$, $\angle B$ & $\angle C$, $\angle C$ & $\angle D$, $\angle D$ & $\angle A$.
 - (v) Line segment joining opposite vertices called diagonal of quadrilateral. e.g., AC & BD.
 - (vi) Sum of the angles of a quadrilateral is 360° , $\angle A + \angle B + \angle C + \angle D = 360^\circ$.
2. Parallelogram : A quadrilateral is a parallelogram if.

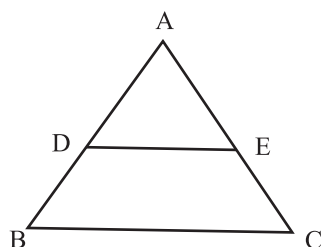


- Opposite sides are equal or
- Opposite angles are equal or
- Diagonals bisect each other or
- One pair of opposite sides is equal and parallel

3. A diagonal of a parallelogram divides it into two congruent triangles.
examples of parallelogram:



4. Theorem :- A line segment joining the mid points of the two sides of a triangle is parallel to the third side and is half of it. If D & E are mid points then $DE \parallel BC$ and $DE = \frac{1}{2} BC$.

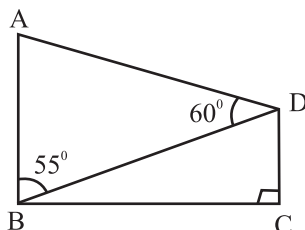


5. Converse of mid point theorem.

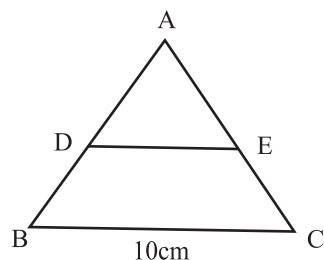
The line drawn through the mid point of one side of a triangle, parallel to another side bisects the third side.

Part – A

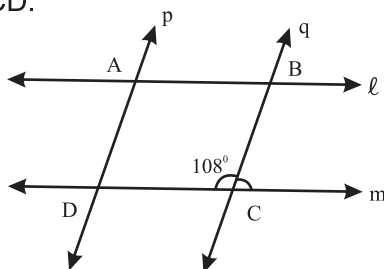
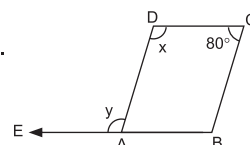
- In a rhombus ABCD, if $\angle A = 60^\circ$ find $\angle B$, $\angle C$ & $\angle D$.
- The angles of a quadrilateral are in the ratio 1:2:4:5. Find the measure of each angle.
- If in a rhombus LMNP, $\angle LNM = 40^\circ$ then what is the measure of $\angle LPM$?
- In a parallelogram if all the four angles are in the ratio 1:1:1:1 then, what type of parallelogram is this?
- In the figure, $AB \parallel CD$, what will be the measure of $\angle ADC$?



6. In the figure, if D & E are respectively the mid points of AB & AC, what will be the length of ED ?



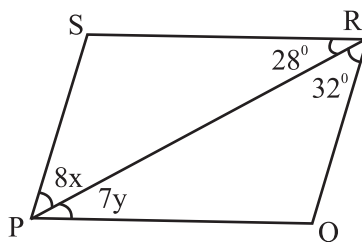
7. PQRS is a rhombus with $\angle QPS = 50^\circ$. Find $\angle RQS$.
8. In the figure, ABCD is a parallelogram find value of $(x + y)$.
9. In the figure line $\ell \parallel m$ and $p \parallel q$, $\angle BCD = 108^\circ$ find all four angles of quadrilateral ABCD.



10. If two adjacent angles of a parallelogram ABCD are in the ratio 5:4, find all the angles of the parallelogram.

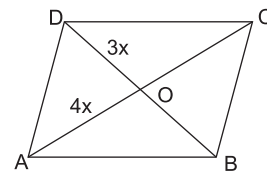
Part – B

11. Prove that the sum of all the four angles of a quadrilateral is 360° .
12. Show that opposite angles of a parallelogram are equal.
13. In a parallelogram ABCD $\angle B = 110^\circ$ determine the measure of $\angle A$ and $\angle D$.
14. In the figure if PQRS is a parallelogram, then find the value of x & y .



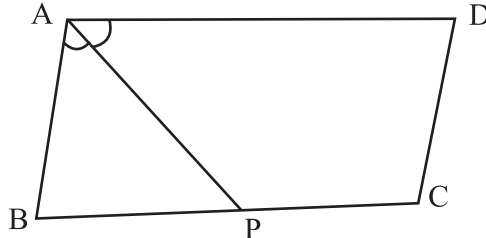
15. The diagonals of a parallelogram ABCD intersect at O. A line through O intersects AB at X & DC at Y. Prove that $OX = OY$.

16. In a parallelogram ABCD diagonals AC and BD intersect at O and AC = 7.4 cm. and BD = 6.2 cm. Find the length of AO and BO.
17. Two opposite angles of a parallelogram are $(5x-3)$ and $(4x+12)$. Find the measure of each angle of the parallelogram.
18. Diagonals of a quadrilateral ABCD bisect each other if $\angle A = 35^\circ$ determine $\angle B$.
19. The perimeter of a parallelogram is 30cm. If longer side is 9.5 cm then find the length of shorter side.
20. In a parallelogram ABCD diagonals AC and BD intersect at O and AC = 12.6 cm and BD = 9.4 cm. Find the measures of OC and OD.
21. ABCD is a rhombus in which $DO = 3x$ & $AO = 4x$, find perimeter of quadrilateral ABCD.
22. The angles of a quadrilateral are $(x+20)$, $(x-20)$, $(2x+5)$, $(2x-5)$. Find the value of x .

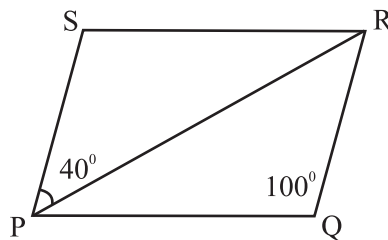


Part – C

23. In the figure P is the mid point of side BC of a parallelogram ABCD such that $\angle BAP = \angle DAP$ prove that $AD = 2CD$.

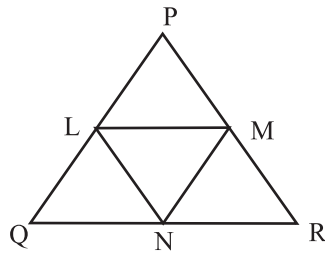


24. In the adjoining figure if PQRS is a parallelogram where $\angle PQR = 100^\circ$ and $\angle SPR = 40^\circ$. Find $\angle PRQ$ and $\angle SRQ$.

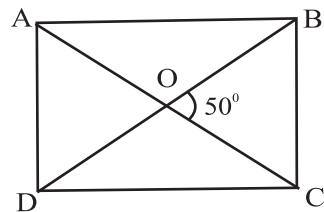


25. Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side.

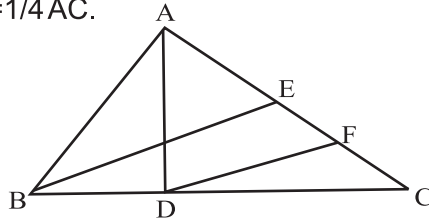
26. In the given figure L, M, and N are mid point of the sides PQ, PR and QR respectively of $\triangle PQR$. If $PQ = 4.4\text{cm}$, $QR = 5.6\text{ cm}$ and $PR = 4.8\text{cm}$ then find the perimeter of $\triangle LMN$.



27. A quadrilateral is a parallelogram if one pair of opposite sides are equal and parallel. Prove it.
28. If the diagonals of a quadrilateral bisect each other then quadrilateral is a parallelogram. Prove it.
29. In a parallelogram PQRS, M and N are points on PQ and RS such that $PM = RN$. Prove that $MS \parallel NQ$.
30. In a parallelogram ABCD, AP and CQ are drawn perpendiculars from vertices A and C on diagonal BD. Prove that $\triangle APB \cong \triangle CQD$.
31. The diagonals of a rectangle ABCD meet at O. If $\angle BOC = 50^\circ$ then find $\angle ODA$.

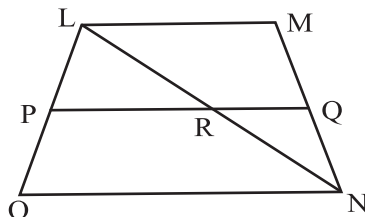


32. In the given figure AD and BE are the medians of $\triangle ABC$ and $BE \parallel DF$ prove that $CF = \frac{1}{4} AC$.

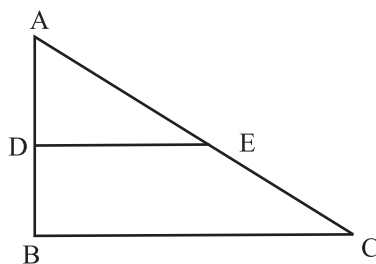


Part – D

33. In the figure LMNO, is a trapezium in which LM is parallel to side ON and P is the mid point of side LO. If Q is a point on the side MN such that segment PQ is parallel to side ON Prove that Q is the mid point of MN and $PQ = \frac{1}{2} (LM + ON)$.



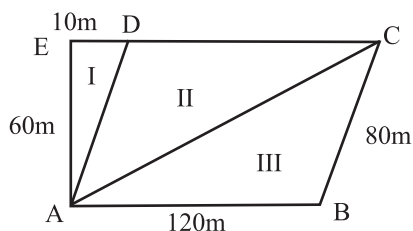
34. In the figure, $\triangle ABC$ is right angled at B. If $AB = 9$ cm $AC = 15$ cm. and D and E are the mid points of AB & AC respectively calculate.
- The length of BC
 - The area of trapezium BCED



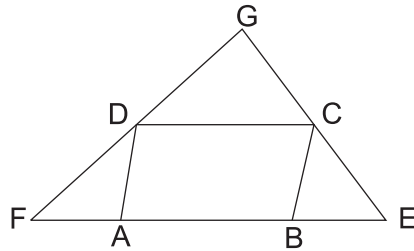
35. A farmer has divided his field into three parts as in the figure. Ist part is used to take care of his cattles. While II and III are used to grow two different crops.

Answer the following :–

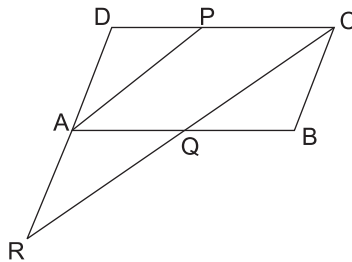
- How much area has been used to take care for cattles ?
- Are the two areas part II and part III equal? Justify.
- What is the total area of the field ?



36. ABCD is a parallelogram. Side AB is produced on both sides to E & F as in figure such that $BE = BC$ & $AF = AD$. Show that EC & FD when produced meets at right angle.



37. P is mid point of side CD of a parallelogram ABCD. A line through C parallel to PA intersects AB at Q & DA produced at R. Prove that $DA = AR$ & $CQ = QR$.



CHAPTER-8
QUADRILATERALS

ANSWERS

- | | |
|--|--|
| 1. $120^\circ, 60^\circ, 120^\circ$ | 20. 6.3 cm, 4.7 cm |
| 2. $30^\circ, 60^\circ, 120^\circ, 150^\circ$ | 21. 20x units |
| 3. 100° | 22. $x = 60^\circ$ |
| 4. Rectangle | 24. $40^\circ, 80^\circ$ |
| 5. 115° | 26. 7.4 cm |
| 6. 5 cm | 27. 65° |
| 7. 65° | 34. 12 cm, 40.5 cm^2 |
| 8. 200° | 35. (i) 300 m^2 , (ii) Yes, (iii) 7500 m^2 |
| 9. $108^\circ, 72^\circ, 108^\circ, 72^\circ$ | |
| 10. $100^\circ, 80^\circ, 100^\circ, 80^\circ$ | |
| 13. $70^\circ, 110^\circ$ | |
| 14. $x = y = 4$ | |
| 16. 3.7 cm, 3.1 cm | |
| 17. $72^\circ, 108^\circ, 72^\circ, 108^\circ$ | |
| 18. 145° | |
| 19. 5.5 cm | |

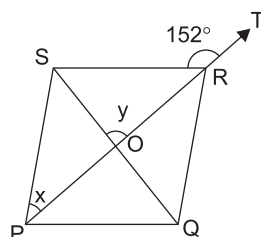
PRACTICE TEST

Time : 50 Min.

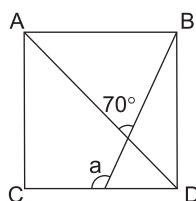
Quadrilaterals

M.M. 20

1. If the diagonals of a quadrilateral ABCD bisect each other & $\angle A = 45^\circ$, what is $m\angle B$? (1)
2. The angles of a Quadrilateral ABCD are in the ratio 2 : 3 : 5 : 8. Find the measure of smallest angle. (1)
3. In a $\triangle PQR$, median PS is produced to a point T such that $PS = ST$. Prove that PQTR is a parallelogram. (2)
4. In the Fig. PQRS is a rhombus in which the diagonal PR is produced to T. If $\angle SRT = 152^\circ$, find x & y. (2)



5. ABCD is a square. A line BM intersects CD at M and the diagonal AC at O such that $\angle AOB = 70^\circ$, find a (3)



6. AD is median of $\triangle ABC$ & E is the mid point of AD. BE is produced to meet AC in F. Prove that $AF = \frac{1}{3}AC$. (3)
7. Show that the bisectors of angles of a parallelogram forms a rectangle. (4)
8. Show that the quadrilateral formed by joining the mid point of the sides of a square is also a square. (4)

CHAPTER-9

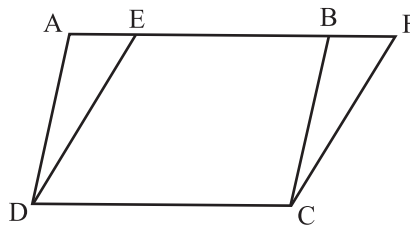
AREAS OF PARALLELOGRAMS & TRIANGLES

KEY POINTS

1. Parallelograms on the same base and between same parallels are equal in area.

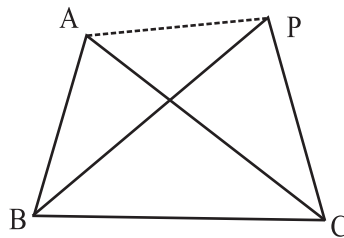
Two parallelograms ABCD and EFCD on the same base DC and between same parallels AF and DC

$$\text{ar}(\text{ABCD}) = \text{ar}(\text{EFCD})$$



2. Two triangles on the same base and between the same parallels are equal in area.

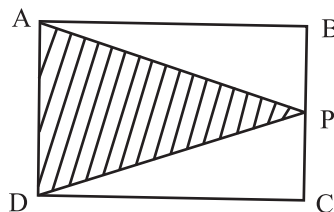
Two triangles ABC and PBC on the same base BC and between same Parallel lines BC and AP in the given figure then $\text{ar}(\triangle ABC) = \text{ar}(\triangle PBC)$



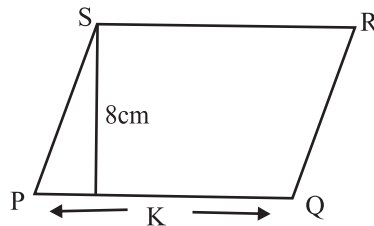
3. Two triangles having the same base and equal areas lies between the same parallels.

Part – A

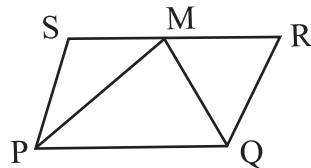
1. If area of Parallelogram ABCD is 80 cm^2 . Find the area of $\triangle APD$.



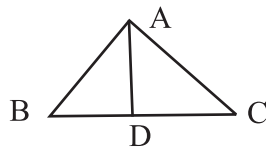
2. If area of Parallelogram PQRS is 88 cm^2 find K.



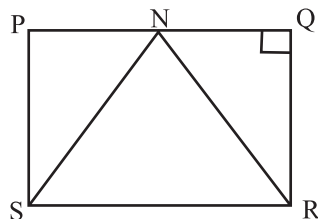
3. PQRS is a Parallelogram and PQM is a triangle. If area of PQM = 18 cm^2 . Find the area of PQRS.



4. In $\triangle ABC$, AD is median. If area of $\triangle ABD = 25 \text{ cm}^2$ find the area of $\triangle ABC$.



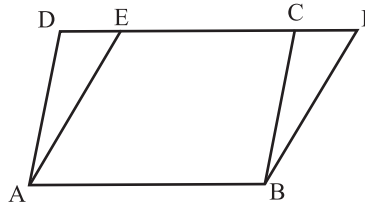
5. In the given figure area of $\triangle SRN = 21 \text{ cm}^2$ RQ = 6cm find PQ.



6. In the figure ABCD and ABFE are Parallelograms then find ar ($\triangle BCF$).

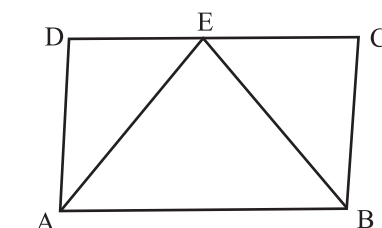
If $\text{ar}(\triangle ABCE) = 18 \text{ cm}^2$

$\text{ar}(\triangle ABCD) = 25 \text{ cm}^2$



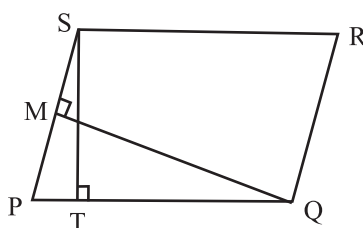
7. If two parallelogram are on equal base and between the same parallels, then what is the ratio of their areas?
8. A triangle and a Parallelograms are on the same base as well as between the same parallels then find the ratio of areas of triangle to that of the parallelogram.

9. In $\triangle ABC$, D, E, F are respectively the mid points of the sides AB, BC and AC. Find ratio of the area of $\triangle DEF$ and area of $\triangle ABC$.
10. If the base of a parallelogram is 8 cm and its altitude is 5 cm then find its area.
11. If two triangles are on the same base and between the same parallels. Then find the ratio of area of the two triangles.
12. In given figure. If area of parallelogram ABCD is 30 cm^2 then find $\text{ar}(\triangle ADE) + \text{ar}(\triangle BCE)$

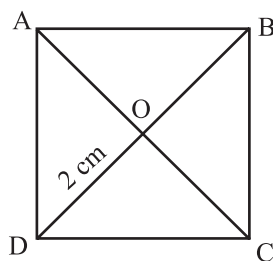


Part – B

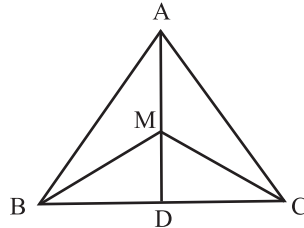
13. Show that the median of a triangle divides it into two triangles of equal areas.
14. P and Q are any two points lying on the side DC and AD respectively of a parallelogram ABCD. Show that $\text{ar}(\triangle APB) = \text{ar}(\triangle BQC)$.
15. If the ratio of altitude and area of the parallelogram is 2:11 then find the length of the base of parallelogram.
16. In figure if PQRS is a parallelogram in which $PQ=12\text{cm}$, $ST=9\text{cm}$, $QM=6\text{cm}$, $ST \perp PQ$, $QM \perp SP$ then find length of SP.



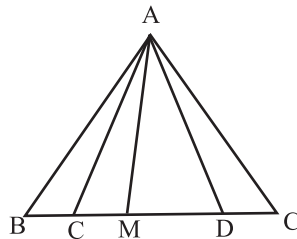
17. In given fig. ABCD is a square whose diagonals are intersecting at O. If $OD = 2 \text{ cm}$ then find the length of AB.



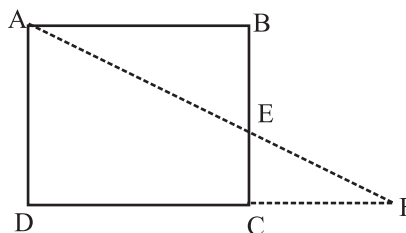
18. Show that the diagonals of a parallelogram divide it into four triangles of equal area.
19. M is any point on the median AD of $\triangle ABC$. Show that $\text{ar}(\triangle AMB) = \text{ar}(\triangle AMC)$.



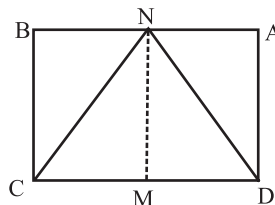
20. If D, E and F are respectively the mid points of sides BC, CA, and AB of $\triangle ABC$ show that.
- BDEF is a parallelogram.
 - $\text{ar}(\triangle DEF) = \frac{1}{4} \text{ar}(\triangle ABC)$
21. In the given figure $BC = CD = DE$
M is the mid point of CD then find the area of $\triangle AMC$.



22. ABCD is a parallelogram. Through point A, a line AEF is drawn to meet BC at E. DC produced at F. Show that $\text{ar}(\triangle BEF) = \text{ar}(\triangle DCE)$.



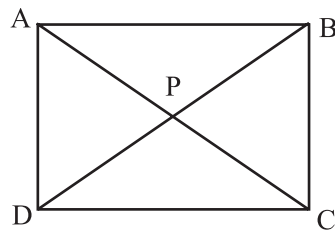
23. In the given figure, the area of parallelogram ABCD is 40 cm^2 . If MN is a median of $\triangle CDN$ then find the area of $\triangle NDM$.



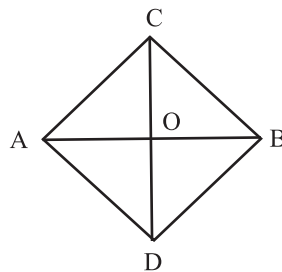
Part-C

24. In the figure, P is the point in the interior of parallelogram ABCD then show that

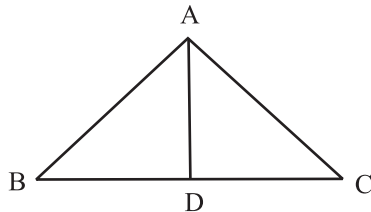
- (i) $\text{ar}(\triangle APB) + \text{ar}(\triangle PCD) = \frac{1}{2} \text{ar}(\text{ABCD})$
- (ii) $\text{ar}(\triangle APD) + \text{ar}(\triangle PBC) = \text{ar}(\triangle APB) + \text{ar}(\triangle PCD)$



25. ABCD is a trapezium in which the $AB \parallel DC$. If diagonal AC and BD intersect at O. Prove that $\text{ar}(\triangle AOD) = \text{ar}(\triangle BOC)$.
26. ABCD is a parallelogram whose diagonals AC and BD intersect at O. A line through O intersects AB at P and DC at Q. Prove that $\text{ar}(\triangle POA) = \text{ar}(\triangle QOC)$.
27. Diagonal PR and QS of quadrilateral PQRS intersect at T such that $PT = TR$ and $PS = QR$, show that $\text{ar}(\triangle PTS) = \text{ar}(\triangle RTQ)$.
28. In the figure, ABC and ABD are two triangles on the same base AB. If line segment CD bisects AB at O show that $\text{ar}(\triangle ABC) = \text{ar}(\triangle ABD)$.

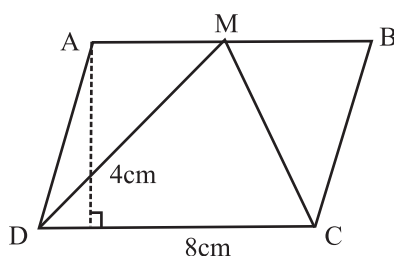


29. In given figure AD is median of $\triangle ABC$. Prove that $\text{ar}(\triangle ABD) = \text{ar}(\triangle ACD)$.



Part – D

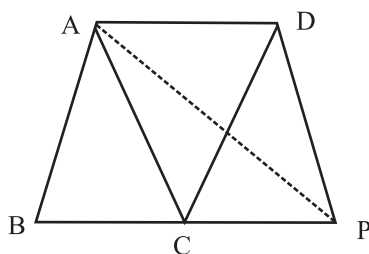
30. Prove that parallelogram on the same base and between same parallels are equal in area.
31. Prove that the two triangles on the same base and between the same parallels are equal in area.
32. If a triangle and parallelogram are on the same base and between the same parallels then prove that the area of triangle is equal to the half the area of parallelogram using this find $\text{ar}(\triangle CMD)$.



33. XY is a line parallel to side BC of a triangle ABC. If BE \parallel AC and CF \parallel AB meet XY at E and F respectively show that $\text{ar}(\triangle ABE) = \text{ar}(\triangle ACF)$.
34. If E, F, G and H are respectively the mid points of the sides of a parallelogram ABCD. Show that $\text{ar}(\triangle EFGH) = \frac{1}{2} \text{ar}(\triangle ABCD)$.
35. There is a plot in a village in the shape of a quadrilateral ABCD. Head of the village wants to get floor cemented so as to use it for panchayat meetings.

Later he decided to construct playground of shape $\triangle ABP$ for children. If $AC \parallel DP$ then

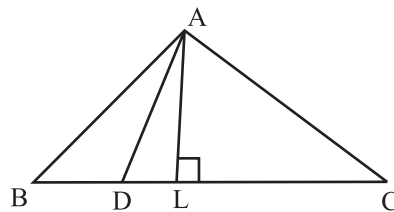
- (a) Prove that $\text{ar}(\triangle ABCD) = \text{ar}(\triangle ABP)$
- (b) $\text{area}(\square ABCD) = 2 \times \underline{\hspace{2cm}}$



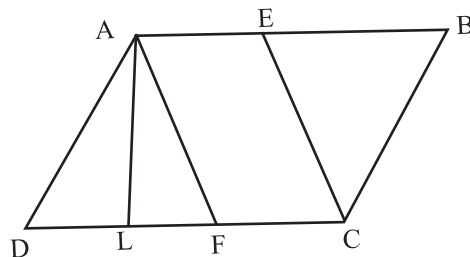
36. A farmer has a square plot of land where he wants to grow five different crops at a time. On half of the area in the middle he wants to grow different crops.

- a) Explain by diagram how he can divide the area to fulfill his purpose.
- b) For same base and between the same parallels write the relation between area of triangle and parallelogram formed.

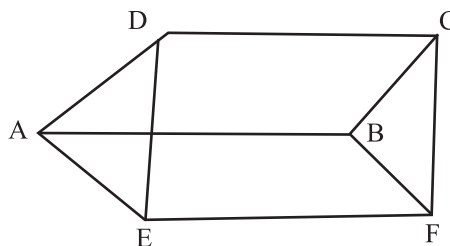
37. In the adjoining figure, the point D divides the side BC of $\triangle ABC$ in the ratio $m:n$. Prove that $\text{ar}(\triangle ABD) : \text{ar}(\triangle ADC) = m : n$.



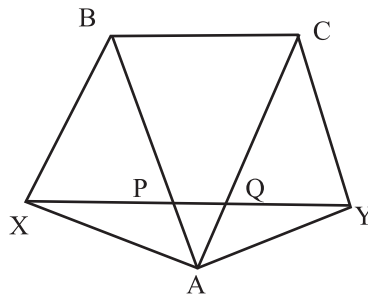
38. ABCD is a parallelogram. E is a point on BA such that $BE = 2EA$ and F is a point on DC such that $DF = 2FC$. Prove that AECF is a parallelogram whose area is one third of the area of parallelogram ABCD.



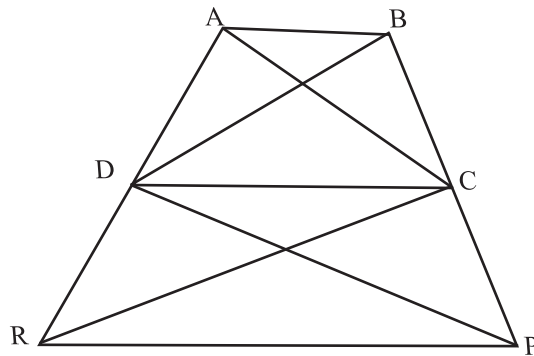
39. In the adjoining figure, two parallelogram ABCD and AEFB are drawn on opposite sides of AB. Prove that $\text{ar}(\square ABCD) + \text{ar}(\square AEFB) = \text{ar}(\square EFCD)$



40. In the given figure $BC \parallel XY$, $BX \parallel CA$ and $AB \parallel YC$. Prove that $\text{ar}(\triangle ABX) = \text{ar}(\triangle ACY)$



41. In the given figure, $\text{ar}(\triangle DRC) = \text{ar}(\triangle DPC)$ and $\text{ar}(\triangle BDP) = \text{ar}(\triangle ARC)$. Show that both the quadrilateral ABCD and DCPR are trapeziums.



CHAPTER-9
AREAS OF PARALLELOGRAMS TRIANGLES
ANSWERS

1. 40 cm^2
2. 11 cm
3. 36 cm^2
4. 50 cm^2
5. 7 cm
6. 7 cm^2
7. $1:1$
8. $1:2$
9. $1:4$
10. 40 cm^2
11. $1:1$
12. 15 cm^2
15. $\frac{11}{2}$ units
16. 18 cm
17. $\sqrt{8} \text{ cm}$
21. $\frac{1}{6} \Delta ABC$
23. 10 cm^2
32. 16 cm^2
35. $\text{area}(\square ADPC) = 2 \text{ ar}(\triangle ACD)$
36. $\text{area of triangle} = \frac{1}{2} \text{ area of parallelogram.}$

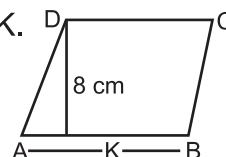
PRACTICE TEST

AREAS OF PARALLELOGRAMS & TRIANGLES

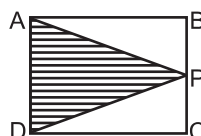
Time : 50 Min.

M.M. 20

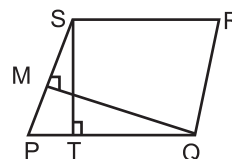
1. If area of parallelogram ABCD is 96 cm^2 , find K.



2. If area of parallelogram ABCD is 60 cm^2 . Find area of $\triangle APD$.

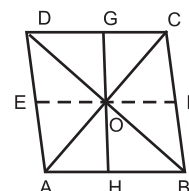


3. Show that the median of a triangle divides it into two triangles of equal area.
4. In figure if PQRS is a parallelogram in which $PQ = 12 \text{ cm}$, $ST = 9 \text{ cm}$, $QM = 6 \text{ cm}$, $ST \perp PQ$, $QM \perp SP$, then find length of SP.

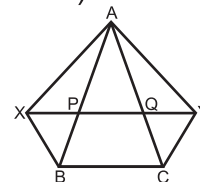


5. The base BC of $\triangle ABC$ is divided at D. Such that $BD = \frac{1}{2} DC$. Prove that $\text{ar}(\triangle ABD) = \frac{1}{3} \text{ar}(\triangle ABC)$

6. ABCD is a parallelogram and O is a point in the interior, Prove that $\text{ar}(\triangle AOB) + \text{ar}(\triangle COD) = \text{ar}(\triangle AOD) + \text{ar}(\triangle BOC)$



7. In the adjoining figure, PQ is a line parallel to the side BC to $\triangle ABC$. If $BX \parallel CA$ and $Cy \parallel BA$ meet the line PQ produced in X and Y respectively. Show that $\text{ar}(\triangle ABX) = \text{ar}(\triangle ACY)$



8. Prove that parallelogram on the same base and between same parallels are equal in area.

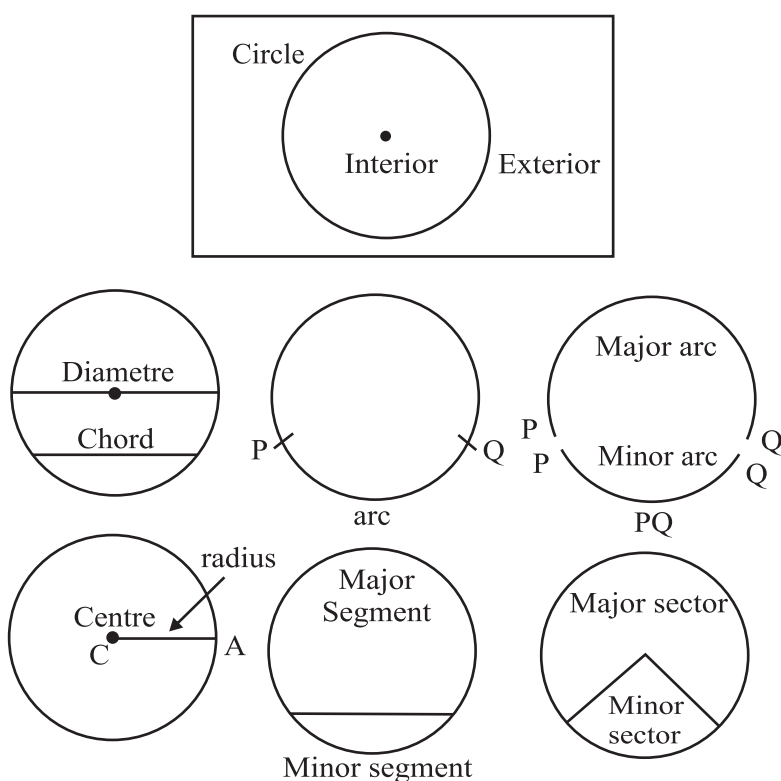
CHAPTER-10

CIRCLES

KEY POINTS

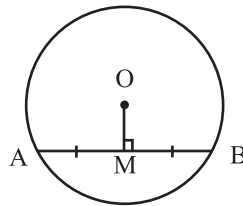
- The collection of those points in a plane which are at a fixed distance from a given fixed point is called a circle. That fixed point is called centre of the circle and that fixed distance is called radius.

Circle and related Terms !

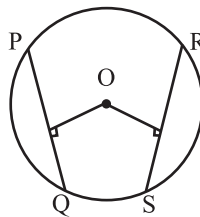


- There is one and only one circle passing through three non-collinear points.
- Equal chords of a circle subtend equal angles at centre.
- If angles subtended by chords at centre are equal then chords are equal.
- The perpendicular from centre to a chord of a circle, bisects the chord.

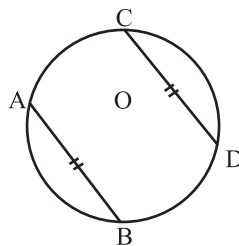
- The line joining the centre of a circle to the mid point of a chord is perpendicular to the chord.



- Equal chords of a circle are equidistant from centre.
- Chords equidistant from centre are equal in length.

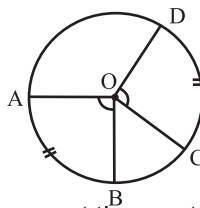


- If two chords of a circle are equal then corresponding arcs are equal.
- If arcs of a circle are equal then corresponding chord are also equal.



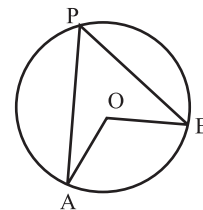
- Congruent arcs (or equal arcs) of a circle subtends equal angle at centre.

$$\Rightarrow \boxed{\angle AOB = \angle COD}$$



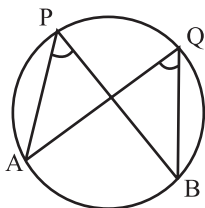
- The angle subtend by an arc at the centre of circle is twice the angle which is subtend at remaining part of the circle.

$$\Rightarrow \boxed{\angle AOB = 2\angle APB}$$



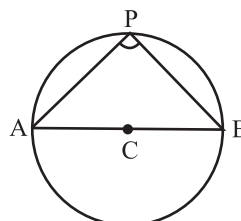
- Any two angles in the same segment of the circle are equal.

$$\Rightarrow \angle APB = \angle AQB$$



- Angle of semi circle is right angle.

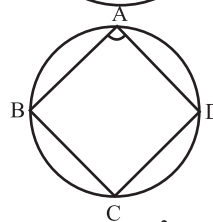
$$\Rightarrow \angle APB = 90^\circ$$



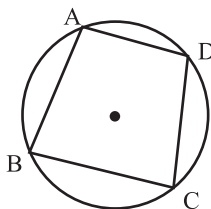
- In a cyclic quadrilateral the sum of opposite angles is 180° .

$$\Rightarrow \angle A + \angle C = 180^\circ$$

$$\Rightarrow \angle B + \angle D = 180^\circ$$

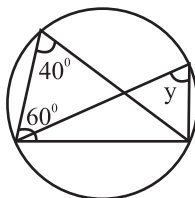


- If sum of opposite angles of a quadrilateral is 180° then that quadrilateral is cyclic quadrilateral.

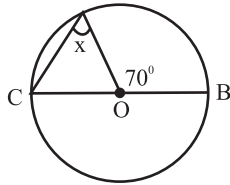


Part – A

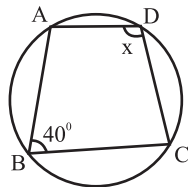
- If the sum of a pair of opposite angles of a quadrilateral is 180° , then quadrilateral is _____.
- A round pizza is cut into 4 equal pieces. What does each piece represent?
- AD is a diameter of a circle and AB is a chord if AD = 34cm, AB=30 cm then find the distance of AB from the centre of chord.
- Given two concentric circles with centre O. A line cut the circle at A, B, C and D respectively. If AB = 10cm, then find the length of CD.
- Find y in given figure



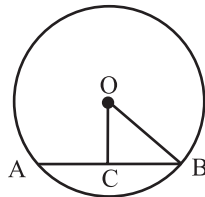
6. Find x



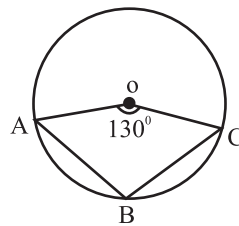
7. Find x



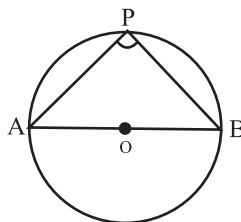
8. Diameter is the _____ Chord of a circle.
9. Circle having the same centre and different radii are called _____ circles.
10. In given figure OC is perpendicular segment drawn from centre O on chord AB. If $OB = 5\text{cm}$, and $OC = 3\text{cm}$ then find length of AB.



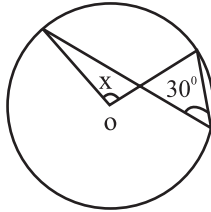
11. In given figure O is centre of circle.
If $\angle AOC = 130^\circ$ then find $\angle ABC$



12. In given figure AOB is diameter of circle & P is any point on the circle.
Find $\angle APB$.

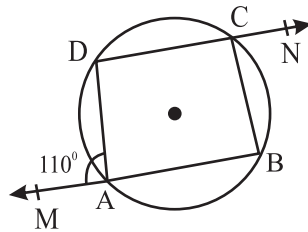


13. Find the value of x in given figure.

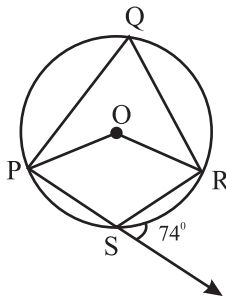


Part – B

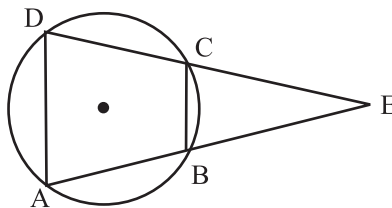
14. Prove that cyclic parallelogram is a rectangle.
15. A chord of a circle is equal to the radius of the circle. Find the angle subtended by the chord at a point on the minor arc and also at a point on the major arc.
16. In the following figure. Find the value of $\angle BCN$.



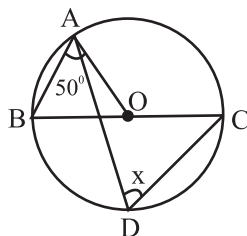
17. In the given figure. Find the value of reflex angle POR.



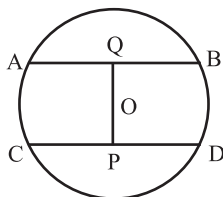
18. In given figure ABCD is a cyclic quadrilateral, chords AB and CD are produced to meet E, show that $EA \times EB = EC \times ED$.



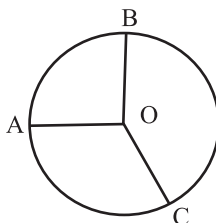
19. Find the value of x in figure if O is centre of circle and $\angle OAB = 50^\circ$.



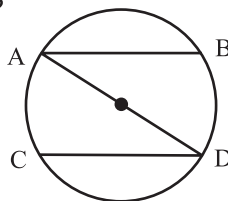
20. In the given figure, O is centre of the circle with radius 5 cm, $OP \perp CD$, $OQ \perp AB$, $AB \parallel CD$, $AB = 6$ cm and $CD = 8$ cm. Determine PQ .



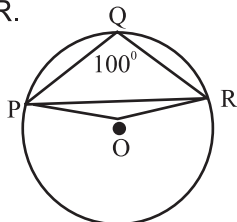
21. In the given figure, O is the centre of a circle, $\angle AOB = 90^\circ$, $\angle BOC = 120^\circ$, what is measure of $\angle ABC$?



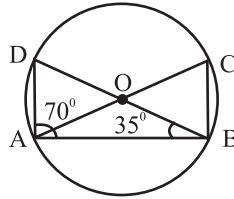
22. In the given figure AB and CD are parallel chords if the length of arc $AC = 14$ cm. What is length of BD ?



23. In given figure $\angle PQR = 100^\circ$ where P, Q & R are points on the circle with centre O . Find $\angle OPR$.

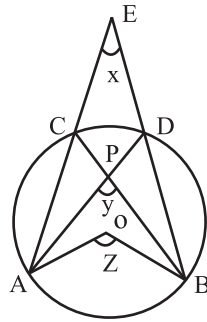


24. In the given figure O is centre of circle, if $\angle ABD = 35^\circ$ and $\angle BAD = 70^\circ$ find $\angle ACB$.

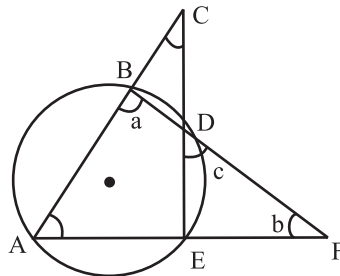


Part – C

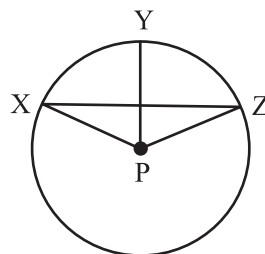
25. In the given figure, O is the centre of a circle prove that $\angle x + \angle y = \angle z$.



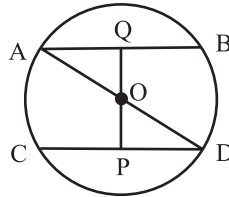
26. If two non parallel sides of a trapezium are equal prove that it is cyclic quadrilateral.
27. In the given figure determine a, b & c if $\angle BCD = 43^\circ$, $\angle BAF = 62^\circ$.



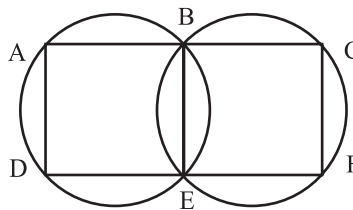
28. In the figure P is the centre prove that $\angle XPZ = 2 (\angle XZP + \angle YXZ)$



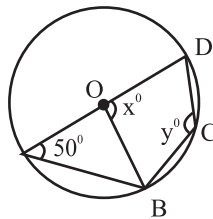
29. In the given figure AD is diameter of the circle whose centre is O and $AB \parallel CD$ prove that $AB = CD$.



30. In an equilateral triangle, prove that the centroid and the circum centre coincide.
31. In the given figure A, B, C and D, E, F are two sets of collinear points. Prove that $AD \parallel CF$.



32. In given figure, O is centre of circle and $\angle DAB = 50^\circ$, calculate the value of x and y.



33. If two equal chords of a circle intersect within the circle prove that the segment of one chord is equal to corresponding segment of other chord.
34. Prove that if a pair of opposite angles of a quadrilateral is supplementary then the quadrilateral is cyclic.

Part – D

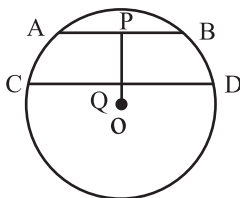
35. Bisector of angle A, B and C of a $\triangle ABC$ intersect its circum circle at D, E and F respectively, prove that the angles of a triangle DEF are

$$90^\circ - \frac{1}{2} A, 90^\circ - \frac{1}{2} B, 90^\circ - \frac{1}{2} C$$

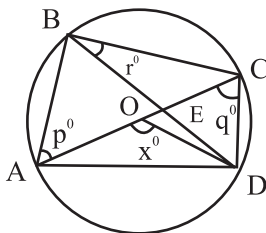
36. Find the sum of the angles in the four segments exterior to a cyclic quadrilateral.
37. Let the vertex of an angle ABC be located outside a circle and let the sides of the angle intersect equal chords AD and CE with the circle. Prove that $\angle ABC$ is equal to half the difference of the angles subtended by the chords AC and DE at the centre.

$$\angle ABC = \frac{1}{2} [\angle DOE - \angle AOC]$$

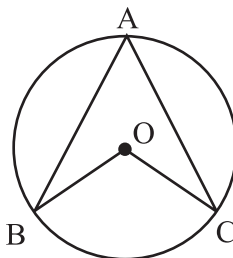
38. In the given figure O is centre of the circle of radius 5 cm, $OP \perp CD$, $AB \parallel CD$
 $AB = 6$ cm and $CD = 8$ cm
 Determine PQ



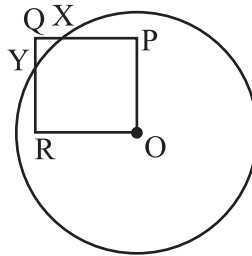
39. In the adjoining figure AC is diameter of a circle with centre O and chord $BD \perp AC$, intersecting each other at E. Find out the values of p, q, r in terms of x, if $\angle AOD = x^\circ$, $\angle BAC = p^\circ$, $\angle ACD = q^\circ$.



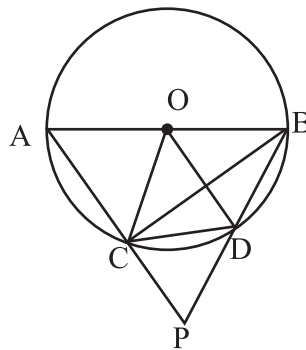
40. During a practical activity in maths lab students were using circular geo board. The angle subtended by an arc at the centre is $(2a+50^\circ)$. Pallavi calculated $\angle BAC$ as $(a+25^\circ)$.
- Is her finding correct? Justify it.
 - Find $\angle BAC$ if $a = 30^\circ$
 - What will be the value of $\angle BOC$ for $a = 15^\circ$
 - If $a = 30^\circ$ then find the measure of Reflex $\angle BOC$.



41. Show that if two chords of a circle bisect each other, they must be diameters of the circle.
42. Prove that the quadrilateral formed by angle bisectors of a cyclic quadrilateral is also cyclic.
43. Prove that there is one and only one circle can pass through three non-collinear points.
44. In the given figure OPQR is a square. A circle drawn with centre O cuts the square in X and Y. Prove that $QX = QY$.

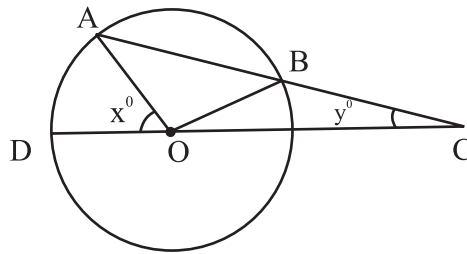


45. Prove that the opposite angles of a cyclic quadrilateral are supplementary.
46. In the given figure, AB is a diameter of a circle (o, r) and chord CD = radius oc. If AC and BD when produced meet at P. Prove that $\angle APB$ is constant.

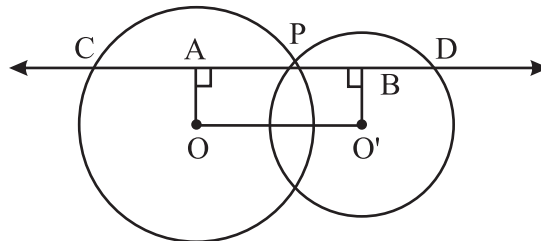


47. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.

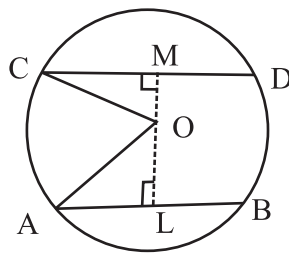
48. In the given figure, AB is a chord of a circle with centre O and AB is produced to C such that $BC = OB$. Also, CO is joined and produced to meet the circle in D. If $\angle ACD = y^\circ$ and $\angle AOD = x^\circ$. Prove that $x = 3y$.



49. Two circles whose centres are O and O' intersect at P. Through P, a line l parallel to OO', intersecting the circle at C and D is drawn. Prove that $CD = 2OO'$.



50. AB and CD are two parallel chords of a circle which are on opposite sides of the centre O such that $AB = 10\text{cm}$, $CD = 24\text{cm}$ and the distance between AB and CD is 17 cm. Find the radius of the circle.



CHAPTER-10 CIRCLES

ANSWERS

1. Cyclic quadrilateral
2. Sector
3. 8 cm
4. 10 cm
5. $y = 40^\circ$
6. $x = 35^\circ$
7. $x = 140^\circ$
8. longest
9. concentric
10. 8 cm
11. 115°
12. 90°
13. 60°
15. $30^\circ, 150^\circ$
16. 70°
17. 212°
19. 50°
20. 7 cm
21. 75°
22. 14 cm
23. 10°
24. 75°
27. $a = 105^\circ, b = 13^\circ, c = 62^\circ$
32. $x = 100^\circ, y = 130^\circ$
36. 540°
38. 1 cm
39. $p = 90^\circ - \frac{1}{2}x, q = \frac{1}{2}x, r = 90^\circ - \frac{1}{2}x$
40. i) yes
ii) 55°
iii) 80°
(iv) 250°
50. 13 cm

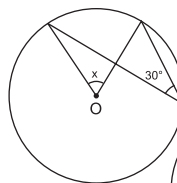
PRACTICE TEST

Time : 50 Min.

Circles

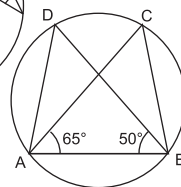
M.M. 20

1. Find the value of x in the given figure



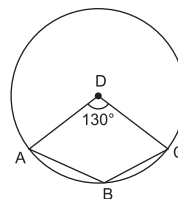
(1)

2. In the given figure : $\angle DAB = 60^\circ$ and $\angle ABD = 50^\circ$. then $\angle ACB = ?$



(1)

3. In given figure O is the centre of circle. If $\angle AOC = 130^\circ$ then find $\angle ABC$.



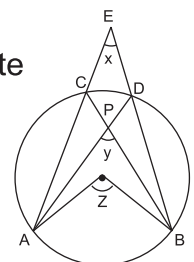
(2)

4. Prove that equal chords of a circle subtend equal angles at the centre.

5. Prove that the sum of either pair of the opposite angles of a cyclic quadrilateral is 180° .

6. In the given figure, O is the centre of a circle prove that

$$\angle x + \angle y = \angle z$$

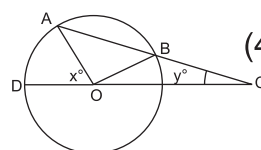


(2)

(3)

(3)

7. In the given figure, AB is a chord of a circle with centre O and AB is produced to C. Such that $BC = OB$. Also, CO is joined and produced to meet the circle in D.



(4)

If $\angle ACD = y^\circ$ and $\angle AOD = x^\circ$. Prove that $x = 3y$.

8. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.

(4)

CHAPTER-11
CONSTRUCTIONS
KEY POINTS

- Following types of constructions using a ruler and compass are important.
 1. Construction of angle of 60° , 120° , 30° , 90° , etc.
 2. Bisecting a given angle i.e. to draw angle bisector.
 3. Construction of the perpendicular bisector of a given line segment.
 4. Construction of the perpendiculars to a given line from a point on the line or out side the line.
 5. Construction of the parallel lines to a given line.
 6. Construction of a triangle given its base, a base angle and the sum of the other two sides.
 7. Construction of a triangle given its base, a base angle, and the difference of the other two sides.
 8. Construction of a triangle given its perimeter and its two base angles.

Questions

1. Draw a line segment of 7.2 cm and bisect it. Also measure each part.
2. Draw perpendicular bisector of $AB = 6.4$ cm.
3. Draw a line segment $PQ = 8$ cm. Draw a perpendicular at P.
4. Draw a line $AB = 7.9$ cm and draw perpendiculars at A and B.
Are these two perpendiculars parallel to each other?
5. Draw an angle $\angle ABC = 32^\circ$ using protractor. Construct another angle equal to $\angle ABC$ using compass.
6. Construct the angles of the following measurements using compass.
 90° , $22\frac{1}{2}^\circ$, 15° , 75° , 105° , 135°
7. Construct a rhombus whose side is 3.4 cm and one of its angle is 45° .

8. Construct $\triangle XYZ$ in which $XY = 4.5$ cm, $YZ = 5.0$ cm. and $ZX = 6.0$ cm. Also draw angle bisector of largest angle.
9. Construct an equilateral triangle of side 6 cm. and label its vertices as P, Q and R. From point Q draw a median QT.
10. Draw a line segment $AB = 13.2$ cm. Find $\frac{1}{4}AB$ using ruler and compass. Write steps of construction.
11. Construct a right triangle ABC, $\angle B = 90^\circ$ $AB + AC = 10$ cm., $BC = 6$ cm.
12. Construct a $\triangle PQR$ in which $QR = 7$ cm. $\angle Q = 75^\circ$ and $PQ + PR = 13$ cm.
13. Construct a $\triangle PQR$ in which $QR = 6$ cm. $\angle Q = 30^\circ$ and $PQ - PR = 3$ cm.
14. Construct a $\triangle XYZ$ in which $YZ = 4.1$ cm. $\angle Y = 45^\circ$, and $XY + XZ = 6.7$ cm.
15. Construct a $\triangle PQR$ in which $QR = 5$ cm. $\angle R = 45^\circ$ and $PR - PQ = 1.6$ cm.
16. Construct a $\triangle XYZ$ in which $\angle Y = 30^\circ$, $\angle Z = 90^\circ$ and $XY + YZ + ZX = 11$ cm.
17. Construct a triangle ABC in which $\angle B = 45^\circ$, $\angle C = 60^\circ$ and the perpendicular from the vertex A to the base BC is 4.5 cm.
18. Construct a triangle with perimeter 12 cm and ratio of their angles are 3 : 4 : 5.
19. Government wish to make an old age home of right triangular shape. If one side is 13m and sum of hypotenuse and other side is 15 m then Construct the triangle taking measurement in cm.
20. Eco club of a school created a triangular park $\triangle ABC$ to maintain greenery of the school. If $BC = 7$ m, $\angle B = 75^\circ$, $AB + AC = 13$ m then Construct $\triangle ABC$ taking measurement in cm.
21. Draw a line ℓ and take a point P which is not on ℓ . From point P draw $m \parallel \ell$.
22. Construct a triangle DEF in which $DE = 5$ cm $\angle D = 120^\circ$ and $EF - DF = 3.6$ cm.
23. Construct an equilateral triangle, the sum of its two sides is 8 cm.
24. Construct a right angled triangle with base 5.4 cm and difference of hypotenuse and perpendicular is 1.9 cm.

25. Construct a triangle PQR with $PQ = 5$ cm. $\angle P = 105^\circ$ and $PR + QR = 8$ cm.
26. Construct a triangle whose perimeter is 11.9 cm and base angles are 80° and 60° .
27. Construct an isosceles triangle XYZ with $YZ = ZX = 8$ cm. and median $YT = 4$ cm.

PRACTICE TEST

Time : 50 Min.

Constructions

M.M. 20

1. Draw an angle of 60° . (1)
2. What is the length of bisected part of a line segment 7.8 cm? (1)
3. Draw any angle and bisect it. (2)
4. Draw line segment $AB = 8.4$ cm and draw perpendicular at its mid-point. (2)
5. Draw $PQ = 10$ cm. Divide it into four equal parts using ruler and compass. Write measurement of each part. (3)
6. Construct $\triangle XYZ$ in which base $XY = 6$ cm and length of median from Z is 3.7 cm. (3)
7. Construct a right triangle when one side is 3.5 cm and sum of other side and hypotenuse is 5.5 cm. (4)
8. Construct a triangle PQR where perimeter is 10 cm and each base angle is 45° . (4)

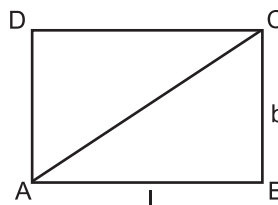
CHAPTER-12

HERON'S FORMULA

KEY POINTS

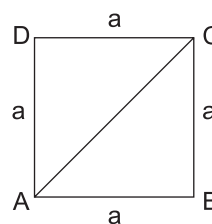
- Rectangle : If length and breadth of a rectangle is 'l' and 'b' respectively then

- (i) Perimeter of rectangle = $2(l + b)$ units
- (ii) Area of rectangle = $l \times b$ sq. units
- (iii) Diagonal of rectangle = $\sqrt{l^2 + b^2}$ units



- Square : If 'a' is the length of side of a square

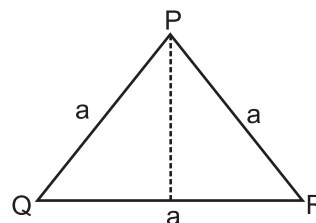
- (i) Perimeter of square = $4a$ units
- (ii) Area of square = $(\text{side})^2 = (a)^2$ sq. units
- (iii) Area of square = $\frac{1}{2} \times (\text{diagonal})^2$



- Triangle :

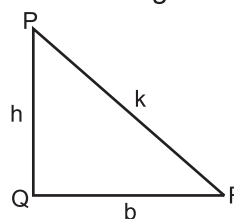
- (A) Equilateral Triangle : In this triangle all three sides are equal. If the length of each side is 'a' then

- (i) Perimeter = $3a$ units
- (ii) Altitude = $\frac{\sqrt{3}}{2} a$ units
- (iii) Area = $\frac{\sqrt{3}}{4} a^2$ or $\frac{\sqrt{3}}{4} (\text{side})^2$ sq. units



- (B) Right Angled Triangle : If one of the angles of a triangle is 90° .

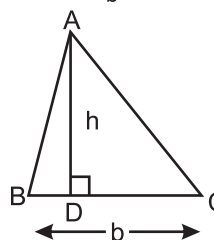
- (i) Hypotenuse $k = \sqrt{b^2 + h^2}$ units
- (ii) Perimeter = $b + h + k$ units
- (iii) Area = $\frac{1}{2} \times b \times h$ sq. units



Area of triangle (General Formula)

$$= \frac{1}{2} \times \text{base} \times \text{Corresponding Altitude}$$

$$= \frac{1}{2} \times b \times h \text{ sq. units}$$



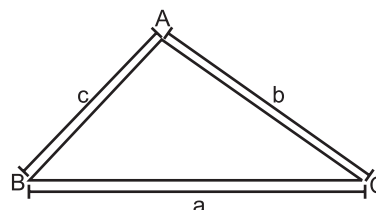
HERON'S FORMULA

- If the sides of triangle are a, b and c

(i) Perimeter = $a + b + c$

(ii) Semi Perimeter (S) = $\frac{a+b+c}{2}$

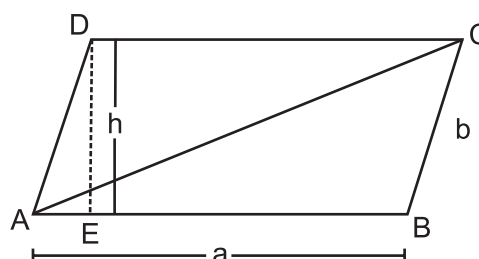
(iii) Area of Triangle ($\triangle ABC$) = $\sqrt{s(s-a)(s-b)(s-c)}$



Note : Heron's formula is applicable to all types of triangles.

- Area of Parallelogram : If a is the length and b is breadth of a parallelogram and h be the height or perpendicular distance between two parallel sides then.

Area of parallelogram (ABCD)
 = Base x Corresponding Height
 = AB x DE
 = $a \times h$ sq. units



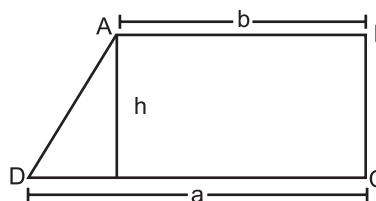
Area of $\triangle ABC = \frac{1}{2} \times \text{Area of Parallelogram}$

- Area of Trapezium : Trapezium with parallel sides a and b and the perpendicular distance between two parallel sides as h.

Area of trapezium

= $\frac{1}{2} \times (a + b) \times h$

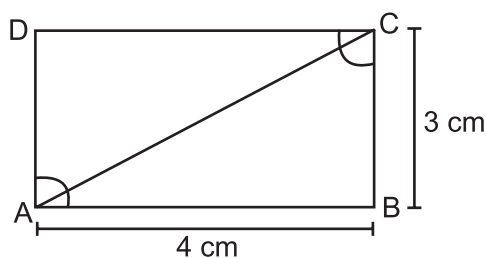
= $\frac{1}{2} \times (\text{sum of parallel sides}) \times \text{height}$



Part – A

- Find the area of a triangle whose base and altitudes are 8cm and 5cm.
- Find the area of an equilateral triangle whose sides are 4cm each.
- If sum of two sides of a triangle is 17cm and its perimeter is 30cm, then what is the length of third side.
- If perimeter of a triangle is 24cm and sides are in the ratio 2 : 1 : 3, then find the longest side?

5. If each sides of a triangle is doubled then how many times the perimeter of triangle increased?
6. If area of a triangle is 50cm^2 and one of its sides is 10cm then find the length of corresponding altitude.
7. The area of an equilateral triangle is $16\sqrt{3}\text{ cm}^2$ then what will be the length of each side of that triangle?
8. Find the ratio between the area $\triangle ABC$ and area $\triangle ACD$ of the given rectangle.

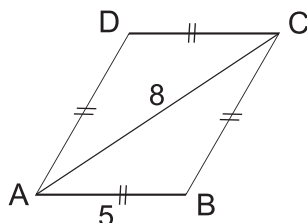


9. A square has each side of 5cm . Find the length of one of its diagonals.
10. If the length and corresponding height of a parallelogram are 10 cm and 8cm then find the area of a triangle made by its diagonal.
11. If one side of a triangle is 9.5 m and its corresponding altitude is 12m then what will be the area of triangle.

Part – B

12. If $(s - a) = 5\text{ cm}$
 $(s - b) = 10\text{ cm}$
 $(s - c) = 1\text{ cm}$. Find a, b & c
 where a, b & c are sides of the triangle.
13. The ratio between the sides of a triangle are $3 : 5 : 7$ and its perimeter is 300cm find the sides of triangle.
14. Find the cost of fencing the ground in the form of a triangle with sides 16 m , 12 m and 18 m . The rate of fencing is Rs. 25 per meter.
15. Find the area of isosceles triangle whose non equal side of 12 cm having the corresponding altitude is 7.5 cm .
16. The parallel side of a trapezium is 77m and 60m and its non parallel sides are 26m and 25m . Find the area of trapezium.

17. Find the area of rhombus in which $AB = 5$ cm and $AC = 8$ cm.



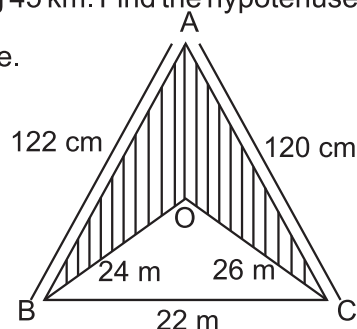
18. If in a triangle $AB = 15$ cm, $BC = 14$ cm and $AC = 13$ cm. Find the area of $\triangle ABC$ and hence its altitude corresponding to side BC .
19. Show that the Area of an equilateral triangle is $\frac{\sqrt{3}}{4} x^2$, where side is x .
20. Perimeter of an isosceles triangle is 32 cm. The ratio of equal side to its base is 3 : 2. Find area of this triangle.

Part – C

21. The area of a quadrilateral is 360m^2 and the perpendiculars drawn to one of the diagonal from the opposite vertices are 10m and 8m. Find the length of the diagonal.
22. If in a triangle with sides a, b & c , $(s - a) = 5$ cm,
 $(s - b) = 10$ cm and $(s - c) = 1$ cm, Find area of the triangle.
23. The cost of levelling a park is 2,700 for each 2 km^2 . If the park is in right angled triangular form with one side being 45 km. Find the hypotenuse.
24. Find the area of shaded region in the figure.

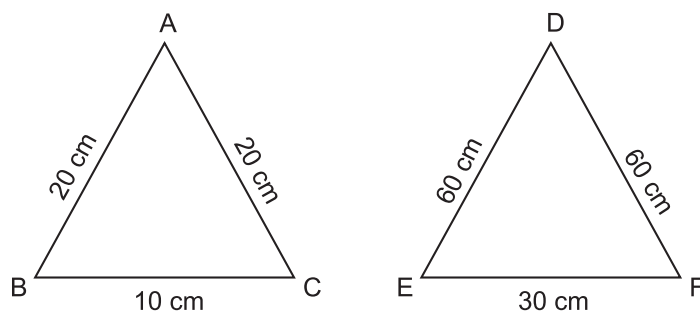
How many triangular flower beds of 6m^2 can be made from this area.

Use $\sqrt{105} = 10.25$



25. Find the area of rhombus whose perimeter is 100 m and one of whose diagonal is 30 m.
26. The sides of a triangle shaped sheet are 5 cm, 12 cm and 13 cm. Find the cost of painting on the sheet at the rate of ₹ 30 per cm^2 .
27. One side of a right angled triangle is 20 cm and the difference in lengths of its hypotenuse & other side is 8 cm. Find the other sides and area of the triangle.

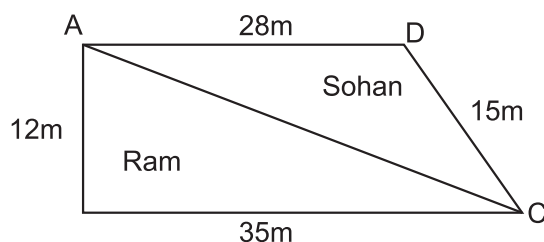
28. Find the ratio between the area of triangle $\triangle ABC$ and $\triangle DEF$.



29. If perimeter of a triangle is x cm and its sides are p , q and r cm. What will be the area of triangle? Use the Heron's formula.

Part – D

30. A Triangular park ABC has sides 120 m, 80m and 50 m. A gardner has to put a fence all around it and also plant some trees inside the garden to get clean air.
- Find the cost of fencing it at the rate of Rs. 50 per meter. Leaving space 5 cm wide for the gate on one side.
 - Find its area where gardner may plant the tree.
31. A piece of land is in the shape as given in the figure, has been cut along diagonal AC. The two pieces of land has been distributed between Ram and Sohan. Who will get larger piece of land in terms of area? [Use $\sqrt{10} = 3.15$]



32. A triangular hoarding of dimensions 11m, 6m and 15m is used for commercial activities. The hoarding yield an earning of d 5000 per m^2 per month.

Calculate the total earning by the hoarding in a month. [Use $\sqrt{2} = 1.41$]

33. If each side of a triangle is doubled, find the ratio of the areas of two triangles, the given triangle & the triangle obtained on doubling the sides. Also find the percentage increase in the area of new triangle.

CHAPTER-12
HERON'S FORMULA

ANSWERS

- | | | |
|--|---------------------------------|---------------------------|
| 1. 20 cm^2 | 2. $4\sqrt{3} \text{ cm}^2$ | 3. 13 cm |
| 4. 12 cm | 5. one time | 6. 10 cm |
| 7. 8 cm | 8. 1 : 1 | 9. $5\sqrt{2} \text{ cm}$ |
| 10. 40 cm^2 | 11. 57 m^2 | 12. 11 cm, 6 cm 15 cm |
| 13. 60cm, 100cm, 140cm | | 14. ₹ 1150 |
| 15. 45 cm^2 | 16. 1644 m^2 | 17. 24 cm^2 |
| 18. 84 cm^2 , 12cm | 20. $32\sqrt{2} \text{ cm}^2$ | |
| 21. 40 m | 22. $20\sqrt{2} \text{ m}^2$ | 23. 75 km |
| 24. 1074 m^2 , 179 | 25. 600 m^2 | 26. ₹ 900 |
| 27. 29 cm, 21 cm | 28. 1 : 9 | |
| 29. $\sqrt{\frac{x}{2}\left(\frac{x}{2} - p\right)\left(\frac{x}{2} - q\right)\left(\frac{x}{2} - r\right)}$ | | |
| 30. (i) ₹ 12250 | (ii) $375\sqrt{15} \text{ m}^2$ | |
| 31. Ram 210 m^2 | 32. R 141000 | |
| 33. (i) 1:4 | | |
| (ii) 300% | | |

PRACTICE TEST

HERON'S FORMULA

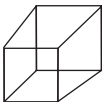
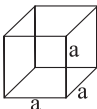
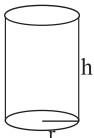
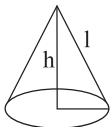
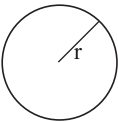

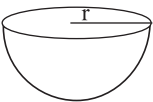
Time : 50 Min.

M.M. 20

1. Find the length to sides of an equilateral triangles having area $a\sqrt{3} \text{ cm}^2$. 1
2. If $(s - a) = 5 \text{ cm}$, $(s - b) = 10 \text{ cm}$, $(S - C) = 1 \text{ cm}$. Find S. 1
3. Find the area of isosceles triangle whose equal sides are of length 15 cm each & the third side is 12 cm. 2
4. If each side of triangle is doubled, then find the ratio of area of new triangle thus formed & the given triangle. 2
5. The sides of a triangle are in the ratio 25 : 17 : 12 and its perimeter is 540 cm. Find the area of the triangle. 3
6. The area of trapezium is 475 cm^2 & height is 19 cm. Find length of its parallel sides if one side is 4 cm greater than the other. 3
7. The length of sides of a triangle are 7 cm, 12 cm & 13 cm. Find the length of perpendicular from opposite vertex to the side whose length is 12 cm. 4
8. The cost of fencing a field @ ₹ 5 per metre is ₹ 1920. If semi perimeter is 48 cm find its area & all sides. 4

CHAPTER-13 SURFACE AREAS AND VOLUMES

KEY POINTS

S. No.	Name	Figure	Lateral/ Curved Surface Area	Total surface Area	Volume	Symbols used for
1.	Cuboid		$2(l+b) \times h$	$2(lb+bh+hl)$	lbh	l =Length b =breadth h =height
2.	Cube		$4a^2$	$6a^2$	a^3	a =side
3.	Right Circular Cylinder		$2\pi rh$	$2\pi r(h+r)$	$\pi r^2 h$	h =height r =radius of base
4.	Right Circular Cone		πrl	$\pi r(l+r)$	$\frac{1}{3} \pi r^2 h$	h =height r =radius of base
5.	Sphere		$4\pi r^2$	$4\pi r^2$	$\frac{4}{3} \pi r^3$	r = radius
6.	Hemisphere Solid		$2\pi r^2$	$3\pi r^2$	$\frac{2}{3} \pi r^3$	r = radius
7.	Hemisphere hollow		$2\pi r^2$	$2\pi r^2$	$\frac{2}{3} \pi r^3$	r = radius

PART-A

- Q.1 The lateral surface area of a cube is 256 cm^2 . Find its volume.
- Q.2 A matchbox measures $4 \text{ cm} \times 2.5 \text{ cm} \times 1.5 \text{ cm}$. What will be the volume of a packet containing 12 such boxes?
- Q.3 The ratio of height of two cylinders is $5:3$, as well as the ratio of their radii is $2:3$. Find the ratio of the volumes of the cylinders.
- Q.4 Find the area of canvas required for a conical tent of height 24 m and base radius 7 m .
- Q.5 Find the ratio of total surface area of a sphere and a hemisphere of same radius.
- Q.6 The surface area of the cuboid is 1372 sq. cm . If its dimensions are in the ratio of $4:2:1$. Then find its length.
- Q.7 If the radius and slant height of a cone are $r/2$ and $2l$. Then find its total surface area.
- Q.8 A cone and a hemisphere have equal base and equal volumes. Find the ratio of their heights.
- Q.9 The radius of a spherical balloon increase from 6 cm to 12 cm as air is being pumped into it. Find the ratio of the surface areas of the balloon in two cases.
- Q.10 The largest possible right circular cone is cut out of a cube of edge $r \text{ cm}$. What is the volume of cone?

PART-B

- Q.11 A rectangular sheet of dimensions $33 \text{ cm} \times 18 \text{ cm}$ is rolled along its breadth to form a cylinder. Find the radius of the cylinder.
- Q.12 A roller 1.5 m long has a diameter of 70 cm . How many revolutions will it make to level a play ground measuring $50 \text{ m} \times 33 \text{ m}$?
- Q.13 The dimensions of a cuboid are in the ratio of $1:2:3$ and its total surface area is 88 m^2 . Find its dimensions.
- Q.14 A solid cylinder has a total surface area of 231 cm^2 . The curved surface area is $\frac{2}{3}$ of the total surface area. Find the volume of cylinder.
- Q.15 The total surface area of a cube is 150 sq. cm . Find the perimeter of any one of its faces.

- Q.16 Three metal cubes whose edge measures 3cm, 4cm and 5cm respectively are melted to form a single cube. Find the edge of the cube.
- Q.17 The length, breadth and height of room are 5m, 4m and 3m respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of S. 7.50 per m^2 .
- Q.18 Three spheres of radii 3cm, 4cm and 5cm are melted together to form a single sphere. Find the radius of new sphere.
- Q.19 The curved surface area of a cylinder is 176 cm^2 and its base area is 38.5 cm^2 . Find the volume of the cylinder.
- Q.20 A cylinder and a cone have the same height and the same radius. The volume of the cylinder is 24 cm^3 . What will be the volume of the cone?
- Q.21 What is the volume of the largest cone that can be inscribed completely in a hollow hemisphere of radius 7 cm?
- Q.22 Find the maximum length of the rod that can be placed in a cuboid of dimensions $22.5 \text{ cm} \times 10 \text{ cm} \times 7.5 \text{ cm}$.

PART-C

- Q.23 A cuboidal vessel is 10m long and 8m wide. How high must it be made to hold 380 m^3 of a liquid?
- Q.24 A wall of length 10m was to be built across an open ground. The height of the wall is 4m and thickness of the wall is 24cm. If this wall is to be built up with bricks whose dimensions are 24cm x 10cm x 8cm, how many bricks would be required?
- Q.25 1.1 cm^3 of gold is drawn into a wire of 0.1 mm in diameter. Find the length of the wire in metre.
- Q.26 A hemispherical bowl of internal diameter 36cm contain a liquid. This liquid is to be filled in cylindrical bottles of radius 3cm and height 6 cm. How many bottles are required to empty the bowl?
- Q.27 Find the lateral curved surface area of a cylindrical petrol storage tank that is 4.2m in diameter and 4.5m high. How much steel was actually used if $1/12$ of steel actually used was wasted in making the closed tank?

- Q.28 Water in a canal, 30 dm wide and 12 dm deep is flowing with a speed of 20 km per hour. How much area will it irrigate in 30 min if 9 cm of standing water is desired ? (10dm=1m)
- Q.29 The radius of a sphere is 10cm. If the radius is increased by 1 cm. then prove that volume of the sphere is increased by 33.1%.
- Q.30 The diameter of a hemisphere is decreased by 30%. What will be the percentage change in its total surface area?
- Q.31 A sphere and a cube have the same surface area. Find the ratio of their volumes.
- Q.32 The volume of a sphere is 4851 cm^3 . How much should its radius be reduced so that its volume becomes $\frac{4312}{3} \text{ cm}^3$?
- Q.33 A semicircular sheet of paper of diameter 14 cm is bent to form an open conical cup. Find the capacity of the cup.
- Q.34 If c, t and v are curved surface area, total surface area and volume of a cylinder then show that

$$th^2 = ch^2 + 4v^2 + 8v^2rh$$

where r and h are radius and height.

PART-D

- Q.35 A cuboidal tank can store 5040 litres of water. The external dimensions of the tank are 2.2m x 1.7m x 1.7m. If the walls of the tank are 5 cm thick, then what is the thickness of the bottom of the tank?
- Q.36 A metallic sheet is of the rectangular shape with dimensions 48cm x 36cm. From each one of its corners, a square of 8cm is cut off. An open box is made of the remaining sheet. Find the volume of the box.
- Q.37 A right triangle having sides 6cm, 8cm and 10cm is revolved about the side of length 8cm. Find the volume of the solid so formed.
- Q.38 A right circular cone is 5.4 cm high and radius of its base is 2cm. It is melted and recast into another right circular cone with radius of base as 1.5 cm. Find the height of new cone formed.
- Q.39 A cylindrical tub of radius 12 cm contains water to the depth of 20cm. A spherical ball is dropped into the tub raising the level of water by 6.75cm. What is the radius of ball?

- Q.40 A cylinder is within the cube touching all the vertical faces. A cone is inside the cylinder. If their height are the same with the same base. Find the ratio of their volumes.
- Q.41 A plot of land is in the form of rectangle has dimension $240\text{m} \times 180\text{m}$. A drain let 10m wide is dug around it (on the outside). and the earth dug out is evenly spread out over the plot increasing its surface level by 25cm . Find the depth of the drainlet.
- Q.42 A residential colony has a population of 5400 and 60 litres of water is required per person per day. For the effective utilization of rain water, a group of people decided to the WATER HARVESTING. They constructed a water reservoir measuring $48\text{m} \times 27\text{m} \times 25\text{m}$ to collect the rain water.
- For how many days the water of this tank is sufficient-if during rain the height of water level is 5 m .
- Q.43 50 students of class IX planned a visit to an old age home and to spend the whole day with its inmates. Each one prepared a cylindrical flower vase using card board to gift the inmates. The radius of cylinder is 4.2cm and the height is 11.2 cm .
- What is the amount spent for purchasing the card board at the rate of 20 per 100m^2 .
- Q.44 Rahul wanted to make a temporary shelter for street dogs, by making a box like structure with tarpaulin that covers all the four sides and the top of the house. How much tarpaulin would be required to make the shelter of height 2.5 m with base dimensions $4\text{m} \times 3\text{m}$. Assuming stitching margin is negligible.
- Q.45 Twenty Seven solid iron spheres each of radius r and surface area S are melted to form a sphere with surface area S^1 . Find the
- radius R of the new sphere.
 - ratio of S and S^1 .
- Q. 46 The diameter of a metallic ball is 4.2cm . What is the mass of the ball, if the density of the metal is 8.9g per cm^3 .

- Q.47 A lead pencil consists of a cylinder of wood with a solid cylinder of graphite filled in the interior.

The diameter of the pencil is 7mm and the diameter of the graphite is 1mm. If the length of the pencil is 14cm. Find the volume of the wood and that of the graphite.

- Q.48 A soft drink is available in two packs. (i) a tin can with a rectangular base of length 5cm and width 4cm, having a height of 15cm and (ii) a plastic cylinder with circular base of diameter 7cm and height 10cm. Which container has greater capacity and by how much?

- Q.49 A bus stop is barricaded from the remaining part of the road, by using 50 hollow cones made of recycled cardboard. Each cone has a base diameter of 40cm and height 1m. If the outer side of each of the cone is to be painted and the cost of painting is ₹ 12 per m^2 , What will be the cost of painting of all these cones? (Use $\pi = 3.14$ and $\sqrt{1.04} = 1.02$)

- Q.50 A sphere of diameter 6cm is dropped in a right circular cylinder vessel partly filled with water. The diameter of the cylindrical vessel is 12cm. If the sphere is completely submerged in water, by how much will the level of water rise in the cylindrical vessel?

- Q.51 Marbles of diameter, 1.4cm are dropped into a cylindrical beaker, of diameter 7cm. containing some waters. Find the number of marbles that should be dropped into the beaker, so that the water level rises by 5.6cm.

- Q.52 Right circular cylinder having diameter 12cm and height 15cm is full of ice-cream. The Ice-Cream is to be filled in cones of height 12cm and diameter 6cm having a hemispherical shaped on the top. Find the number of such cones which can be filled with Ice-Cream.



- Q.53 A toy is in the form of a cone mounted on a hemisphere of diameter 7cm. The total height of the toy is 14.5 cm. Find the volume and the total surface area of the toy. (Take $\pi = \frac{22}{7}$)

- Q.54 If h , c and v respectively, are the height, the curved surface and volume of the cone, prove that
- $$3\pi vh^3 - c^2h^2 + 9v^2 = 0$$
- Q.55 A wooden box with dimensions $36 \text{ cm} \times 24 \text{ cm} \times 12 \text{ cm}$ is 2 cm thick. Find the weight of the wood if density of the wood is 100 gm/m^3 .
- Q.56 A rectangular reservoir is 210 m long and 75 m wide. Water is flowing into it through a square pipe of side 25 cm such that water rises to 3.5 m in 15 hours. Find the speed of the water.
- Q.57 A hemispherical bowl is to be painted from inside at the rate of Rs. 20 per 100 m^2 . The total cost of painting is Rs. 30.80 . Find
- (i) Inner surface area of the bowl.
 - (ii) Volume of air inside the bowl.

CHAPTER-13 SURFACE AREAS AND VOLUMES

ANSWERS

- | | |
|---|--|
| 1. 512 cm^2 | 27. $59.4 \text{ m}^2, 95.04 \text{ m}^2$ |
| 2. 180 cm^2 | 28. $4,00,000 \text{ m}^2$ |
| 3. $20 : 27$ | 30. 51% |
| 4. 550 m^2 | 31. $\sqrt{6} : \sqrt{\pi}$ |
| 5. $4 : 3$ | 32. 3.5 cm |
| 6. 28 cm | 33. 79.2 cm^3 |
| 7. $\pi r \left(1 + \frac{r}{4}\right)$ | 35. 10 cm |
| 8. $2 : 1$ | 36. 5120 cm^3 |
| 9. $1 : 4$ | 37. $96\pi \text{ cm}^3$ |
| 10. $v = \frac{1}{12} \pi r^3$ | 38. 9.6 cm |
| 11. 2.8 cm | 39. 9 cm |
| 12. 500 | 40. $V1 : V2 : V3 = 42 : 33 : 11$ |
| 13. $2 \text{ m}, 4 \text{ m}, 6 \text{ m}$ | 41. 1.227 m |
| 14. 269.5 cm^2 | 42. 20 days |
| 15. 20 cm | 43. $\text{₹ } 3511.20$ |
| 16. 6 cm | 44. 47 m^2 |
| 17. $\text{Rs. } 555$ | 45. i) $R=3r$ (ii) $S : S^1 = 1 : 9$ |
| 18. 6 cm | 46. 345.39 g |
| 19. 308 cm^3 | 47. $5.28 \text{ cm}^3, 0.11 \text{ cm}^3$ |
| 20. 8 cm^3 | 48. Plastic Cylinder, 85 cm^3 |
| 21. 359.33 cm^3 | 49. $\text{₹ } 384.34$ |
| 22. 25.7 cm | 50. 1 cm |
| 23. 4.75 m | 51. 150 |
| 24. 5000 | 52. 10 |
| 25. 140 m | 53. $231 \text{ cm}^3, 204.05 \text{ cm}^2$ |
| 26. 72 | 55. 3968 g |
| | 56. 58.8 km/hr |
| | 57. (i) 154 m^2 , (ii) 251.5 m^3 |

PRACTICE TEST

Time : 50 Min.

Surface Areas and Volumes

M.M. 20

1. If l , b and h are the length, breadth and height of a room then what will be the total area of the four walls? (1)
2. The volume of a sphere is 310.4 cm^3 . Find its radius. (1)
3. The circumference of the base of a cylinder is 30.8 cm. Its curved surface area is 289.52 cm^2 . Find the height of the cylinder (2)
4. The side of a cube is double the length of the cuboid. The breadth and height of the cuboid are half of its length. Find the ratio of the curved surface area of cube to cuboid. (2)
5. The seed of a corn has dimensions $1.8 \text{ cm} \times 0.8 \text{ cm} \times 0.2 \text{ cm}$. The height of the corn-tube is 13.7 cm and its radius is 4.2 cm. Assuming that the corn-seeds have negligible distance between them and all seeds are of same size, find the number of seeds on the corn-tube. (3)
6. The length, breadth and height of a cuboid are increased by 30%. Find the percent increase in the total surface area. (3)
7. Ajay prepared a dish and kept it in a hemispherical bowl of 30 cm diameter. He distributed the dish in cylinder cups of diameter 15 cm and height 4 cm. among his friends and himself. How many friends were with Ajay? (4)
8. A river 15 m deep 50 m wide is flowing at the rate of 2 cm per second. How many litres of water will fall from the river into the sea in 9 hours? (4)

CHAPTER-14 STATISTICS

KEY POINTS

- In Statistics we study collection, presentation, analysis and interpretation of data.
- Facts or figures collected with a definite purpose are called data.
- The number of times an observation occurs in the given data is called frequency of the observation.
- Classes intervals are the groups in which all observations are divided.
- For class interval 20-30, 30 is called upper class limit and 20 is called lower class limit.
- Class mark = $\frac{\text{Lower class limit} + \text{upper class limit}}{2}$
- Average or mean = $\frac{\text{Sum of all observations}}{\text{number of observations}}$
- For raw data mean $(\bar{x}) = \frac{\sum_{i=1}^n x_i}{n}$ Mean $(\bar{x}) = \frac{X_1 + X_2 + \dots + X_n}{n}$
- When frequency f_i is given Mean $\bar{x} = \frac{\sum_{i=1}^n f_i x_i}{\sum_{i=1}^n f_i}$
- Mode is the value of observation which occurs most frequently.
- For Median arrange the data in ascending order or descending orders.

If number of observations 'n' is odd

$$\text{median} = \frac{(n+1)}{2}^{\text{th}} \text{ term}$$

If number of observations 'n' is even

$$\text{median} = \frac{\left(\frac{n}{2}\right)^{\text{th}} \text{ term} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{ term}}{2}$$

PART-A

1. The marks of 5 students in a subject out of 50 are 32, 48, 50, 27, 37. Find the range of marks.
2. A data contains 64 as the highest value and its range is 13. What is its lowest value of data?
3. What is the class mark of the class interval 4.7-6.3?
4. If class mark of a class interval is 8.5. The class size is 5. Find the class limits of the corresponding class interval.
5. In a bar graph 0.2 cm length of a bar represents 100 people. What is the length of bar which represents 1300 people?
6. Find the mean of first 5 Prime numbers.
7. The mean of 5 observations is 10. If each observation of the data is increased by 5. Find the new mean.
8. If the mean of 10 observations is 15. Find the sum of all observations.
9. The mean of three numbers is 7. If two numbers are 7 and 8. Find the third number.
10. If the mean of 6, 8, 5, 7, x and 4 is 7 then find the value of x .
11. The mode of 4, 9, 5, 4, 9, 5, 4, 9 and $x-10$ is 9 Find x .
12. If the median of the data arranged in ascending order as 6, 9, 15, $x+4$, $x+8$, $x+11$, 30, 32 is 19 find x .
13. The mean of the data $x_1, x_2, x_3, \dots, x_n$ is 10. Find mean of $5x_1, 5x_2, 5x_3, \dots, 5x_n$.

PART-B

14. Write the class size and class limits of 104, 114, 124, 134.
15. If the mean of the observations $x, 2x+1, 2x+5, 2x+9$ is 30. What is mean of last two observations?
16. Find the mean from the following table.

x_i	5	6	7	8	4
f_i	3	2	1	3	2

17. The mean of five numbers is 27. If one of the number is excluded, the mean gets reduced by 2. What is the value of the excluded number?

18. Find the mode of the data 15, 14, 19, 20, 14, 15, 16, 14, 15, 18, 14, 19, 15, 17, 15. If last observation is changed to 14 then find the new mode.
19. If the median of the data arranged in ascending order is 63, find the value of x in the data 29, 32, 48, $x-2$, x , $x+2$, 72, 78, 84, 95.
20. The mean monthly salary of 40 workers of a factory is x in a particular year. Each one was given 3000 as Diwali Bonus. What will be the mean monthly salary in that month.
21. In the question 20 instead of bonus, ₹300 be deducted from each workers salary for April to February. What will be their mean monthly salary for December month?
22. For what value of x the mode of the following data is 17. The frequency of x is maximum. 13, 24, 13, 27, 17, 16, 17, x , 22, 21, 13, 17?
23. The average age of Shikha and her husband Amit is 48 years. The average age of Shikha, Amit and their daughter Advika is 39 years. Find the age of Advika.
24. The mean of 6, 10, 11, x , 12, y is 10. Also y is 7 more than x . Find the value of x and y .

PART-C

25. In three unit tests of Mathematics Priya got 75, 82 and 90 marks. How many marks must she obtain in Unit Test IV to have an average of 85 in all the four unit tests?
26. Time taken in seconds by 25 students in an examination to solve certain question is given below.
20, 16, 20, 27, 27, 28, 30, 33, 37, 50, 40, 42, 46, 38, 43, 46, 46, 48, 49, 53, 58, 59, 60, 64, 52.

By taking class interval of size 10, make a frequency distribution table.

27. Find the mean from the following table

x_i	5	15	25	35	45
f_i	6	4	9	6	5

28. Draw the histogram from the following data

Class	0-10	10-20	20-30	30-40	40-50
Frequency	8	15	20	12	16

29. Given below is a cumulative frequency distribution table showing the marks scored by 50 students of a class.

Marks	Number of students
Below 20	17
Below 40	22
Below 60	29
Below 80	37
Below 100	50

Form a frequency table from the above data.

30. Given below are the seats won by different political parties in a state assembly election.

Political Party	A	B	C	D	E	F	G
Seat Won	75	55	37	29	10	37	50

Draw a bar graph for above data.

31. Find the value of 'p' from the following distribution if the mean is 6.

xi	2	4	6	10	p+5
fi	3	3	3	1	2

32. Give below is the data of students who participated in different activities.

Activity	Sports	Meditation	Yoga	Walking
No. of Girls	42	35	100	120
No. of Boys	90	64	130	86

Draw double bar graph.

33. The distance travelled by 40 engineers in (km) from their place of work were found as follows.

5	3	10	20	25	11	13	7	12	31
19	10	12	17	18	11	32	17	16	2
7	9	7	8	3	5	12	15	18	3
12	14	2	9	6	15	15	7	6	12

construct a group frequency distribution table with class size 5 for the data given above taking first interval 0-5 (5 not included).

34. Define the term "Median". If the median of 6, 7, $x-2$, x , 17, 20 written in ascending order is 16. Find the value of x .

35. Draw histogram to represent the data given below.

Age (in years)	No. of children
1 - 2	5
2 - 3	4
3 - 5	10
5 - 7	12
7 - 10	9
10 - 15	10
15 - 17	8

36. The mean marks of boys & girls in periodical test are 36 and 39 respectively. If the mean marks of all the students of class IX in that test are 37. Find the ratio of the number of boys to the number of girls.

PART-D

37. The mean of the following data is 50.

x_i	10	30	50	70	90
f_i	17	$5a+3$	32	$7a-11$	19

Find 'a' and the frequencies for $x_i = 30$ & $x_i = 70$

38. Draw a frequency polygon for the following data

Marks	Frequency
0-10	03
10-20	09
20-30	18
30-40	16
40-50	12
50-60	02

39. If the 26 English alphabets are taken such that A=1, B=2, C=3,....., Z=26 then find

- the mean and median of the numbers corresponding to the vowels.
- Which alphabet corresponds to the median.

40. In a school a student who scored 80% or above in his/her previous class is eligible for "Merit scholarship" Marks obtained by two students Nishi and Vinayak of class IX in their previous class (VIII) in all subjects are given below.

Name	Hindi	English	Maths	Science	SSt.	Skt.
Nishi	78	74	86	85	73	83
Vinayak	79	76	88	83	71	85

Find average percentage score of Nishi and Vinayak, which of the two are eligible for merit scholarship?

41. The blood group of 30 students of class IX are recorded as follows.

A, B, B, B, O, B, B, A, AB, A, O, B, O, AB, O

AB, AB, B, AB, B, A, O, AB, B, A, O, AB, A, A, AB

- Make a frequency distribution table for the above data.
- Mr. 'X' meets an accident and needs blood. His blood group is AB. How many of these students can donate their blood to Mr. 'X'?

42. 15 students of Govt. school spend the following numbers of hours in a month for doing, cleaning in their street 25, 15, 20, 20, 9, 20, 25, 15, 7, 13, 20, 12, 10, 15, 8

Find mean, median and mode from above data.

43. In an assembly election the number of seats won by the different political parties is shown below.

Political Party	A	B	C	D	E	F	G
No. of Seats	1	47	15	2	19	1	5

- Draw a bar graph.
- Which political party won by availing maximum number of seats?

44. A doctor suggests two ways for treatment of a particular diseases one by taking medicine only and other by doing meditation and yoga.

Age group	No. of patients taking medicines	No. of patients doing meditation & yoga
20-30	20	05
30-40	30	12
40-50	42	20
50-60	40	30
60-70	30	20

i) Draw Frequency polygon for the above data on the graph.

45. The following table given the distribution of students of two sections according to 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

Represents the marks of both the sections on the same graph by two frequency polygons.

46. The following table shows number of voluntary blood donor as per day in voluntary blood donation camp organized Delhi.

Days	No. of Donars
Sunday	100
Monday	80
Tuesday	110
Wednesday	80
Thursday	60
Friday	70
Saturday	120

- i) Draw a bar graph showing above informations.
- ii) On which day donation was maximum and on which day it was minimum.

CHAPTER-14 STATISTICS

ANSWERS

1. 23

2. 51

3. 5.5

4. 6-11

5. 2.6cm

6. 5.6

7. 15

8. 150

9. 6

10. 12

11. 19

12. 13

13. 50

14. 10, 99-109, 109-119, 119-129, 129-139

15. 37

16. 06

17. 35

18. 15, 14

19. 64

20. $x + 3000$

22. 17

23. 21 years

24. $x = 7, y = 14$

25. 93

26.

15-25	25-35	35-45	45-55	55-65
3	5	5	8	4

27. 25

29.

Class	0-20	20-40	40-60	60-80	80-100
Freq.	17	5	7	8	13

31. $P = 7$

33. Mean 15.6, Median=15, Mode=20

34. $x = 17$

36. 2 : 1

37. 5, 28, 24

39. 9.8, 9, I

40. 79.83, 80.33, Vinayak

41. a) 30, b) 6

42. Mean = 15.6, Median = 15, Mode = 20

43. (i) B (ii) 18 years

46. (ii) Saturday, Thursday

PRACTICE TEST

Time : 50 Min.

Statistics

M.M. 20

1. Write class size and class limits of the following: (1)
47, 52, 57, 62, 67, 72, 77
2. Find the value of "x" if mode of the following data is 5. Find the x. (1)
2, 4, 3, 5, 4, 5, 6, 4, x, 7, 5
3. The median of the following observations arranged in ascending order is 25. Find the x. (2)
11, 13, 15, 19, $x+2$, $x+4$, 30, 35, 39, 46
4. Find the median of the first 10 natural numbers. Is it equal to their mean? (2)
5. The mean of 40 observations was 160. It was detected on rechecking that the value of 165 was wrongly copied as 125 for computation of mean. Find the correct mean. (3)
6. If the mean of the following distribution is 6. Find the value of "R". (3)

X	2	4	6	8	$R + 5$
F	3	2	3	1	2

7. Draw histogram of the weekly pocket expenses of students of a School given below (4)

Weekly Expenses(Rs.)	No. of Students
10–20	10
20–30	15
30–50	40
50–60	25
60–90	30
90–100	5

8. Draw Histogram and Frequency polygon. (4)

Marks	0 - 10	10-20	20-30	30-40	40-50	50-60	60 - 70
No. of Students	5	10	4	6	7	3	2

CHAPTER-15
PROBABILITY
KEY POINTS

Trial- Trial is an action which results in one or several outcomes.

Example -

- i) To toss a coin every time, is called a trial.
- ii) To throw a dice every time is called a trial.
 - Probability of an event E is given by

$$P(E) = \frac{\text{Number of Favourable outcomes}}{\text{Total Number of Trials}}$$

- The probability of any event always occur between 0 and 1.
 $0 \leq P(E) \leq 1$
- The probability of any sure event is 1.
 $P(A) = 1$
- The probability of an impossible event is 0.
 $P(A) = 0$
- The sum of probability of all events is 1.
 $P(E) + P(\bar{E}) = 1$

PART-A

1. What is the sum of the probabilities of happening of an event & not happening of the event?
2. What could be the probability of happening of an event E?
3. If the probability of an event to occur is 55%, then what is the probability of non occurrence of that event.
4. What is sum of the probabilities of all the possible events of a random experiment?
5. What is the probability of coming a prime number on throwing of a die?

6. A coin is tossed once, what is the probability of getting a tail?
7. A die is tossed once, what is the probability of getting an even number?
8. A bag contains 2 red, 3 green & 1 white ball, what is the probability that the ball picked up is black.
9. In the word MATHEMATICS, what is the probability of choosing a vowel?
10. Out of 35 students of a class, 21 opt automobile engineering & other financial management. What is the probability of choosing a student who took financial management?
11. During an interview for estate manager 15 candidates appeared. Out of which 8 were retired army men, 4 were retired principals & 3 others from different departments. What is the probability of selecting a retired army man for this post?
12. A bag contains slips with numbers between 3 & 32. What is the probability that a slip chosen contains multiples of 4?

PART-B

13. Below is the table showing marks secured in mathematics by students of class IX : What is

Marks secured	0-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
Frequency	0	1	9	10	10	8	5	3	2

- i) Probability of getting marks less than 50%
 - ii) Probability of getting 90% & above 90%
14. Cards numbered from 7 to 49 are put in a box & mixed thoroughly. A card is drawn from the box, what is the probability that the number written on it is.
 - i) A prime number
 - ii) A multiple of 7.
15. The number of hours spent by Ashu, a school student on various activities on a working day are given below:

Activity	Sleep	school	H.W.	Tution out of home	Outdoor games	Other Acti. at home
No. of Hours	7	7	2	3	3	2

A friend Sonu came to his house to study together. What is the probability that

- i) Ashu is available at home.
- ii) Ashu's friend will play with Ashu.

16. At a traffic light on 28th April, out of 310 vehicles which crossed the light, 200 were cars, 60 were two wheelers & so were autos. 18 were fined for jumping the red light or not wearing of belt or helmet, 5 were fined for using car with odd number, four were left after giving warning. What is the probability that.

- i) A car is chosen & it bears even number.
- ii) A fine was given.

17. The following data was collected from an old age home.

Drink	Campa/Soft Drink	Shikanji	Milk	Canned Juice
No. of people	6	10	16	8

What is the probability that a person chosen likes.

- i) Natural drink
- ii) Canned Juice

18. There are 35 students in class IX A, 34 in IX-B & 33 in IX C. If even roll numbers are allotted project on chapter 2, Polynomials & odd roll number are allotted chapter-1, Number system. What is the probability that the student choosen

- i) Prepares project on chapter 1
- ii) Prepares project on chapter 2

19. If the difference between the probabilities of happening & non happening of an event E is $\frac{3}{7}$. Find the probability of happening of the event E.

20. Following table shows the birth month of 40 students of a class.

Jan	3	July	2
February	4	August	6
March	2	September	3
April	2	October	4
May	5	November	4
June	1	December	4

A student is chosen what is the probability that

- i) its birth month is november
- ii) The month contains 31 days.

PART-C

21. After a medical check up for HB level of 35 students of class IX Following data was recorded.

HB Level	Below 8	Below 10	Below 12	Below 14	Below 16
No. of Students	3	7	13	23	35

What is the probability that a student chosen has

- i) HB level less than 10.
 - ii) HB level greater than or equal to 12 but less than 16.
22. To know the opinion of 35 students about sixth subject as automobile engineering or financial management a survey was done. The data is recorded in the following table in favour of choosing automobile engineers.

No of student like 20

Dislike 15

Find the probability that a student will opt.

- i) automobile engineering
 - ii) Financial management
23. A die is thrown 100 times by a player during a game. The data is recorded in the table given below.

Outcome	1	2	3	4	5	6
Frequency	20	12	18	19	16	15

A Player will get one more chance if he gets 1 or 6 & loses his/her next chance if 3 or 5 comes.

- i) What is the probability of losing the next chance?
- ii) What is the probability of getting one more chance?

24. Following is the table showing marks obtained by 200 students out of 100 in an examination.

Marks	No. of Students
0-10	20
10-20	40
20-30	15
30-40	24
40-50	25
50-60	12
60-70	9
70-80	7
80-90	12
90-100	36

Find the probability that a student is chosen.

- i) Obtained less than 40 marks.
 - ii) Obtained greater than or equal to 60 but less than 80.
 - iii) Obtained 80 & above.
25. Mathematics book of class IX contains 15 chapters. A maths teacher asked one of the students to write the name of each chapter on slips, One name on one slip. She mixed the slips thoroughly in a box.

She called a student to pick up one of the slips. What is the probability that the chapter written on it is from

- (i) Geometry
- (ii) Algebra

PART-D

26. ABCD is a quadrilateral whose one of the diagonal AC bisects it into two triangles equal in areas. Find the probability that the quadrilateral chosen has

- i) All the angles right angles.
 - ii) both the diagonals bisect each other.
 - iii) Diagonals are perpendicular to each other.
 - iv) Only one of the diagonal bisect the other.
27. How many pages of NCERT class IX Mathematics book of English medium contains? A page is selected at random. What is the probability that the page number contains.
- i) 9 at one's place.
 - ii) multiple of 4
 - iii) perfect square

28. The following table shows per day salary of 1000 workers.

Salary Per Day (I)	500-700	701-900	901-1100	1101-1300
No. of Workers	280	175	420	125

If a worker is chosen at random, find the probability that he is getting.

- i) at least ₹ 701 daily
 - ii) at most ₹ 900 daily
 - iii) at most ₹ 1300 daily
29.
$$\text{BMI} = \frac{\text{Mass in Kg.}}{(\text{height in metres})^2}$$

The following table shows the BMI of different categories.

S.No.	Category	BMI (kg/m ²)
1.	Under weight	16.0-18.5
2.	Normal weight	18.5-25.0
3.	Over weight	25.0-30.0
4.	Obesity	Above 30.0

Three persons x, y,z have the same height 170 cm and their masses are 70 kg., 85 kg. & 65 kg. respectively.

Find the probability that a person choosen is overweight.

30. Read the lines carefully

Horse is horse, of course, of course.

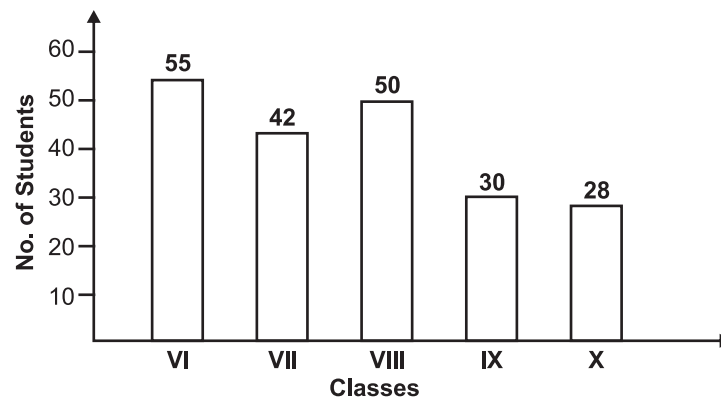
And no one can talk to horse of course.

That is, of course, unless the horse is the famous mister ID.

Find the probability of the word 'course' from the above stanza.

Name the word which has the same probability as the word 'course' has.

31. The bar graph below shows the number of students in different classes of a school.



In the annual function of primary classes, class IX & X was deputed for discipline duty, students of class VII & VIII for sitting, class VI students were to welcome the chief guests.

Find the probability that a student chosen is

- i) Deputed for sitting
- ii) a student of class X.
- iii) member of welcome committee.

32. In a park, there is a right angled triangular flower bed. It's two small sides are 5m & 12m respectively. Along its all sides at a distance of $\frac{1}{2}$ m each, plants of different types are to be planted. Rose plants are to be planted along the shortest side, Marigold plants are to be planted along the longest side & sunflower plant along the third side. At each of the vertex a different type of flower plant is to be planted. Find the probabilities of the following.

- (i) Number of flower plants on the longest side.
- (ii) Number of sun flower plants.
33. Out of 1000 small coloured bulbs $81^{3/2}$ are of white colour. 5^3 are red coloured, 2^6 are green coloured & rest are blue coloured. What is the probability that bulb chosen is.
- (i) blue coloured
- (ii) red coloured.
- (iii) white coloured.
34. In a school there are 682 students. The mode of transport used by them is as follows:

Mode of Transport	Car with Parents	Bicycle	Pedestrian	DTC Bus	Bike with Parents	Van	Auto rickshaw
No. of Students	64	52	128	100	86	172	80

A student is chosen at random. What is the probability that he comes by:

- (i) Four wheeler
- (ii) Two wheeler

CHAPTER-15 PROBABILITY

Answers

- | | | |
|--|---------------------------|--|
| 1. One | 21. i) $\frac{10}{35}$ | ii) $\frac{22}{35}$ |
| 2. $0 \leq P(E) \leq 1$ | 22. i) $\frac{20}{35}$ | ii) $\frac{15}{35}$ |
| 3. 45% | 23. i) $\frac{34}{100}$ | ii) $\frac{35}{100}$ |
| 4. One | 24. i) $\frac{99}{200}$ | ii) $\frac{16}{200}$ iii) $\frac{48}{200}$ |
| 5. $\frac{1}{2}$ | 25. i) $\frac{7}{15}$ | ii) $\frac{2}{15}$ |
| 6. $\frac{1}{2}$ | | |
| 7. $\frac{1}{2}$ | | |
| 8. Zero | 26. i) $\frac{2}{5}$ | ii) $\frac{4}{5}$ iii) $\frac{3}{5}$ |
| 9. $\frac{4}{11}$ | iv) $\frac{1}{5}$ | |
| 10. $\frac{14}{35} = \frac{2}{5}$ | 28. i) $\frac{720}{1000}$ | ii) $\frac{455}{1000}$ iii) 1 |
| 11. $\frac{8}{15}$ | 29. i) $\frac{1}{3}$ | |
| 12. $\frac{7}{28} = \frac{1}{4}$ | 30. i) $\frac{1}{7}$ | ii) Horse |
| 13. i) $\frac{20}{48}$ ii) $\frac{2}{48}$ | 31. i) $\frac{92}{205}$ | ii) $\frac{28}{205}$ iii) $\frac{55}{205}$ |
| 14. i) $\frac{11}{43}$ $\left(\begin{smallmatrix} 7, 11, 13, 17, 23, 29 \\ 31, 37, 41, 43, 47 \end{smallmatrix} \right)$ ii) $\frac{7}{43}$ | 32. i) $\frac{27}{60}$ | ii) $\frac{23}{60}$ |
| 15. i) $\frac{11}{24}$ ii) $\frac{3}{24}$ | 33. i) $\frac{82}{1000}$ | ii) $\frac{125}{1000}$ iii) $\frac{729}{1000}$ |
| 16. i) $\frac{195}{200}$ ii) $\frac{23}{310}$ | 34. i) $\frac{236}{782}$ | ii) $\frac{138}{782}$ |
| 17. i) $\frac{26}{40}$ ii) $\frac{8}{40}$ | | |
| 18. i) $\frac{52}{102}$ ii) $\frac{50}{102}$ | | |
| 19. i) $\frac{5}{7}$ | | |
| 20. i) $\frac{1}{10}$ ii) $\frac{7}{12}$ | | |

PRACTICE TEST

Time : 50 Min.

Probability

M.M. 20

1. Write the probability of an impossible event. (1)
2. Write the probability of a sure event. (1)
3. A dice is thrown once. Find the probability of getting a prime number. (2)
4. A letter of english alphabet is chosen at random. Calculate the probability that letter chosen is a vowel. (2)
5. A bag contains 15 cards numbered 1 to 15. Find the probability of drawing a card from the bag randomly. (3)
 - (i) Card has a number multiple of 3.
 - (ii) Card has a prime number.
6. One number is chosen at random from numbers 1 to 100. Find the probability that it is divisible by 4 or 6. (3)
7. In a one day international cricket match, a batsman play 50 balls. The run scored as follows

Run Scored	0	1	2	3	4	5	6
No. of Balls	13	11	9	7	6	0	4

- Find the probability that batsman will score (4)
- (a) 6 runs (b) 4 or 6 runs
(c) Runs less than 2 (d) 3 Runs
8. Three coins are tossed simultaneously 200 times with the following frequencies of different out comes. (4)

Outcomes	3 Head	2 Head	1 Head	No Head
Frequency	23	72	77	28

Find the probability of getting :

- (a) Two heads , (b) Three heads, (iii) At least two heads

PRACTICE QUESTION PAPER-I

CLASS-IX

SUBJECT : MATHEMATICS

Time : 3 Hrs.

M.M. 80

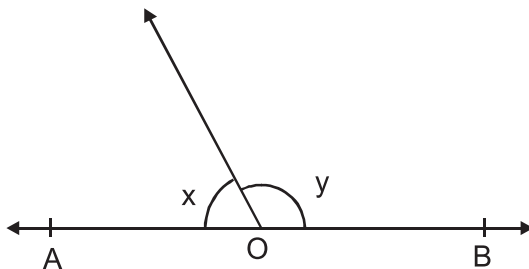
General Instruction:

1. All questions are compulsory.
2. The paper consists of 30 questions divided into four section A, B, C, D. Section A comprises of 6 questions of 1 mark each. Section B comprises of 6 questions of 2 marks each. Section C comprises of 10 questions of 3 marks each. Section D comprises of 8 questions of 4 marks each.
3. There is no over all choice in this question paper. Although internal choices has been provided in some questions.

SECTION-A

1. Write the formula used to calculate the total surface area of a hemispherical solid of radius 'r'.
2. If each side of a triangle is doubled then how many times the area of triangle increased?

3.



If $2x = y$ then find the value of y ?

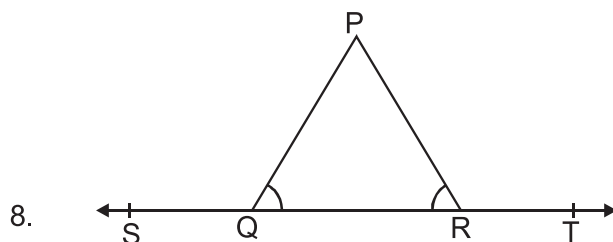
4. Represent $\frac{-7}{5}$ on the number line.
5. In which quadrants y co-ordinates are negative?
6. How many solutions are there for equation $y = x + 2$?

SECTION-B

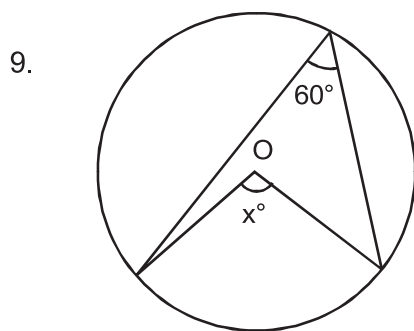
7. Write the coefficients of x^2 in each of following.

(i) $2 - x^2 + x$

(ii) $\sqrt{2x} - 1$

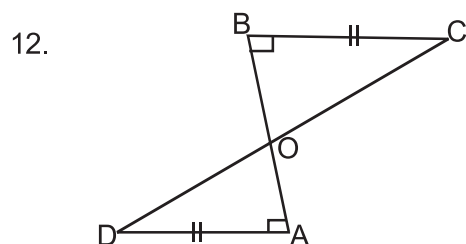


In figure $\angle PQR = \angle PRQ$ then prove that $\angle PQS = \angle PRT$.



Find the value of x° .

10. The angles of a quadrilateral are in the ratio 3 : 5 : 9 : 13. Find the greatest angle of the quadrilateral.
11. PQRS is a rhombus with $\angle QPS = 50^\circ$ find $\angle RQS$.



AD and BC are equal perpendiculars to a line segment AB as given in figure, show that CD bisects AB.

SECTION-C

13. Simplify the given expression.

$$(5 + \sqrt{7})(2 + \sqrt{5})$$

14. Two coins are tossed simultaneously 500 times and we get
two heads = 105 times
one head = 275 times
No head = 120 times
find the probability of each of these events.

15. The following observations have been arranged in ascending order.
If the median of the data is 63. Find the value of x.
29, 32, 48, 50, x, x + 2, 72, 78, 84, 95

OR

The points scored by a kabbadi team in a series of 10 matchers are as follows :

12, 17, 9, 13, 16, 9, 12, 13, 12, 17

Find the mean and mode of these score.

16. Evaluate $(998)^3$ using suitable identities.
17. Construct a triangle ABC in which $BC = 8$ cm, $\angle B = 45^\circ$ and $AB - AC = 3.5$ cm.

OR

Construct a triangle ABC in which $\angle B = 60^\circ$, $\angle C = 45^\circ$ and $AB + BC + AC = 11$ cm.

18. If two lines intersect, prove that vertically opposite angles are equal.

OR

Prove that equal chords of a circle subtend equal angles at the centre.

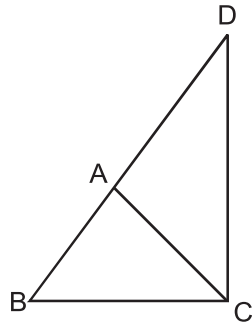
19. Plot the point (x, y) given in the following table in the graph.

x	-3	6	-4
y	5	-4	-3

20. Give the geometric representation of $2x + 9 = 0$ as an equation.

(i) in one variable (ii) In two variable

21.



$\triangle ABC$ is an isosceles triangle in which $AB = AC$. Side BA is produced to D such that $AD = AB$. Show that $\angle BCD$ is a right angle.

OR

Prove that the angles opposite to equal sides of a triangle are equal.

22. Show that the area of an equilateral triangle is $\frac{\sqrt{3}}{4} x^2$ where x is side of the triangle.

SECTION-D

23. Show that the diagonals of a rhombus are perpendicular to each other.

OR

Show that the bisectors of angles of a parallelogram form a rectangle.

24. Rationalise the denominator $\frac{1}{7 + \sqrt{2}}$.

25. Prove that 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.

26. Given below is the data of students who participated in different activities.

Activity	Sports	Meditation	Yoga	Walking
Number of Girls	40	35	100	120

Draw the bar graph. For the given data.

27. Sides of a triangle are in ratio 12 : 17 : 25 and its perimeter is 540 cm. Find its area.

OR

A field is in the shape of a trapezium whose parallel sides are 25 m and 10 m, the non parallel sides are 14 m and 13 m find the area of the field.

28. If $x + y + z = 0$ show that,
 $x^3 + y^3 + z^3 = 3xyz$
29. Draw the graph of following linear equation in two variables.
 $x + y = 4$.
30. The length, breadth and height of a room are 5m, 4m and 3m respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of ₹7.50 per m^2 .

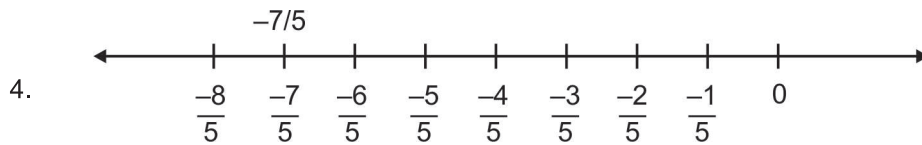
OR

The volume of a right circular cone is 9856 cm^3 . If the diameter of the base is 28 cm find.

- (i) Height of the cone.
(ii) Curved surface area of the cone.

SOLUTION

1. $3\pi^2$
2. 3 times
3. $2x = y$
 $x + y = 180^\circ$
 $x + 2x = 180^\circ$
 $x = 60$
 $\therefore y = 120^\circ$



5. III and IV Quadrants
6. Infinitely many solutions.
7. (i) -1 , (ii) 0
8. $\angle PQR + \angle PQS = \angle PRQ + \angle PRT$ (Linear Pair)
 $\angle PQR + \angle PQS = \angle PQR + \angle PRT$ ($\because \angle PQR = \angle PRQ$)
 $\therefore \angle PQS = \angle PRT$
9. $x = 2 \times 60^\circ = 120$
 (angle subtended by an arc at the centre is double the angle subtended by the same arc on the remaining part of the circle).
10. Let angles be $3x, 5x, 9x, 13x$
 $\therefore 3x + 5x + 9x + 13x = 360^\circ$
 $30x = 360^\circ$
 $\therefore x = 12^\circ$
 \therefore Greatest angle $= 13x = 13 \times 12 = 156$.
11. $\angle RQP + \angle QPS = 180^\circ$
 $\therefore \angle RQP = 180^\circ - 50^\circ$
 $\angle RQP = 130^\circ$
 $\therefore \angle RQS = 65^\circ$

12. IN $\triangle OBC$ and $\triangle OAD$

$$\angle B = \angle A = 90^\circ \quad (\text{given})$$

$$BC = AD \quad (\text{given})$$

$$\angle BOC = \angle AOD \quad (\text{V.O.A})$$

$$\therefore \triangle OBC \cong \triangle OAD \quad (\text{By AAS congruency rule})$$

$$\therefore OB = OA \quad (\text{CPCT})$$

\therefore CD bisects AB.

13. $(5 + \sqrt{7})(2 + \sqrt{5}) = 10 + 5\sqrt{5} + 2\sqrt{7} + \sqrt{35}$

14. (i) $P(2 \text{ Head}) = \frac{21}{100}$

$$(ii) P(\text{One Head}) = \frac{11}{20}$$

$$(iii) P(\text{Not Head}) = \frac{6}{25}$$

15. No. of terms (n) = 10 (even)

$$\therefore \text{Median} = \frac{\frac{n}{2} \text{th} + \left(\frac{n}{2} + 1\right) \text{th term}}{2}$$

$$63 = \frac{5^{\text{th}} \text{term} + 6^{\text{th}} \text{term}}{2}$$

$$\therefore 63 = \frac{x + x + 2}{2} \Rightarrow x = 62$$

OR $\text{Mean} = \frac{130}{10} = 13$

$$\text{Mode} = 12$$

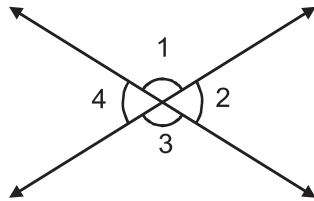
16. $(998)^3 = (1000 - 2)^3$

$$(A - B)^3 = A^3 - B^3 - 3AB(A - B)$$

$$\therefore (998)^3 = (1000)^3 - (2)^3 - 3 \times 1000(1000 - 2) \\ = 1000012000 - 600008 = 994011992$$

17. Construction of triangle.

18.



$$\angle 1 + \angle 2 = \angle 1 + \angle 4$$

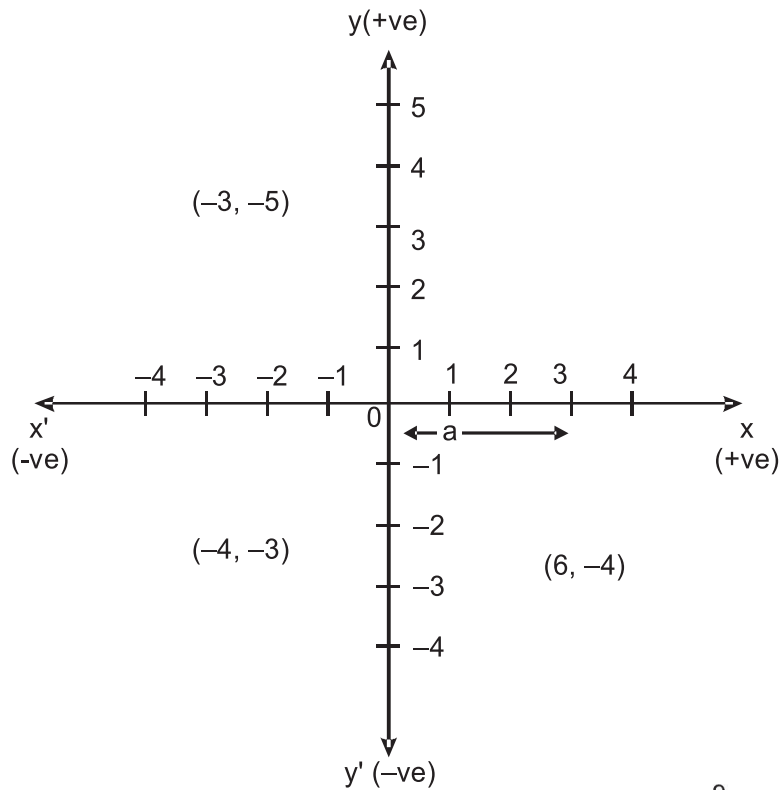
(Linear Pair)

$$\therefore \angle 2 = \angle 4$$

$$\text{Similarly } \angle 1 = \angle 3$$

\therefore When two lines intersect, vertically opposite angles are equal.

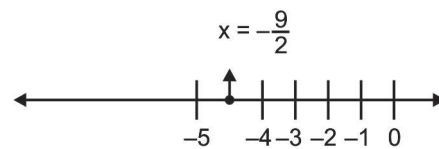
19.



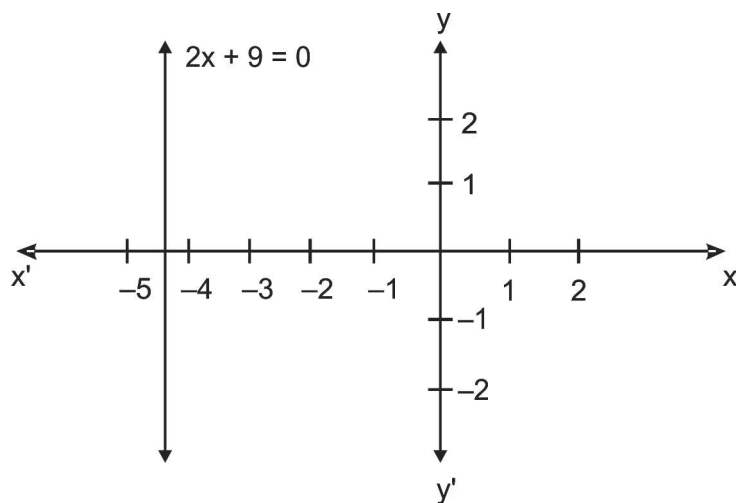
20. (i) In One Variable

$$2x + 9 = 0$$

$$x = -\frac{9}{2}$$



(ii) In Two Variable



21.

In $\triangle BCD$

$$\angle B + \angle C + \angle D = 180^\circ$$

$$\angle 1 + (\angle 2 + \angle 3) + \angle 4 = 180^\circ$$

$$\angle 2 + \angle 2 + \angle 3 + \angle 3 = 180^\circ$$

$$\therefore 2(\angle 2 + \angle 3) = 180^\circ$$

$$\angle 2 + \angle 3 = 90^\circ$$

$$\therefore \angle C = 90^\circ$$

i.e., $\angle BCD$ is a right angle.

OR

Draw $AD \perp BC$

In rt $\triangle ABC$ and rt $\triangle ACD$

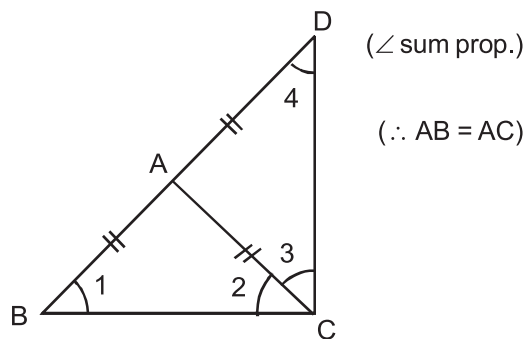
$$AB = AC$$

$$AD = AD$$

$$\angle ABD = \angle ADC (= 90^\circ)$$

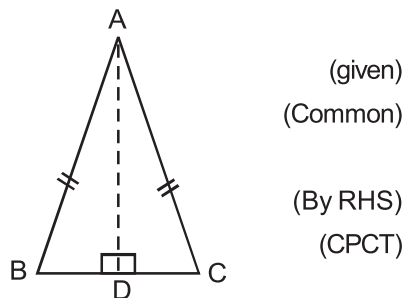
$$\therefore \triangle ABD \cong \triangle ACD$$

$$\therefore \angle B = \angle C$$



(\angle sum prop.)

($\therefore AB = AC$)



(given)

(Common)

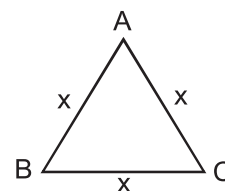
(By RHS)

(CPCT)

22.

$$S = \frac{x + x + x}{2} = \frac{3x}{2}$$

$$\therefore \text{Area of } \triangle = \sqrt{s(s-a)(s-b)(s-c)}$$



$$= \sqrt{\frac{3x}{2} \times \frac{x}{2} \times \frac{x}{2} \times \frac{x}{2}}$$

$$= \frac{\sqrt{3}}{4} x^2$$

23. In $\triangle AOD$ and $\triangle COD$

$$OA = OC$$

$$OD = OD$$

$$AD = CD$$

$$\therefore \triangle AOD \cong \triangle COD$$

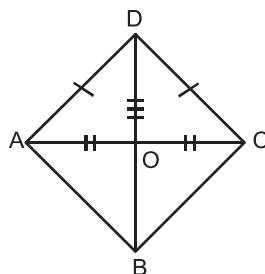
$$\therefore \angle AOD = \angle COD$$

$$\angle AOD + \angle COD = 180^\circ \text{ (Linear Pair)}$$

$$\therefore \angle AOD + \angle AOD = 180^\circ$$

$$\therefore \angle AOD = 90^\circ$$

\therefore Diagonals of rhombus are \perp to each other.



(diagonal of \parallel gm)

(Common)

(Sides of rhombus)

(By SSS)

(CPCT)

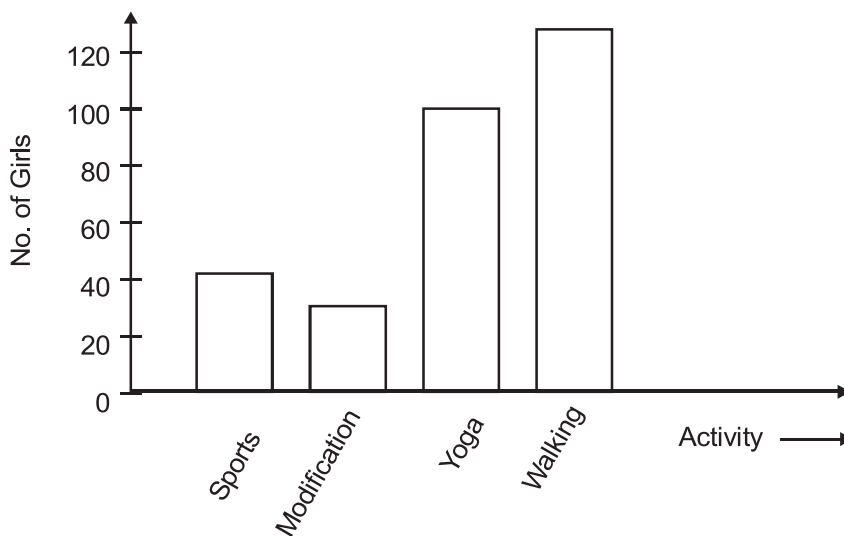
($\because \angle AOD = \angle COD$)

24.
$$\frac{1}{7 + \sqrt{2}} = \frac{1}{7 + \sqrt{2}} \times \frac{7 - \sqrt{2}}{7 - \sqrt{2}} = \frac{7 - \sqrt{2}}{49 - 4}$$

$$= \frac{7}{47} - \frac{\sqrt{2}}{47}$$

25. Correct proof of theorem.

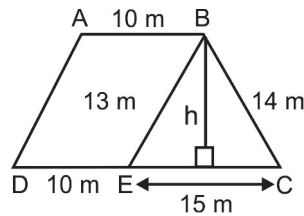
26.



27. Calculation of sides 120, 170 and 250 cm

$$\text{Area} = \sqrt{S(S-a)(S-b)(S-c)}$$

$$\text{Area} = 9000 \text{ cm}^2$$



OR

$$\text{ar } \triangle BEC = 84 \text{ cm}^2 \text{ (Hero's)}$$

$$h = \frac{\text{Area} \times 2}{b} = 11.2 \text{ m}$$

$$\text{Area of trapezium} = \frac{1}{2} h [a + b] = 196 \text{ m}^2$$

28. Using identity $x^3 + y^3 + z^3 - 3xyz$

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

$$\text{If } x + y + z = 0$$

$$\text{RHS} \Rightarrow 0 \times [x^2 + y^2 + z^2 - xy - yz - zx] = 0$$

$$\text{LHS} \Rightarrow x^3 + y^3 + z^3 - 3xyz = 0$$

$$\text{Hence } x^3 + y^3 + z^3 = 3xyz$$

29. Correct graph for $x + y = 4$

30. Area of 4 walls = $2h [l + b] = 54 \text{ m}^2$

$$\text{Area of ceiling} = L \times b = 20 \text{ m}^2$$

$$\text{Area to be white washed} = 74 \text{ m}^2$$

$$\text{Cost} = \text{Area} \times \text{Rate} = ₹ 555$$

OR

$$\text{Volume} = \frac{1}{3} \pi r^2 h = 9856 = 12 \times \pi \times 14 \times 14 \times h$$

(i) $h = 48 \text{ m}$

(ii) CSA for cone = $\pi r l$

$$l = \sqrt{h^2 + r^2} = 50 \text{ cm}$$

$$\text{CSA} = 2200 \text{ cm}^2$$

PRACTICE QUESTION PAPER-2

CLASS-IX

SUBJECT : MATHEMATICS

Time : 3 Hrs.

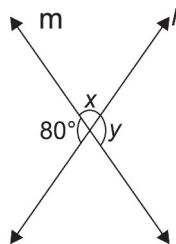
M.M. 80

General Instruction:

1. All questions are compulsory.
2. The paper consists of 30 questions divided into four section A, B, C, D. Section A comprises off 6 questions of 1 mark each. Section B compmrises of 6 questions of 2 marks each. Section C comprises of 10 questions of 3 marks each. Section D comprises of 8 questions of 4 marks each.
3. There is no over all choice in this question paper. Although internal choices has been provided in some questions.

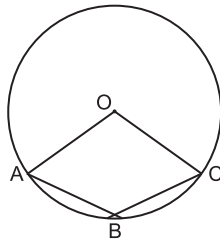
SECTION-A

1. Write the Heron's formula used to calculate the area of a triangle whose sides are a, b, and c.
2. Find the ratio of the volumes of a cone and of a cylinder whose base diameter and heights are equal.
3. Find two irrational numbers between 786 and 787.
4. Is P (0, 7) and Q (7, 0) represent the same point?
5. How many solutions are there for equation $y = x + 2$?
6. Find x and y from the given figure.

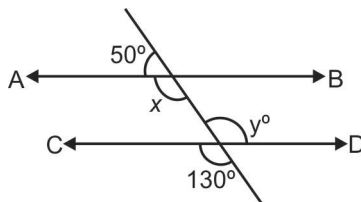


SECTION-B

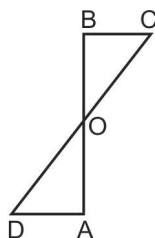
7. In given figure O is centre of the circle if $\angle AOC = 130^\circ$ then find $\angle ABC$



8. Find the value of the polynomial $5x - 4x^2 + 3$ at
 (i) $x = 0$ (ii) $x = 2$
9. Find the value of x and y and then show that $AB \parallel CD$



10. In a quadrilateral ABCD. $AB = AD$ and AC bisects $\angle A$ show that $\triangle ABC \cong \triangle ABD$.
11. Write the names of any four different types of quadrilaterals.
12. AD and BC are equal perpendiculars to a line segment AB (See the figure). Show that CD bisects AB.



SECTION-C

13. The record of a weather station shows that out of past 250 consecutive days forecast, weather forecasts were correct on 175 times.

- (i) What is the probability that on a given day it was correct.
(ii) What is the probability that it was not correct on a given day.
14. Express $1.\overline{27}$ in the form of p/q . where p and q are integers and $q \neq 0$.
15. Evaluate $(104)^3$ using suitable identity.

OR

Without Actual Calculating the cubes

Find the value of $(-12)^3 + (7)^3 + (5)^3$

16. Write the names of quadrant in which the following co-ordinate points lies, where x and y are natural numbers.
(i) $(-x, y)$ (ii) (x, y) (iii) $(-x, -y)$
17. The sum of the angles of a triangle is 180° . Prove it.

OR

Prove that angles opposite to equal sides of an isosceles triangle are equal

18. Write three solution of the equation $\pi x + y = 9$.
19. Prove that Equal chords of a circle subtend equal angles at the centre.

OR

If the non-parallel sides of a Trapezium are equal, Prove that it is cyclic.

20. Construct a triangle PQR in which $QR = 7$ cm $\angle Q = 75^\circ$ and $PQ + PR = 13$ cm.

OR

Construct a triangle with perimeter 12 cm and the ratio of their sides is $3 : 4 : 5$.

21. The sides of a triangle shaped sheet are 5 cm, 12 cm and 13 cm. Find the cost of painting on the sheet at the rate of ₹ 30 per cm^2 .
22. In a mathematics test given to 15 students, the following marks are recorded.

41, 39, 48, 52, 46, 62, 54, 40, 96, 52, 98, 40, 42, 52, 60

Find mean, median and mode of the above data.

SECTION-D

23. The volume of right circular cone is 9856 cm^3 . If the diameter of base is 28 cm. Find
- (i) Slant height of the cone.
 - (ii) Height of the cone.
 - (iii) Curved surface area of the cone.

OR

A godown measures $40 \text{ m} \times 25 \text{ m} \times 15 \text{ m}$. Find the maximum number of wooden boxes each measuring $1.5 \text{ m} \times 1.25 \text{ m} \times 0.5 \text{ m}$ that can be stored in the godown.

24. Rationalise the denominator $\frac{5}{\sqrt{3} - \sqrt{5}}$
25. Show that in a Right Angle triangle, The hypotenuse is the longest side.
26. Factorise $x^3 + 6x^2 + 11x + 6$
27. Sanya has a piece of land which is in the shape of a Rhombus. She wants to divide it equally in to two parts one for her son and other for her daughter. If the perimeter of the land is 400 m and one of its diagonal is 160m.

Find How much area each of them will get?

OR

A triangular park has side 120 m, 80 m and 50 m. A Gardner Ramu has to put a fence all around it and also plant some trees inside the garden to get clean air.

- (i) Find the cost of fencing at the rate of Rs 5 per meter.
- (ii) Find the area where Ramu plant the trees.

28. Give the geometric representations of $5y + 3 = 0$
 (i) In one variable (ii) In two variables.
29. In a triangle ABC, D, E and F are respectively mid points of sides AB, BC and AC. Show that $\triangle ABC$ is divided in to four congruent triangles by joining D, E and F.

OR

ABCD is a rectangle and P, Q, R and S are mid points of the sides AB, BC, CD and DA respectively. Show that the quadrilateral PQRS is a rhombus.

30. The following table gives the life times of 400 neon lamps.

Life time in hours	No of lamps
300-400	14
400-500	56
500-600	60
600-700	86
700-800	74
800-900	62
900-1000	48

- (i) Represent the given information with the help of a histogram.
 (ii) How many lamps have a life time of more than 700 hrs.

SOLUTION

1. ar $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$
2. 1 : 3
3. Any two irrational numbers between 786 and 787.
4. No.
5. Infinitely many solutions.
6. $x = 100^\circ$, $y = 80^\circ$
7. $\angle ABC = 115^\circ$
8. (i) 3 (ii) - 3
9. $x = 130^\circ$, $y = 130^\circ$
11. Trapezium, Parallelogram, Rectangle, Rhombus, Square etc.
13. (i) $\frac{175}{250}$ (ii) $\frac{75}{250}$
14. $\frac{14}{11}$
15. 1124864 OR -1260
16. (i) II (ii) I (iii) III
18. Any three solutions.
21. ₹ 900
22. Mean = 54.8, Median = 52, Mode = 52
23. (i) 50 cm (ii) 48 cm (iii) 2200 cm²
OR
16000
24. $\frac{-5}{2}(\sqrt{3} + \sqrt{5})$
26. $(x + 1)(x + 2)(x + 3)$
27. 4800 Sq. m.
OR
(i) ₹ 1250
(ii) 1875 sq. m
30. (ii) 184