

**DIRECTORATE OF EDUCATION**  
**Govt. of NCT, Delhi**

**SUPPORT MATERIAL**  
**(2020-21)**

**MATHEMATICS**  
**(ENGLISH MEDIUM)**

**Class : IX**

Under the Guidance of

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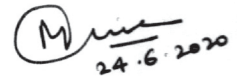
DO No.DE. 5/228/Exam/Message/S.M./2018  
Dated

**MESSAGE**

The importance of adequate practice during examinations can never be overemphasized. I am happy that support material for classes IX to XII has been developed by the Examination Branch of Directorate of Education. This material is the result of immense hard work, co-ordination and cooperation of teachers and group leaders of various schools. The purpose of the support material is to impart ample practice to the students for preparation of examinations. It will enable the students to think analytically & rationally, and test their own capabilities and level of preparation.

The material is based on latest syllabus prepared by the NCERT and adopted by the CBSE for the academic session 2020-21 and covers different levels of difficulty. I expect that Heads of Schools and Teachers will enable and motivate students to utilize this material during zero periods, extra classes and regular classes best to their advantage.

I would like to compliment the team of Examination Branch for their diligent efforts of which made it possible to accomplish this work in time. I also take this opportunity to convey my best wishes to all the students for success in their endeavours.

  
24.6.2020

(Manisha Saxena)



**BINAY BHUSHAN, IAS**



**Director**

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**D.O. No.**

**Date :**

Dear Students,

Directorate of Education is committed to providing qualitative and best education to all its students. The Directorate is continuously engaged in the endeavor to make available the best study material for uplifting the standard of its students and schools.

Every year, the expert faculty of Directorate reviews and updates Support Material. The expert faculty of different subjects incorporates the changes in the material as per the latest amendments made by CBSE to make its students familiar with new approaches and methods so that students do well in the examination.

The book in your hand is the outcome of continuous and consistent efforts of senior teachers of the Directorate. They have prepared and developed this material especially for you. A huge amount of money and time has been spent on it in order to make you updated for 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.

  
**BINAY BHUSHAN**  
**DIRECTOR (EDUCATION)**



**Dr. (Mrs.) Saroj Bala Sain**

Addl. Director of Education  
(School / Exam / EVGB/IEB/ VOC.)



सत्यमेव जयते

Govt. of NCT of Delhi  
Directorate of Education  
Old Secretariat, Delhi-110054  
Tel.: 23890023, 23890093

D.O. No. PA/ADD.DE(Sch)/86  
Date : 03-10-2019

I am very much pleased to forward the Support Material for classes IX to XII. Every year, the Support Material of most of the subjects is updated/revised as per the most recent changes made by CBSE. The team of subject experts, officers of Exam Branch, members of Core Academic Unit and teachers from various schools of Directorate has made it possible to make available unsurpassed material to students.

Consistence use of Support Material by the students and teachers will make the year long journey seamless and enjoyable. The main purpose to provide the Support Material for the students of government schools of Directorate is not only to help them to avoid purchasing of expensive material available in the market but also to keep them updated and well prepared for exam. The Support Material has always been a ready to use material, which is matchless and most appropriate.

I would like to congratulate all the Team Members for their tireless, unremitting and valuable contributions and wish all the best to teachers and students.

(Dr. Saroj Bala Sain)  
Addl.DE (School/Exam)





## Text of Article 51-A

### PART IVA FUNDAMENTAL DUTIES

51A. Fundamental duties.-It shall be the duty of every citizen of India—

- (a) to abide by the Constitution and respect its ideals and institutions, the National Flag and the National Anthem;
- (b) to cherish and follow the noble ideals which inspired our national struggle for freedom;
- (c) to uphold and protect the sovereignty, unity and integrity of India;
- (d) to defend the country and render national service when called upon to do so;
- (e) to promote harmony and the spirit of common brotherhood amongst all the people of India transcending religious, linguistic and regional or sectional diversities; to renounce practices derogatory to the dignity of women;
- (f) to value and preserve the rich heritage of our composite culture;
- (g) to protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures;
- (h) to develop the scientific temper, humanism and the spirit of inquiry and reform;
- (i) to safeguard public property and to abjure violence;
- (j) to strive towards excellence in all spheres of individual and collective activity so that the nation constantly rises to higher levels of endeavour and achievement;
- (k) who is a parent or guardian to provide opportunities for education to his child or, as the case may be, ward between the age of six and fourteen years.

**मौलिक कर्तव्य की संख्या 11 है, जो इस प्रकार हैं :**

1. प्रत्येक नागरिक का यह कर्तव्य होगा कि वह संविधान का पालन करे और उसके आदर्शों, संस्थाओं, राष्ट्र ध्वज और राष्ट्र गान का आदर करें।
2. स्वतंत्रता के लिए हमारे राष्ट्रीय आंदोलन को प्रेरित करने वाले उच्च आदर्शों को हृदय में संजोए रखें और उनका पालन करें।
3. भारत की प्रभुता, एकता और अखंडता की रक्षा करें और उसे अक्षुण्ण रखें।
4. देश की रक्षा करें।
5. भारत के सभी लोगों में समरसता और समान भ्रातृत्व की भावना का निर्माण करें।
6. हमारी सामाजिक संस्कृति की गौरवशाली परंपरा का महत्व समझें और उसका निर्माण करें।
7. प्राकृतिक पर्यावरण की रक्षा और उसका संवर्धन करें।
8. वैज्ञानिक दृष्टिकोण और ज्ञानार्जन की भावना का विकास करें।
9. सार्वजनिक संपत्ति को सुरक्षित रखें।
10. व्यक्तिगत एवं सामूहिक गतिविधियों के सभी क्षेत्रों में उत्कर्ष की ओर बढ़ने का सतत प्रयास करें।
11. माता-पिता या संरक्षक द्वारा 6 से 14 वर्ष के बच्चों हेतु प्राथमिक शिक्षा प्रदान करना (86वां संशोधन)।

# **THE CONSTITUTION OF INDIA**

## **PREAMBLE**

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a SOVEREIGN SOCIALIST SECULAR DEMOCRATIC REPUBLIC and to secure to all its citizens:

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity; and to promote among them all

FRATERNITY assuring the dignity of the individual and the unity and integrity of the Nation;

WE DO HEREBY GIVE TO OURSELVES THIS CONSTITUTION.

## भारत का संविधान

### उद्देशिका।

हम, भारत के लोग, भारत को एक [सम्पूर्ण प्रभुत्व - सम्पन्न समाजवादी पंथनिरपेक्ष लोकतंत्रात्मक गणराज्य] बनाने के लिए, तथा उसके समस्त नागरिकों को :

सामाजिक, आर्थिक और राजनैतिक न्याय, विचार, अभिव्यक्ति, विश्वास, धर्म

और उपासना की स्वतंत्रता

प्रतिष्ठा और अवसर की समता

प्राप्त करने के लिए,

तथा उन सब में व्यक्ति की गरिमा और [राष्ट्र की एकता और अखंडता] सुनिश्चित करने वाली बंधुता बढ़ाने के लिए

हम दृढ़संकल्प होकर इस संविधान को आत्मार्पित करते हैं।

**DIRECTORATE OF EDUCATION**  
**Govt. of NCT, Delhi**

**SUPPORT MATERIAL**  
**(2020-21)**

**Class : IX**  
**MATHEMATICS**

**NOT FOR SALE**

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**PUBLISHED BY : DELHI BUREAU OF TEXTBOOKS**



**LIST OF GROUP LEADER AND SUBJECT EXPERTS  
FOR PREPARATION / REVIEW OF SUPPORT MATERIAL**

---

**Class - IX  
Subject : Mathematics**

- |    |  |   |
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| 2. | <b>Mr. Neeraj Gupta</b>                | TGT Maths<br>RPVV, Civil Lines, Delhi                   |
| 3. | <b>Mrs. Ritu Tiwari</b>                | TGT Maths<br>RPVV, Surajmal Vihar, Delhi                |
| 4. | <b>Mr. Jaspal Singh Negi</b>           | TGT Maths<br>GBSSS, J&K Block,<br>Dilshad Garden, Delhi |
| 5. | <b>Mr. Jai Prakash</b>                 | TGT (Maths)<br>SBV, Jafrabad, Delhi                     |
| 7. | <b>Ms. Aakankasha</b>                  | TGT (Maths)<br>Core Academic Unit                       |

## CONTENTS

<b>S.No.</b>	<b>Chapters</b>	<b>Page No.</b>
1.	Number Systems	8
2.	Polynomials	28
3.	Coordinate Geometry	44
4.	Linear Equation in two variables	56
5.	Introduction to Euclid's Geometry	70
6.	Lines & Angles	77
7.	Triangles	96
8.	Quadrilaterals	112
9.	Areas of Parallelograms and Triangles	126
10.	Circles	141
11.	Constructions	162
12.	Heron's Formula	165
13.	Surface Areas and Volumes	176
14.	Statistics	191
15.	Probability	205
	Practice Questions Paper - 1	221
	Practice Questions Paper - 2	238
	Practice Questions Paper - 3	245



## MATHEMATICS (IX)

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 of Teaching of Mathematics which is to meet the emerging needs of all categories of students. For motivating the teacher to related 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 problem and studying the subject as a separate discipline. It is expected that students should acquire the ability to solve problem using algebraic methods and apply the knowledge of simple trigonometry to solve problem 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, mensuration, statistics, graphs and coordinate geometry, etc.

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

### Objectives

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

- consolidate the Mathematical knowledge and skills acquired at the upper primary stage; acquire knowledge and understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles and symbols and underlying processes and skills; develop mastery of basic algebraic skills;
  - develop drawing skills;
  - feel the flow of reason while proving a result or solving a problem;
  - apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method;
  - to develop ability to think, analyze and articulate logically;
- to develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of gender biases;

- to develop necessary skills to work with modern technological devices and mathematical software's.
- to develop interest in mathematics as a problem-solving tool in various fields for its beautiful structures and patterns, etc.
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics;
- to develop interest in the subject by participating in related competitions;
- to acquaint students with different aspects of Mathematics used in daily life;
- to develop an interest in students to study Mathematics as a discipline.

### COURSE STRUCTURE CLASS - IX

Unit	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	<b>80</b>

#### UNIT I: NUMBER SYSTEMS

##### 1. REAL NUMBERS

(16 Periods)

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

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

## **UNIII: ALGEBRA**

### **1. POLYNOMIALS (23 Periods)**

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

Recall of algebraic expressions and identities. Verification of identities:

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

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

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

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

and their use in factorization of polynomials.

### **2. LINEAR EQUATIONS IN TWO VARIABLES (14) Periods**

Recall of linear equations in one variable. Introduction to the equation in two variables. Focus on linear equations of the type  $ax + by + c = 0$ . Explain that a linear equation in two variables has infinitely many solutions and justify their being written as ordered pairs of real numbers, plotting them and showing that they lie on a line. 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 (6) Periods**

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 (Not for assessment)

(6) Periods

History - Geometry in India and Euclid's geometry. Euclid's method of formalizing observed phenomenon into rigorous Mathematics with definitions, common/obvious notions, axioms/postulates and theorems. The five postulates of Euclid. 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

(13) Periods

1. (Motivate) If a ray stands on a line, then the sum of the two adjacent angles so formed is  $180^\circ$  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  $180^\circ$ .
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

(20) Periods

1. (Motivate) Two triangles are congruent if any two sides and the included angle of one triangle is equal to any two sides and the included angle of the other triangle (SAS Congruence).
2. (Prove) Two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle (ASA Congruence).
3. (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence).
4. (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are equal (respectively) to the hypotenuse and a side of the other triangle. (RHS Congruence)

5. (Prove) The angles opposite to equal sides of a triangle are equal.
6. (Motivate) The sides opposite to equal angles of a triangle are equal.
7. (Motivate) Triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

#### **4. QUADRILATERALS (10) Periods**

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

#### **5. AREA (7) Periods**

Review concept of area, recall area of a rectangle.

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

#### **6. CIRCLES (15) Periods**

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  $180^\circ$  and its converse

**7. CONSTRUCTIONS (10) Periods**

1. Construction of bisectors of line segments and angles of measure  $60^\circ$ ,  $90^\circ$ ,  $45^\circ$  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 (4) Periods**

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 (12) Periods**

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

**UNIT VI: STATISTICS Et PROBABILITY**

**1. STATISTICS (13) Periods**

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 (9) Periods**

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).

**QUESTION PAPER DESIGN**  
**CLASS-IX AND X (2020-21)**  
**Subject : Mathematic**

**Time : 3 Hrs.**

**Maximum Marks : 80**

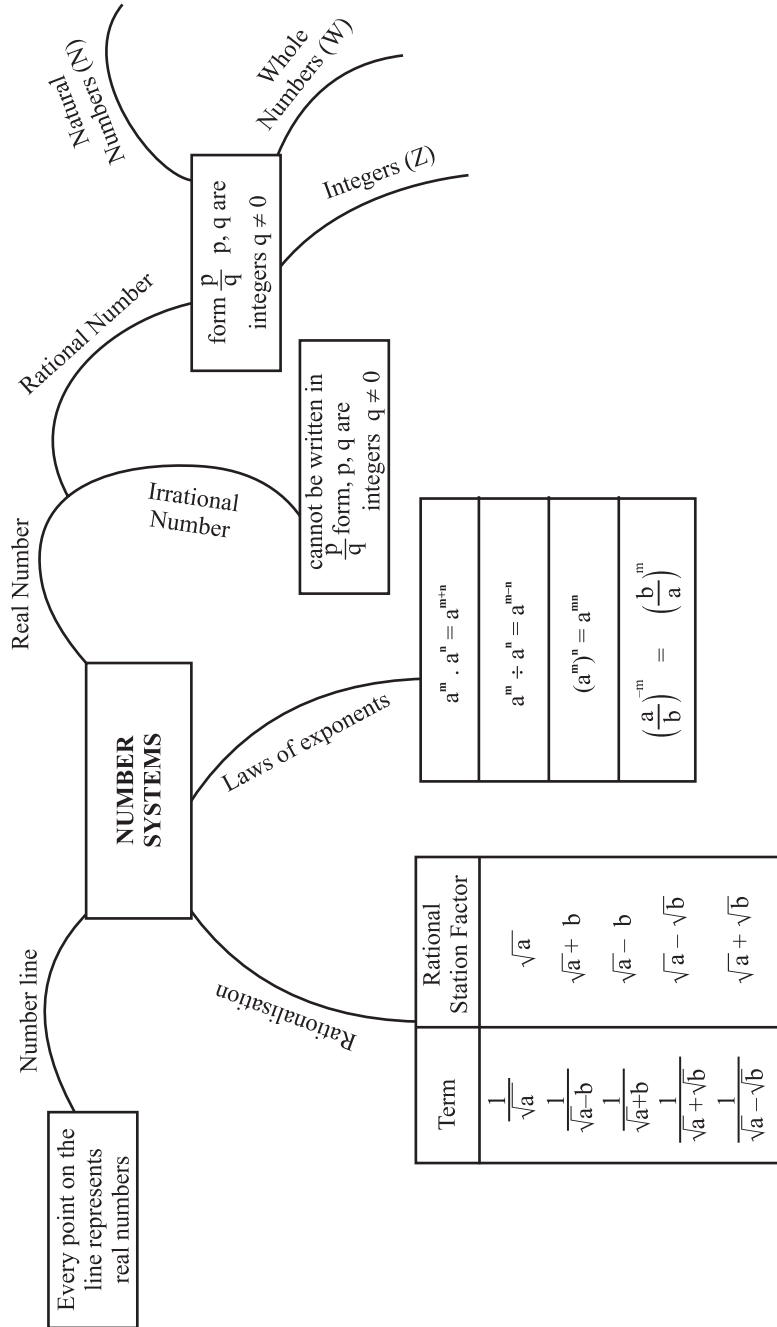
Sr. No.	Typology of Questions	Very Short Answer objective type (VSA) (1 Mark)	Short Answer objective type (SA) (2 Mark)	Short Answer - II (SA) (3 Mark)	Long Answer - (LA) (4 Mark)	Total Marks	% Weightage (approx.)
1.	<b>Remembering</b> : Exhibit memory of previously learned material by recalling facts, terms, basic concepts and answers.	06	02	02	01	20	25
2.	<b>Understanding</b> : Demonstrate understanding of facts and ideas by organizing, comparing, translating, interpreting, giving descriptions, and stating main ideas	06	01	01	03	23	29
3.	<b>Applying</b> : Solve problems to new situations by applying acquired knowledge, facts, techniques and rules in a different way.	05	02	02	01	19	24
4.	<b>Analyzing and Evaluating</b> : Examine and break information into parts by identifying motives or causes. Make inferences and find evidence to support generalizations. <b>Evaluation</b> : Present and defend opinions by making Judgements about information, validity of ideas, or quality of work based on a set of criteria.	03	01	03	01	18	22
5.	<b>Creating</b> : Compile information together in a different way by combining elements in a new pattern or proposing alternative solutions.						
	<b>Total</b>	20x1= 20	6x2= 12	8x3= 24	6x4= 24	80	100

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

# CHAPTER-1

## NUMBER SYSTEMS

### MIND MAP

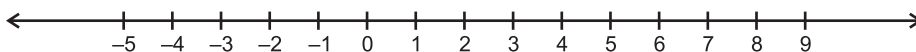




# CHAPTER-1

## 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 a 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.  $0.\overline{1234} = 0.1234234.....$ )
- 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 is a natural number and b is an integer.

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

$$1) a^m a^n = a^{m+n}$$

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

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

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

$$5) a^0 = 1$$

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

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

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

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

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

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

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

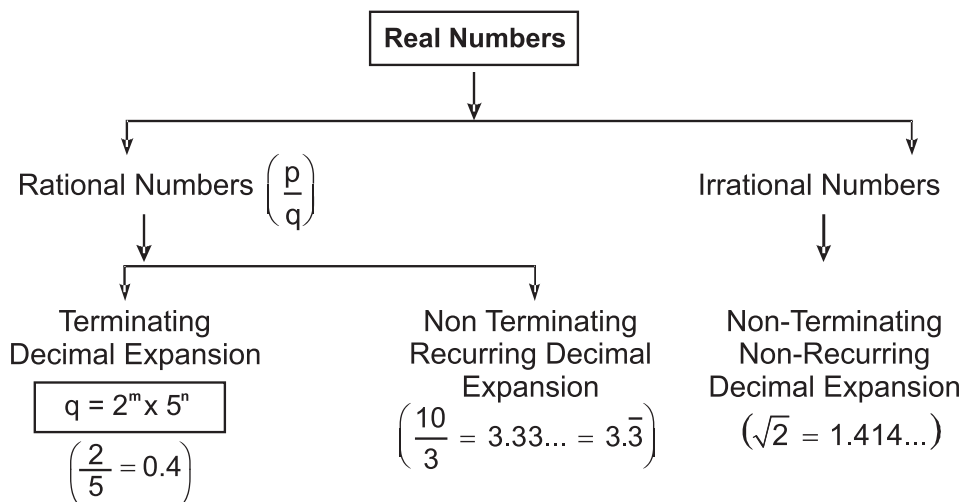
All natural numbers, whole numbers and integers are rational

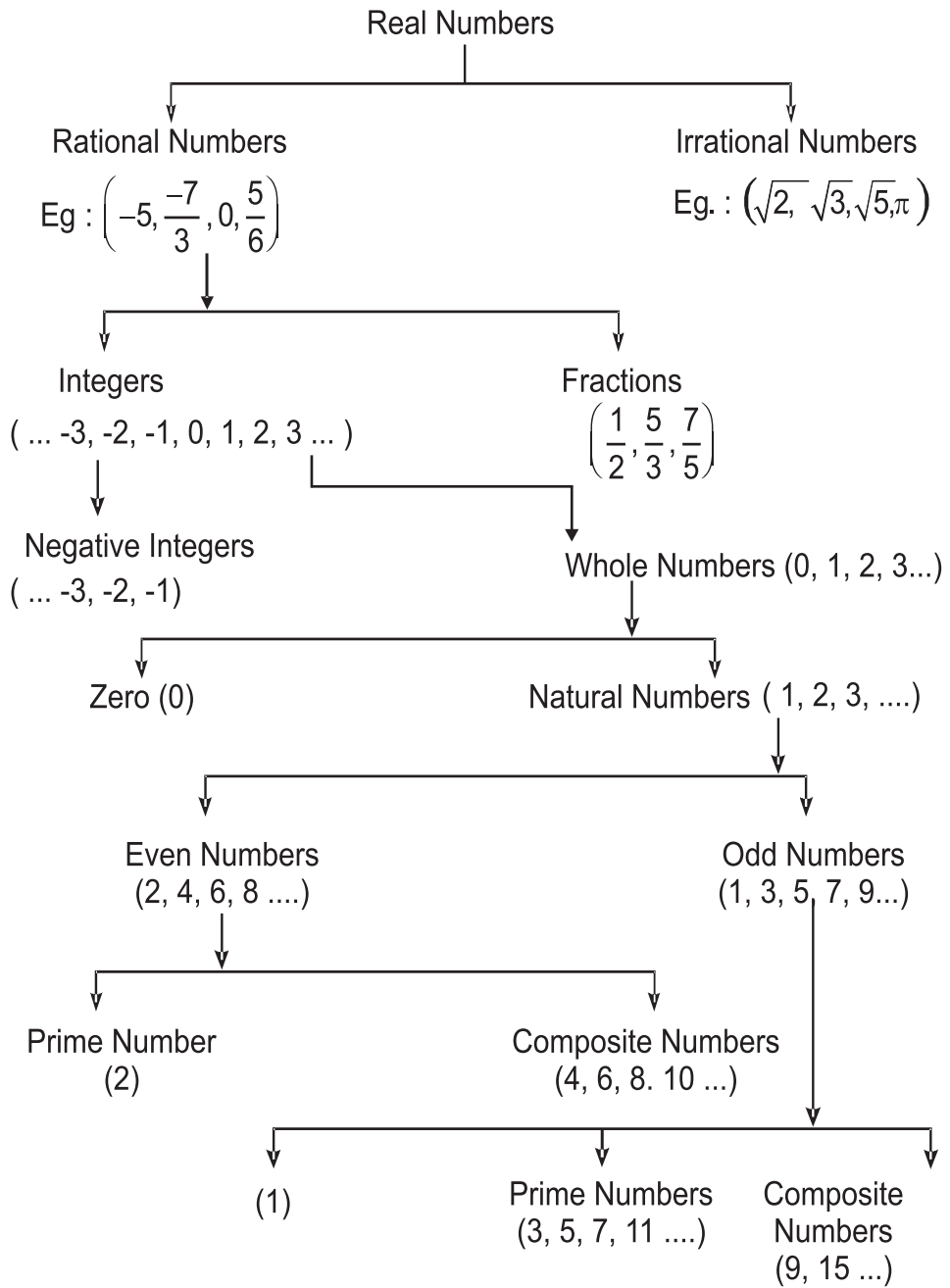
**Prime Numbers** : All natural numbers that have exactly two factors (i.e., 1 and itself) are called prime numbers. e.g., 2, 3, 5, 7, 11, 13, 17, 19, 23, ... etc.

**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.

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

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

## PART - A

1. If  $x = 2$  and  $y = 4$ , then  $\left(\frac{x}{y}\right)^{x-y} + \left(\frac{y}{x}\right)^{y-x} =$  \_\_\_\_\_
- a) 4  
c) 12  
d) 2
2. Which of the following is the greatest ?
- a)  $4^2$   
c)  $\left(\frac{1}{64}\right)^{-1/3}$   
b)  $(16)^{3/2}$   
d)  $(256)^{-1/4}$
3.  $\frac{(32)^{0.2} + (81)^{0.25}}{(256)^{0.5} - (121)^{0.5}} =$  \_\_\_\_\_
- a) 2  
c) 1  
b) 5  
d) 11
4.  $\frac{3}{7}$  line between \_\_\_\_\_
- a)  $\frac{4}{9}, \frac{5}{9}$   
c)  $\frac{42}{99}, \frac{4}{9}$   
b)  $\frac{43}{99}, \frac{4}{9}$   
d)  $\frac{41}{99}, \frac{41}{9}$
5. The number 0.318564318564318564..... is
- a) a natural number  
c) a rational number  
b) an integer  
d) an irrational number
6. The number  $0.\overline{7}$  in the form  $\frac{p}{q}$ , where p and q are integers and  $q \neq 0$ , is
- a)  $\frac{77}{100}$   
c)  $\frac{7}{9}$   
b)  $\frac{7}{10}$   
d)  $\frac{7}{100}$
7. The value of  $0.\overline{23} + 0.\overline{22}$  is
- a) 0.45  
c)  $\frac{45}{99}$   
b)  $0.\overline{45}$   
d) both (B) and (C)





24. The product of any two irrational numbers is
- always an irrational number.
  - always a rational number.
  - always an integer.
  - sometimes rational, sometimes irrational.
25. a rational number between  $\sqrt{2}$  and  $\sqrt{3}$  is
- $\frac{\sqrt{2} + \sqrt{3}}{2}$
  - $\frac{\sqrt{2} \times \sqrt{3}}{2}$
  - 1.5
  - 1.8

**Fill in the blanks**

26. The sum of a rational and an irrational numbers is always \_\_\_\_\_ number.
27. The difference of a rational and an irrational number is always \_\_\_\_\_ number.
28. The decimal expansion of every rational number is either \_\_\_\_\_ or non - terminating \_\_\_\_\_ .
29. The decimal expansion of every irrational number is always \_\_\_\_\_ .
30. Every number whose decimal expansion is non-terminating non-recurring is \_\_\_\_\_ number.
31. Between two distinct rational numbers there lie \_\_\_\_\_ rational numbers.
32. Between two distinct rational numbers there lie \_\_\_\_\_ irrational numbers.
33. Between two distinct irrational numbers there lie \_\_\_\_\_ rational numbers.
34. The reciprocal of every (non-zero) rational number is a \_\_\_\_\_ number.

**State whether the following statements are true or false.**

35. Every integer is a whole number.
36. Every integer can be written in the form  $\frac{p}{q}$  , where p, q are integers,  $q \neq 0$ .



37. Every real number is an irrational number.
38. There are infinitely many integers between any two integers.
39. The square of an irrational number is always a rational number.
40. Reciprocal of every rational number is a rational number.
41. Write first five whole numbers in  $\frac{p}{q}$  form, where p and q are integers and  $q \neq 0$
42. Find decimal expansion of  $\frac{17}{8}, \frac{3}{15}, \frac{2}{7}, \frac{50}{3}$ .
43. Find four rational numbers between  $\frac{2}{9}$  and  $\frac{3}{7}$ .
44. Find decimal form of  $\sqrt{23}$  and  $\sqrt{24}$  upto 3 decimal places.
45. Find two Irrational numbers between  $\sqrt{23}$  and  $\sqrt{24}$ .
46. Find one Irrational and one rational number between 2 and  $\sqrt{5}$ .
47. Write two numbers whose decimal expansions are terminating.
48. What can be the maximum number of digits in the repeating block of digits in the decimal expansion of  $\frac{5}{7}$  ?
49. Write two numbers whose decimal expansions are non-terminating non-repeating (non-recurring).
50. Find the value of  $(256)^{0.16} \times (256)^{0.09}$
51. Find two Irrational numbers between 2016 and 2017.
52. Represent  $\frac{-7}{5}$  on the number line.
53. Represent following on number line
  - i)  $\sqrt{5}$
  - ii)  $\sqrt{3}$
  - iii)  $\sqrt{2}$
54. Insert two Irrational numbers between  $\frac{2}{3}$  and  $\frac{3}{2}$
55. Simplify :  $\frac{\sqrt{5} + \sqrt{3}}{\sqrt{80} + \sqrt{48} - \sqrt{45} - \sqrt{27}}$
56. Find the value of  $[1^3 + 2^3 + 3^3 + 8^2]^{-5/2}$
57. Find the value of x if  $x^{1/2} = (36)^{0.5}$
58. Find the value of x if  $(\sqrt{3})^x = 3^7$

59. If  $2^{5x} \div 2^x = \sqrt[5]{32}$ . Then find the value of x.
60. Evaluate  $a^{x-y} \cdot a^{y-z} \cdot a^{z-x}$ .
61. Simplify  $12^{\frac{2}{5}} \cdot 5^{\frac{2}{5}}$ .
62. 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)  $\frac{51}{60}$ .

63. 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.

64. 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)  $\pi$       (x)  $\sqrt[3]{27}$

65. 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)  $3.6\overline{51}$

66. 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)

67. 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)  $(6 - \sqrt{2})(2 + \sqrt{3})$

68. Evaluate :

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

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

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

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

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

### Part (D)

73. Express  $0.6 + 0.7 + 0.4\overline{7}$  in the form  $\frac{p}{q}$ , where p and q are integers and  $q \neq 0$ .

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

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

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

77. If  $xyz = 1$ , then simplify

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

78. Find the value of  $x$  if

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

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

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

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

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

82. Show that :

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

83. 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  $a^2 + b^2 + ab$ .

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

85. 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)  $\sqrt{x} - \frac{1}{\sqrt{x}}$

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

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

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

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

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

90. 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. b) 8
2. b)  $(16)^{3/2}$
3. c) 1
4. c)  $\frac{42}{99}, \frac{4}{9}$
5. c) a rational number
6. c)  $\frac{7}{9}$
7. d) Both (B) and (C)
8. b) -1
9. b) 1
10. a) a rational number
11. c) 243
12. c) 5
13. b)  $2 - \sqrt{3}$
14. c) 1
15. a)  $\sqrt{2}$

16. c) Every rational number is an integer
17. d) Non-terminating non-recurring
18. c) There are infinitely many rational numbers
19. c)  $\sqrt{7}$
20. c) a real number
21. b)  $4\sqrt{3}$
22. c) 19
23. c)  $(\sqrt{9^3})^{2/3}$
24. d) Sometimes rational, sometimes irrational
25. c) 1.5
26. an irrational
27. an irrational
28. Terminating, recurring
29. non-terminating non-recurring
30. an irrational
31. infinitely many
32. infinitely many
33. infinitely many
34. rational
35. False
36. True
37. False
38. False
39. False
40. False

- 41)  $\frac{0}{1}, \frac{1}{1}, \frac{2}{1}, \frac{3}{1}, \frac{4}{1}$
- 42)  $\frac{17}{8} = 2.125, \frac{3}{15} = 0.2, \frac{2}{7} = 0.\overline{285714}, \frac{50}{3} = 16.\overline{6}$
- 43)  $\frac{15}{63}, \frac{16}{63}, \frac{17}{63}, \frac{18}{63}$  (other answers are possible).
- 44)  $\sqrt{23} = 4.795, \sqrt{24} = 4.898$
- 45) 4.8010010001 ....., 4.8020020002 ....., (other answers are possible)
- 46) 2.1, 2.010010001 ....., (other answers are possible).
- 48) 6
- 50) 4
- 51) 2016.1010010001 ..... ; 2016.2020020002 .....; (other answers are possible)
- 54) 0.909009000 .....; 1.10100100010000 ..... (other answers are possible)
- 55) 1                      56)  $\frac{1}{10^5}$                       57) 36                      58) 14
- 59)  $x = \frac{1}{4}$                       60) 1                      61)  $(60)^{2/5}$
- 62) (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



63. (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).
64. (i) Irrational (ii) Rational (iii) Rational (iv) Irrational  
(v) Rational (vi) Irrational (vii) Rational (viii) Rational  
(ix) Irrational (x) Rational
65. (i)  $0.0875 = \frac{7}{80}$  (ii)  $\frac{2123456789}{1000000000}$  (iii)  $\frac{2}{11}$   
(iv)  $\frac{433}{990}$  (v)  $\frac{1643}{450}$
66. (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)  $4\sqrt{6} - 3\sqrt{3}$
67. (i) -19 (ii) 2 (iii)  $13 + 2\sqrt{42}$   
(iv)  $12 + 6\sqrt{3} - 2\sqrt{2} - \sqrt{6}$
68. (i)  $\frac{1}{2}$  (ii) 2
69.  $a = -2$  70. 5 71.  $\frac{3375}{512}$
72.  $x = 3$  73.  $\frac{167}{90}$

$$74. \frac{1}{59} (9\sqrt{3} + 5\sqrt{5} + \sqrt{7} - 2\sqrt{105})$$

$$75. a = 0, b = 2$$

$$77. \frac{1}{(1+y+xy)(1+z+yz)(1+x+zx)}$$

$$78. \text{ (i) } \frac{9}{2} \qquad \text{(ii) } \frac{11}{4}$$

$$79. 4$$

$$80. 1$$

$$81. 1$$

$$83. a^2 + b^2 + ab = 675$$

$$84. 0$$

$$85. \text{ (i) } 18$$

$$\text{(ii) } -8\sqrt{5}$$

$$\text{(iii) } 322$$

$$\text{(iv) } -144\sqrt{5}$$

$$\text{(v) } 5778$$

$$\text{(vi) } -2584\sqrt{5}$$

$$\text{(vii) } 2\sqrt{5}$$

$$\text{(viii) } 4$$

$$\text{(ix) } 103682$$

$$\text{(x) } 33385282$$

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

$$86. 1 - \sqrt{7}$$

$$87. 98$$

$$88. \frac{635}{1998}$$

$$89. 28.28$$

$$90. 214$$

**Practice Test**  
**NUMBER SYSTEMS**

Time : 50 Min.

M.M. 20

1. If  $\frac{4}{a} = \frac{a^2}{16}$ , then check whether a is rational or irrational number. (1)

2. Find two irrational numbers between  $\sqrt{2}$  and  $\sqrt{3}$ . (1)

3. Simplify:

$$4\sqrt{3} + 3\sqrt{48} - \frac{5}{2}\sqrt{\frac{4}{3}} \quad (2)$$

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)

$$\frac{16 \times 2^{a+1} - 4 \times 2^a}{16 \times 2^{a+2} - 2 \times 2^{a+2}}$$

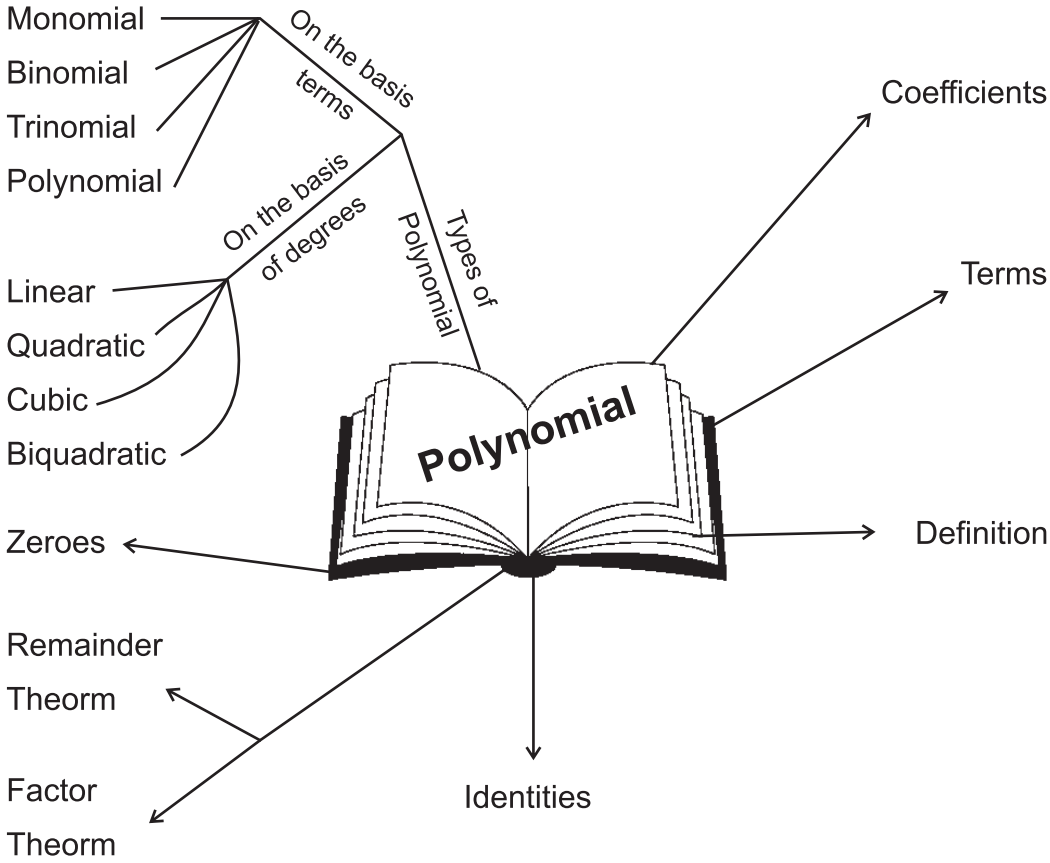
8. Express the following in the form  $\frac{p}{q}$  where p and q are integers and  $q \neq 0$  (4)

$$0.\overline{4} + 0.1\overline{8}$$

**CHAPTER-2**  
**POLYNOMIALS**  
**MIND MAP**

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## 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  $x^0, x^1, x^2, \dots, x^n$
  - (iii) Each of  $a_n x^n, a_{n-1} x^{n-1}, a_{n-2} x^{n-2}, \dots, a_2 x^2, a_1 x, a_0$  are called terms 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 is 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  $\geq 1$  and 'a' is any real number then
  - (i)  $(x - a)$  is a factor of  $p(x)$ , if  $p(a) = 0$  and
  - (ii)  $p(a) = 0$  if  $(x - a)$  is a factor of  $p(x)$ .

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

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

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

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

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

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

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

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

## POLYNOMIALS

- Find  $ax^p + bx^q + c$  to be polynomial p & q are :
  - Rational Numbers
  - Natural Numbers
  - Real Numbers
  - Whole Numbers
- Which of the following is/are polynomial (s) :
  - $\sqrt{7x} + 5$
  - $\sqrt{7}x + 5$
  - $\frac{\sqrt{7}x + 5}{\sqrt{7}x - 5}$
  - $\frac{5x^{5/2} + 3x^{3/2}}{x}$
- Choose the correct option for a polynomial :
  - $3x+2$
  - $7x+1 = 0$
  - $5x^4 + 3x^2 + 1 = 0$
  - $x^3 + 3x^2 + 1$
  - i) & ii)
  - i) & iii)
  - ii) & iv)
  - i) & iv)
- The terms of the polynomial  $x^3 - 4x^2 - 3x + 2$  are :
  - 1, -4, -3, 2
  - $x^3 - 4x^2 - 3x + 2$
  - $+x^3, -4x^2, -3x, 2$
  - $x^3, 4x^2, 3x, 2$
- Coefficient of  $x^2$  in  $(x^2-1)(x-2)$  is :
  - 2
  - 2
  - 1
  - +1
- The degree of the polynomial  $\sqrt{5}$  is :
  - 1/2
  - 0
  - 1
  - 1
- If  $\deg(f(x)) = 5$  &  $\deg(g(x)) = 4$  then  $\deg[f(x) - g(x)]$  is.
  - 5
  - 4
  - 1
  - 9
- Degree of cubic polynomial with two terms is –
  - 0
  - 1
  - 2
  - 3



9. Degree of zero polynomial is :
- a) 0
  - b) 1
  - c) 2
  - d) Not defined
10. Degree of non zero constant polynomial is –
- a) 0
  - b) 1
  - c) -1
  - d) Not defined
11. The zero (s) of the polynomial  $x^2-8$  is (are) :-
- a) 8
  - b)  $2\sqrt{2}$
  - c)  $2\sqrt{2}, -2\sqrt{2}$
  - d)  $\sqrt{8}$
12. The zero (s) of the polynomial  $z^2-2z$  is (are) –
- a) 0
  - b)  $2z$
  - c) 2
  - d) 0, 2
13. If  $(px+q)$  is a factor of the polynomial  $h(x)$  then which one is true :
- a)  $h\left(\frac{-p}{q}\right) = 0$
  - b)  $h\left(\frac{p}{q}\right) = 0$
  - c)  $h\left(\frac{q}{p}\right) = 0$
  - d)  $h\left(\frac{-q}{p}\right) = 0$
14. Let  $h(x)$  be a polynomial such that  $h\left(-\frac{1}{3}\right) = 0$ , then one of the factors of  $h(x)$  is –
- a)  $3x-1$
  - b)  $3x+1$
  - c)  $x-3$
  - d)  $x+3$
15. If  $y+2m$  is a factor of  $y^5 - 4m^2y^3 + 2y + 2m + 3$  then value of  $m$  is –
- a)  $\frac{2}{3}$
  - b)  $\frac{3}{2}$
  - c) 1
  - d)  $\frac{-3}{2}$
16. If  $\left(\frac{1}{16}p^2-q\right) = \left(\frac{1}{4}p - 11\right)\left(\frac{1}{4}p + 11\right)$  then  $q$  is –
- a) 11
  - b) 1
  - c) 121
  - d)  $\frac{11}{4}$

17. If  $3x = a + b + c$  then  $(x-a)^3 + (x-b)^3 + (x-c)^3 - 3(x-a)(x-b)(x-c)$  is  
 a)  $a+b+c$  b)  $0$   
 c)  $1$  d)  $3(x-a)(x-b)(x-c)$
18. If  $p + q + r = 9$  then  $(3-p)^3 + (3-q)^3 + (3-r)^3$  is :-  
 a)  $3(3-p)(3-q)(3-r)$  b)  $0$   
 c)  $1$  d)  $-3(3-p)(3-q)(3-r)$
19. If  $(x-1)(x-2)(x+c) = x^3 + ax^2 + bc + 5 \times 2 \times 1$  then  $c$  will be  
 a)  $1$  b)  $2$   
 c)  $5$  d)  $-5$
20. If  $(x+2)(x-5) = x^2 + (a+b)x + a \times b$  then value of  $(a+b)$  is  
 a)  $3$  b)  $-3$   
 c)  $7$  d)  $-10$

**Fill in the blanks:-**

21.  $49^3 - 30^3 + (\dots\dots\dots)^3 = 3 \times 49 \times 30 \times 19$
22. The polynomial containing two non zero terms is called .....
23. The polynomial containing exactly two non zero, zeroes has ..... degree .....
24. If  $l(x) = 4x+1$  then  $l(-6) - l(-5)$  is .....
25. If  $p(x) = x^3 - 2x^2 + x + 1$  then  $p(0) \times p(-1) = \dots\dots\dots$
26. If  $q(x) = x^2 - 3x + 2$  then  $p(1) + p(-1) - p(0)$  is .....
27. If side of a square is  $(x+2y-z)$  units then area of the square is .....
28. If  $x^2 + mx - 30 = (x-5)(x+6)$  then  $m$  is .....
29. A quadratic polynomial can be written as the product of ..... linear polynomials.
30. If the factors of  $5x^2 - 18x + 9$  are  $(ax+b)$ ,  $(x+b)$  then the values of  $a$  &  $b$  are ..... & ..... respectively.
31. In the polynomial  $x^3 - 5x$ , the expressions  $x^4$  &  $-5x$  are called ..... of the polynomial

32. When a polynomial  $q(x)$  is divided by  $(x-2)$  & the remainder  $q(2) = 0$  then  $(x-2)$  is a ..... of the polynomial.

**33. Write True or False :**

- i) Every polynomial is also an equation.
- ii) Every polynomial is binomial.
- iii) A binomial may have degree 5.
- iv) If 2 is a zero of a polynomial  $q(x)$  then 2 is also a zero of  $2 \times q(x)$ .
- v) If  $(x-a)$  is a factor of polynomial  $p(x)$  then  $a$  is a zero of  $a \times p(x)$ .
- vi)  $x=3$  is a zero of the polynomial  $x^3 - 3x + x - 3$ .
- vii) 2, 1 and  $-1$  all are zeroes of  $x^2 - x - 2$ .
- viii)  $(x+1)$  is a factor of  $x^n + 1$  only if  $n$  is odd positive integer.
- ix) When  $(p^2 - p - 29)$  is divided by  $(p-6)$  the remainder is 1.
- x) The remainder theorem is true only when the divisor of the polynomial is linear polynomial.

34.	Column I	Column II
	i) Degree of the polynomial $0.x^4 + 4x^3 - 2x + 3$	a) $(100-3)^2$
	ii) Factors of $(x+y)^3 - (x^3 + y^3)$	b) 0
	iii) $97^2$ can be solved as	c) 3
	iv) Zero (s) of $(x-2)^2 - (x+2)^2$	d) 3, x, y, $(x+y)$

35.	Column I	Column II
	i) $103 \times 103$	a) 0
	ii) If $\frac{x}{y} + \frac{y}{x} = 2$ then value of $(x-y)^2$ is	b) 1
	iii) Number of zeros of $px + q$	c) $-1$
	iv) the value of $K$ when $(-x^{140} - 2x^{151} + K)$ is divided by $(x+1)$	d) $(100+3)^3$

36. Check whether  $q(x)$  is a multiple of  $r(x)$  or not.  
Where  $q(x) = 2x^3 - 11x^2 - 4x + 5$ ,  $r(x) = 2x + 1$
37. Show that  $(x-5)$  is a factor of  $x^3 - 3x^2 - 4x - 30$ .
38. Evaluate by using suitable identity :  $(997)^3$
39. Find the zeroes of the polynomial  $p(x) = x(x-2)(x+3)$
40. Find the quotient when  $3x^2 - 7x - 6$  is divided by  $(x-3)$
41. Factorise  $8x^3 + \sqrt{27} y^3$ .
42. If  $p(x) = x + 9$ , then find  $p(x) + p(-x)$
43. Find the product without multiplying directly  $106 \times 94$ .
44. Expand using suitable identity  $(2x-3y+z)^2$
45. Find the value of  $(351)^2 - (350)^2$ .

### PART (C)

46. Factorise :  $64a^2 + 96ab + 36b^2$
47. Factorise :  $x^3 + 6x^2 + 11x + 6$
48. If  $x^2 + y^2 = 49$  and  $x - y = 3$ , then find the value of  $x^3 - y^3$ .
49. Simplify :  $(5a-2b)(25a^2+10ab+4b^2) - (2a+5b)(4a^2-10ab+25b^2)$
50. Find the sum of remainders when  $x^3 - 3x^2 + 4x - 4$  is divided by  $(x-1)$  and  $(x+2)$ .
51. Find the product  $\left(p - \frac{1}{p}\right) \left(p + \frac{1}{p}\right) \left(p^2 + \frac{1}{p^2}\right) \left(p^4 + \frac{1}{p^4}\right)$
52. Factorise :  $7\sqrt{2}k^2 - 10k - 4\sqrt{2}$ .
53. Simplify :  $(3x-4y)^3 - (3x+4y)^3$
54. Use appropriate identity, expand  $(2a)^3 + b^3 + (3c)^3 - 18abc$ .
55. Simplify :  $(x+y+z)^2 - (x-y-z)^2$ .
56. Factorise :  $125x^3 + 8y^3 + z^3 - 30xyz$ .
57.  $x+2$  is a factor of polynomial  $ax^3 + bx^2 + x - 2$  and the remainder 4 is obtained on dividing this polynomial by  $(x-2)$ . Find the value of  $a$  and  $b$ .
58. If the polynomial  $ax^3 + 4x^2 + 3x - 4$  &  $x^3 - 4x + a$  leave the same remainder when divided by  $(x-3)$ . Find  $a$
59. If  $\left(\frac{9}{10}\right)^3 - \left(\frac{2}{5}\right)^3 - \left(\frac{1}{2}\right)^3 = \frac{x}{50}$ , find  $x$

60. If  $(x-3)$  and  $\left(x - \frac{1}{3}\right)$  are factors of the polynomial  $px^2 + 3x + r$ , show that  $p = r$ .
61. i) Using identity, find the value of  $(-7)^3 + (5)^3 + (2)^3$ .  
 ii) Find dimensions of cube whose volume is given by the expression  $4x^2 + 14x + 6$ .
62. Give possible expression for the length and breadth of each of the following rectangles if.
- i) Area =  $(x^2 + 5\sqrt{5x + 30})$  sq. unit.  
 ii) Area =  $(24x^2 - 26x - 8)$  sq. unit.
63. 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.
64. 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).
65. If  $a + b + c = 0$ , find the value of  

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

$$\frac{(a^2-b^2)^3 + (b^2-c^2)^3 + (c^2-a^2)^3}{(a-b)^3 + (b-c)^3 + (c-a)^3}$$
67. Factorise:  
 $(2a-b-c)^3 + (2b-c-a)^3 + (2c-a-b)^3$
68. 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.
69. If  $p, q, \& r$  are all non zero and  $p+q+r = 0$ , prove that  

$$\frac{p^2}{qr} + \frac{q^2}{rp} + \frac{r^2}{pq} = 3$$
70. Factorise :  $9x^3 - 27x^2 - 100x + 300$

71. If  $(x+4)$  is a factor of the polynomial  $x^3 - x^2 - 14x + 24$ , find the other factors.
72. If  $\frac{x}{y} + \frac{y}{x} = -1$  where  $x \neq 0, y \neq 0$  then find the value of  $x^3 - y^3$ .
73. 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. d) Whole Number
2. b)  $\sqrt{7}x + 5$
3. d) (i) & (iv)
4. c)  $x^3, -4x^2, -3x, 2$
5. b)  $-2$
6. b)  $0$
7. a)  $5$
8. d)  $3$
9. d) Not defined
10. a)  $0$
11. c)  $\pm 2\sqrt{2}$
12. d)  $0, 2$
13.  $h\left(\frac{-q}{p}\right) = 0$
14. b)  $3x + 1$
15. b)  $3/2$
16. c)  $121$
17. b)  $0$
18. a)  $3(3-p)(3-q)(3-r)$
19. c)  $5$
20. b)  $-3$
21.  $19$
22. Binomial
23.  $2$

23. 2
24. - 4
25. - 5
26. 4
27.  $(x + 2y - z)^2 = x^2 + 4y^2 + z^2 + 4xy - 4yz - 2xz$
28. 1
29. Two
30. 5 and 3
31. Terms
32. Factor
33. i) False  
ii) False  
iii) True  
iv) True  
v) True  
vi) False  
vii) False  
viii) True  
ix) True  
x) True
34. i) c  
ii) d  
iii) a  
iv) b
35. i) d  
ii) a  
iii) b  
iv) c
36. 110



37. Hint Put  $x = 5$
38. 991026973
39. 0, 2, -3
40.  $(3x+2)$
41.  $(2x + \sqrt{3} y) (4x^2 - 2\sqrt{3} xy + 3y^2)$
42. 18
43. Hint :  $(100+6) (100-6) = 9964$
44.  $4x^2 + 9y^2 + z^2 - 12xy - 6yz + 4xz$
45. 701
46.  $(8a + 6b)^2$
47.  $(x+1) (x+2) (x+3)$
48. 207
49.  $117a^3 - 133b^3$
50. - 34
51.  $p^8 - \frac{1}{p^8}$
52.  $(K - \sqrt{2}) (7\sqrt{2} K + 4)$
53.  $- 8y(16y^2 + 27x^2)$  or  $-128y^3 - 216 x^2y$
54. -
55.  $4xy + 4zx$
56.  $(5x + 2y + z) (25y^2 + 4y^2 + z^2 - 10xy - 2yz - 5zx)$
57.  $a = 0, b = 2$
58.  $a = -1$  Hint  $p(3) = q(3)$
59.  $x = 27$  (Use  $a+b+c = 0, a^3 + b^3 + c^3 = 3abc$ )
60. -
61. i) - 210  
ii) 2 ;  $(x + 3)$  ;  $(2x + 1)$

62. i)  $(x + 2\sqrt{5})(x + 3\sqrt{5})$   
ii)  $(4x + 1), (6x - 8)$
63.  $3x^2 - 19x + 20$
64.  $(3x + 2)$
65. 3
66.  $(a+b)(b+c)(c+b)$
67.  $3(2a-b-c)(2b-c-a)(2c-a-b)$
68.  $a = 5, (x-1)(2x+1)(2x-7)$
70.  $(3x+10)(x-3)(3x-10)$
71.  $(x-3)(x-2)$
72. 0
73. 0.01

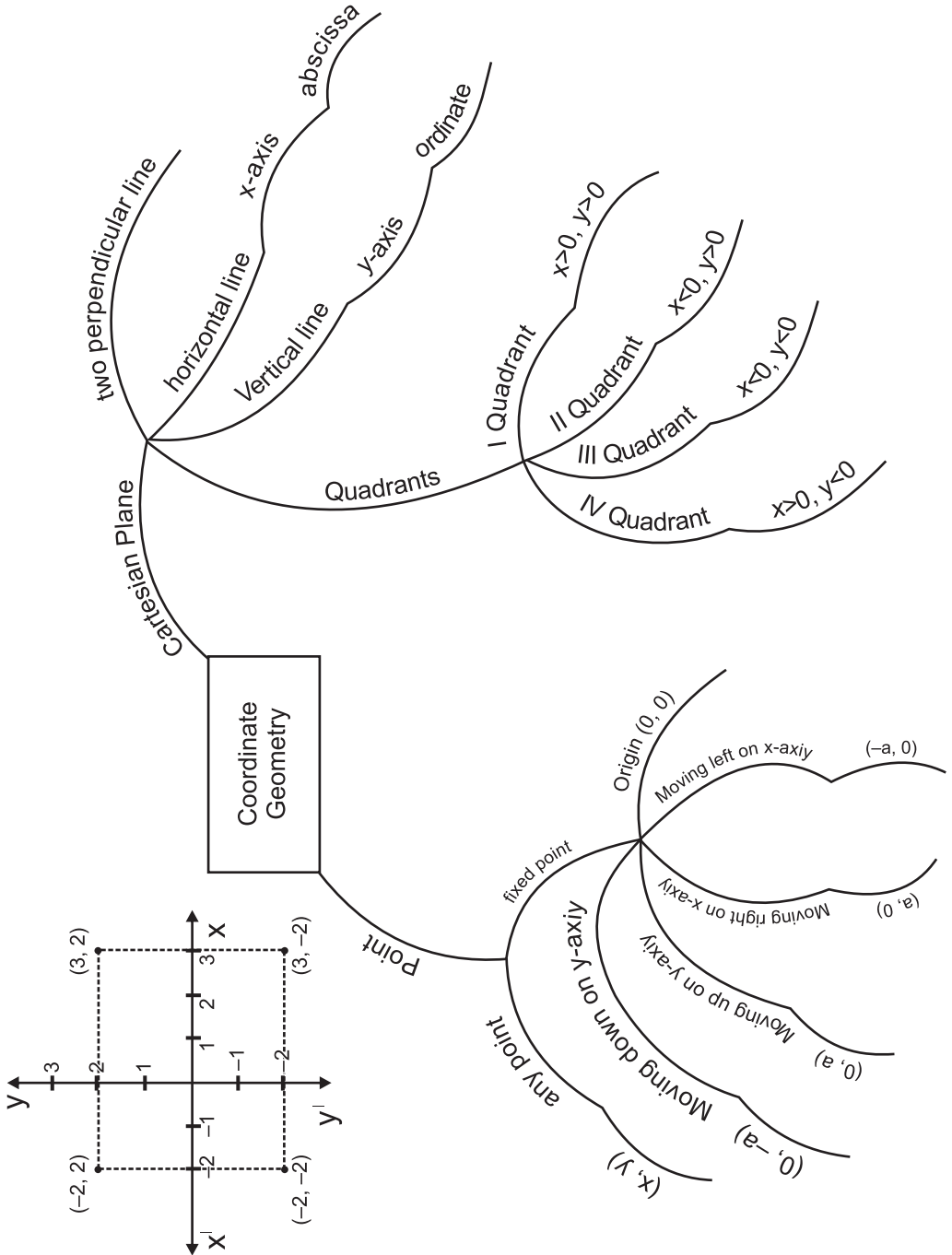
## Practice Test POLYNOMIALS

Time : 50 Min.

M.M. 20

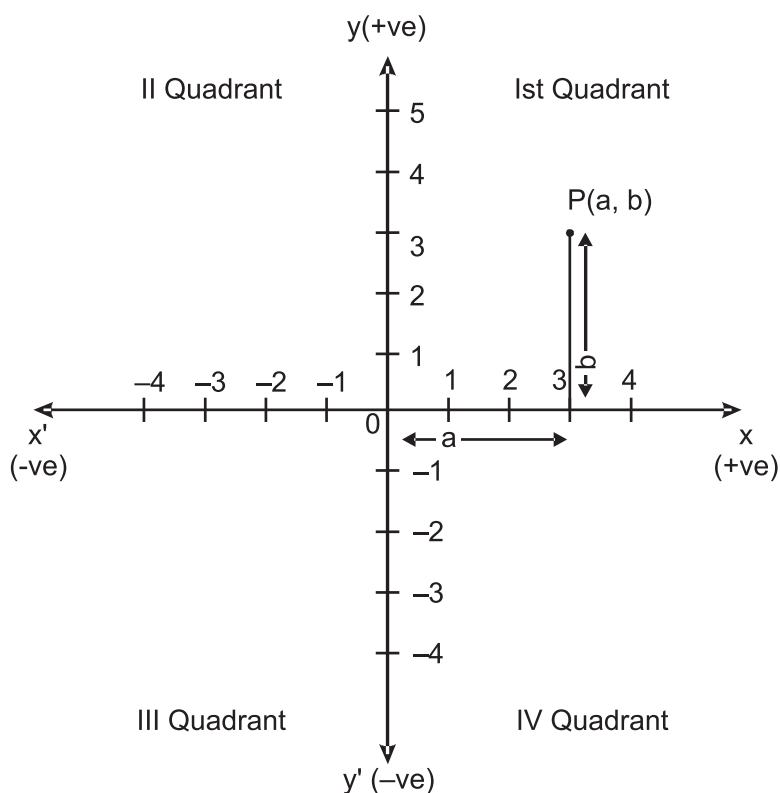
1. Is  $(x^2)^{\frac{1}{2}} + 2\sqrt{5}a$  a polynomial? (1)
2. Show that  $x = 1$  is a zero of the polynomial  $3x^3 - 4x^2 + 8x - 7$ . (1)
3. Find the zeroes of the polynomial  $x^2 - 4x + 3$  (2)
4. If  $x + y + z = 6$ ,  $xy + yz + zx = 11$ . Find the value of  $x^2 + y^2 + z^2$ . (2)
5. If  $3x - 4$  is a factor of the polynomial  $p(x) = 2x^3 - 11x^2 + kx - 20$ , find the value  $k$  (3)
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 COORDINATE GEOMETRY MIND MAP



**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.

- Coordinates of a point on  $x$ -axis are of the form  $(x, 0)$
- Coordinates of a point on  $y$ -axis are of the form  $(0, y)$

## PART (A)

1. The abscissa of a point is the distance of the point from
  - a) x-axis
  - b) y-axis
  - c) origin
  - d) None of these
2. The y-coordinate of a point is the distance of that point from
  - a) x-axis
  - b) y-axis
  - c) origin
  - d) None of these
3. If both the coordinates of a point are negative then that point will lie in
  - a) First quadrant
  - b) Second quadrant
  - c) Third quadrant
  - d) Fourth quadrant
4. If abscissa of a point is zero then that point will lie
  - a) on x-axis
  - b) on y-axis
  - c) at origin
  - d) in 1st quadrant
5. If  $x > 0$  and  $y < 0$ , then the point  $(x, -y)$  lies in \_\_\_\_\_.
  - a) I quadrant
  - b) II quadrant
  - c) III quadrant
  - d) IV quadrant
6. Point  $(a, 0)$  lies
  - a) on x-axis
  - b) on y-axis
  - c) in third quadrant
  - d) in fourth quadrant
7. Signs of abscissa and ordinate of a point in the fourth quadrant are respectively.
  - a) +, +
  - b) -, -
  - c) -, +
  - d) +, -
8. Ordinate of a point is positive is
  - a) I and IV quadrants
  - b) I quadrant only
  - c) I and II quadrants
  - d) I and III quadrants
9. The point which lies on y-axis at a distance of 10 units in the negative direction of y-axis is
  - a)  $(10, 0)$
  - b)  $(0, 10)$
  - c)  $(-10, 0)$
  - d)  $(0, -10)$

10. The point whose abscissa and ordinate have different signs will lie in
- a) I and II quadrants                      b) I and III quadrants  
 b) II and III quadrants                    d) II and IV quadrant
11. Which of the point P(0, 3), Q(1, 0), R(0, -1), S(-5, 0), T(1, 2) do not lie on x-axis ?
- a) P and R only                              b) Q and S only  
 c) P, R and T                                d) Q, S and T
12. If the coordinates of the points are P(-2, 3), and Q (-3, 5), then (abscissa of P) - (abscissa of Q) is
- a) -5    b) 1  
 c) -1    d) -2
13. Point (1, 1), (1, -1), (-1, 1), (-1, -1)
- a) lie in I quadrant                          b) lie in III quadrant  
 c) lie in I and III quadrants              d) do not lie in the same quadrant
14. The point of intersection of the coordinate axes is
- a) Abscissa                                      b) Ordinate  
 c) Quadrant                                     d) Origin
15. The abscissa and ordinate of the origin are
- a) 1, 0    b) 1, 1  
 c) 0, 1    d) 0, 0
16. The measure of the angle between the coordinate axes is
- a)  $0^\circ$     d)  $90^\circ$   
 c)  $180^\circ$     d)  $270^\circ$
17. The perpendicular distance of the point p(-4, -3) from x-axis is
- a) -4    b) -3  
 c) 4     d) 3
18. The perpendicular distance of the point p(-7, 2) from y-axis is
- a) -7    b) 7  
 c) 2     d) None of these

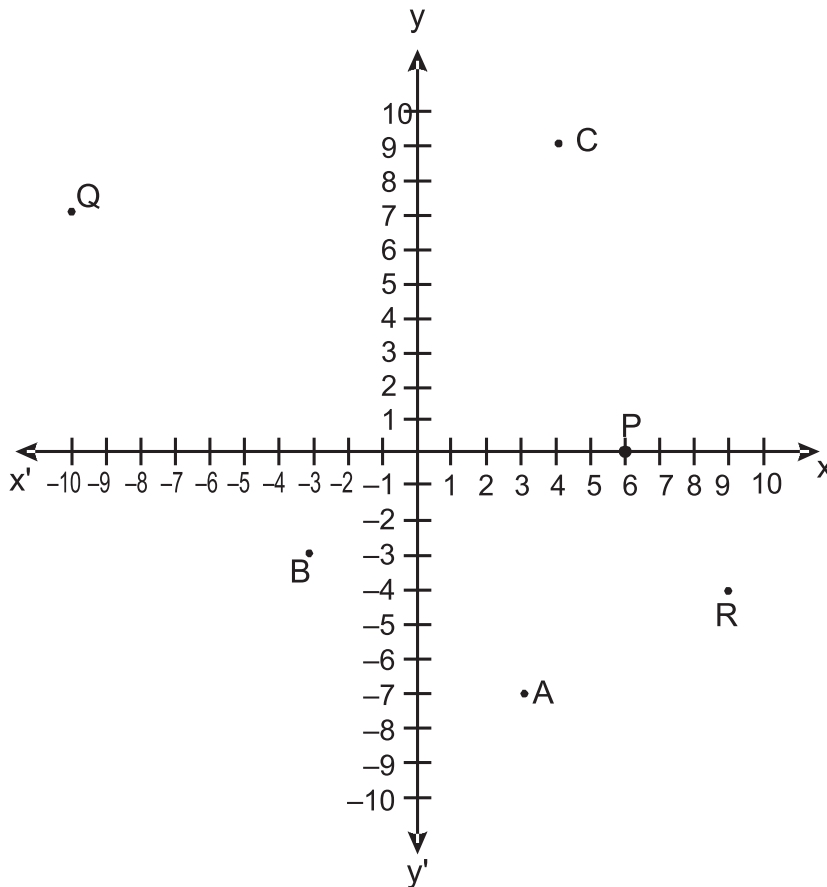




35. The coordinates of a point, which lies on negative x-axis at a distance of 6 units from y-axis, are  $(-6, 0)$ .
36. In which quadrant do the given points lie.
- |                  |                 |                 |
|------------------|-----------------|-----------------|
| i) $(3, -2)$     | ii) $(17, -30)$ | iii) $(-2, 5)$  |
| iv) $(-50, -20)$ | v) $(10, 100)$  | vi) $(-81, 80)$ |
37. On which axis do the given points lie :
- |                 |                |                |
|-----------------|----------------|----------------|
| i) $(11, 0)$    | ii) $(-11, 0)$ | iii) $(0, 14)$ |
| iv) $(0, -100)$ |                |                |
38. The abscissa and ordinate of a point A are  $-3$  and  $-5$  respectively then write down the coordinate of A.
39. Do  $P(7, 0)$  and  $Q(0, 7)$  represent the same point ?
40. In which quadrant x coordinate is negative ?
41. Name the figure formed when we plot the points  $(0, 0)$ ,  $(4, 4)$  and  $(0, 4)$  on a graph paper.
42. In which quadrant, does the point A  $(x, y)$  with values  $x > 0$  and  $y > 0$  exist.
43. Write the coordinates of the fourth vertex of a square when three of its vertices are given by  $(1, 2)$ ,  $(5, 2)$ ,  $(5, -2)$ .
44. If abscissa of point A is positive & ordinate is negative then in which quadrant does A lie ?
45. 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.
46. 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) $F(8, 0)$   |

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

A, B, C, P, Q, R



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

49. Find the distance of point (8, 3) from x axis & y axis.

50. 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.

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

52. If the mirror image of a point (x, y) about x-axis is (x, -y) then write the mirror image of the point S (-5, 7) about x-axis is \_\_\_\_\_.

53. Find the distance of the point P (4, 2) from origin.
54. Write the mirror image of (4, -3) about y-axis.

PART – C

55. 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.
56. 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?
57. Plot the points P (2, -3) & Q (-5, -3) whose ordinates are same. To which axis the line P Q is parallel?
58. 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 ?
59. 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.
60. 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?
61. 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?
62. 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?
63. 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.
64. Plot the point 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.  | b) y-axis                          | 25. | 0                      |
| 2.  | a) x-axis                          | 26. | right angled isosceles |
| 3.  | c) third quadrant                  | 27. | I, III                 |
| 4.  | b) on y-axis                       | 28. | different              |
| 5.  | a) I quadrant                      | 29. | (-5, 7)                |
| 6.  | a) on x-axis                       | 30. | (5, 0)                 |
| 7.  | d) +, -                            | 31. | False                  |
| 8.  | c) I and II quadrants              | 32. | True                   |
| 9.  | d) (0, -10)                        | 33. | False                  |
| 10. | d) II and IV quadrants             | 34. | False                  |
| 11. | c) P, R and T                      | 35. | True                   |
| 12. | b) 1                               | 36. | i) IV quadrant         |
| 13. | d) do not lie in the same quadrant |     | ii) IV quadrant        |
| 14. | d) Origin                          |     | iii) II quadrant       |
| 15. | d) (0, 0)                          |     | vi) III quadrant       |
| 16. | b) 90°                             |     | v) I quadrant          |
| 17. | d) 3                               |     | vi) II quadrant        |
| 18. | b) 7                               | 37. | i) x-axis              |
| 19. | d) 5                               |     | ii) x-axis             |
| 20. | d) Points B and C both             |     | iii) y-axis            |
| 21. | quadrants                          |     | ii) y-axis             |
| 22. | 5, -2                              | 38. | (-3, -5)               |
| 23. | IV                                 | 39. | No                     |
| 24. | 0                                  | 40. | II and III quadrant    |
|     |                                    | 41. | Right angled Triangle  |

42. 1st Quadrant
43.  $(1, -2)$
44. IV
45.  $(-3, 5)$
47.  $A(3, -7), B(-3, -3)$   
 $C(4, 9), P(6, 0)$   
 $Q(-10, 7), R(9, -4)$
48.  $(4, -3)$
49. 3 units, 8 units
50. Triangle or isosceles  
Triangles
51.  $(0, 2)$
52.  $(-5, -7)$
53.  $\sqrt{20}$  units
54.  $(-4, -3)$
56. Yes, y-axis
57. x-axis
58. i)  $(7, 0)$   
ii) Parallel to y-axis
59. 15 square units
60. Rectangle, y-axis
61. Any point on y-axis, infinite
62. At origin  $(0, 0)$
63.  $(0, 0), (10, 0), (10, 8), (0, 8)$
64. i) Rectangle  
ii) 10 sq. units

## Practice Test

### COORDINATE GEOMETRY

Time : 50 Min.

M.M. 20

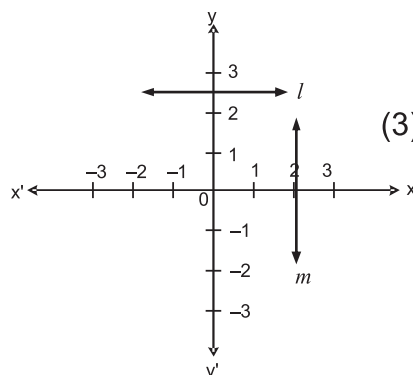
1. In which quadrant, the point  $(x, y)$  will lie? (Where  $x$  is a positive and  $y$  is a negative number). (1)
2. Write the  $y$ -coordinate of a point which lies on  $x$ -axis. (1)
3. Find the value of  $x$  and  $y$  if: (2)
  - (a)  $(x - 4, 7) = (4, 7)$
  - (b)  $(1, 2y - 3) = (1, 7)$

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  $x = 0$ .



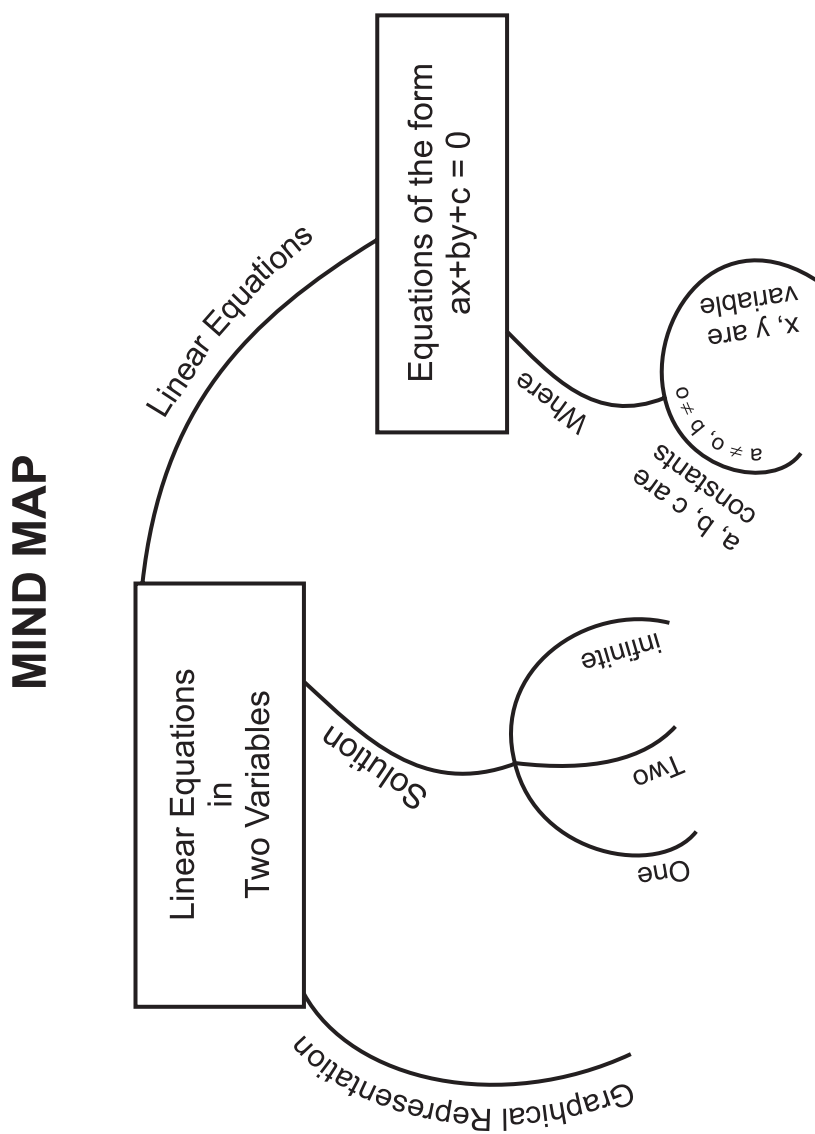
7. Plot the points  $O(0, 0)$ ,  $A(4, 0)$  and  $C(0, 6)$ . Find the coordinates of the fourth point  $B$  such that  $OABC$  forms a rectangle. (4)
8. The base  $AB$  of two equilateral triangles  $ABC$  and  $ABD$  with side  $2a$ , lies along the  $x$ -axis such that the mid point of  $AB$  is at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

# CHAPTER-4

## Linear Equations In Two Variables

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**CHAPTER-4**  
**LINEAR EQUATIONS IN TWO VARIABLES**  
**KEY POINTS**

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- **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 linear equation in two variables.

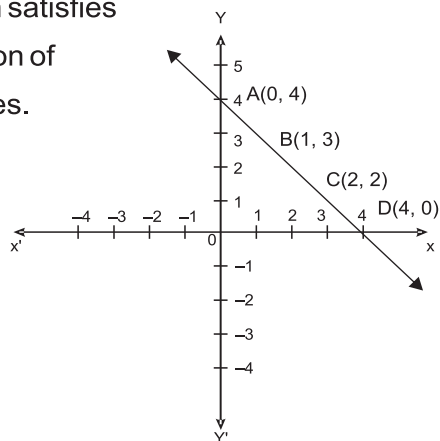
Example :  $x + y = 4$

Solutions of equation

$x+y = 4$  are

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

and many more



## PART-A

- Which of the following is not a linear equation ?
  - $3x+3 = 5x + 2$
  - $x^2 + 5 = 3x - 5$
  - $\frac{7}{3}x - 5 = 4x - 3$
  - $(x+2)^2 = x^2 - 8$
- Which of the following is not a linear equation in two variables ?
  - $2x+3y = 5$
  - $3x + 2y = 6$
  - $ax^2 + by = c$
  - $ax + by = c$
- A linear equation in two variables has maximum
  - Only one solution
  - Two solution
  - Infinite solution
  - None of these
- The graph of  $ax+by+c = 0$  is
  - a straight line parallel to x-axis
  - a straight line parallel to y-axis
  - a general straight line
  - Name of these
- If  $x = 1, y = 1$  is a solution of equation  $9ax + 12ay = 63$ , then the value of a is
  - 3
  - 0
  - 3
  - 4
- The equation of x-axis is
  - $x = k$
  - $x = 0$
  - $y = k$
  - $y = 0$
- Any point on the line  $y=x$  is of the form
  - $(a, 0)$
  - $(0, a)$
  - $(a, a)$
  - $(a, -a)$
- $x = 0$  represents the equation of
  - x-axis
  - y-axis
  - a line parallel to x-axis
  - a line parallel to y-axis
- $x=2, y=3$  is a solution of the linear equation

- a)  $2x + y = 8$                       b)  $x + 2y = 8$   
 c)  $x + y = 8$                         d)  $-x + y = 8$
10. The graph of  $2x + 3y = 6$  is a line which meets the y-axis at the point ?  
 a) (2,0)    b) (3,0)    c) (0,2)    d) (0,3)
11. How many linear equations in x and y can be formed by  $x = 18$  and  $y = 4$  ?  
 a) only one                                      b) two  
 c) three    d) infinitely many
12. The point of the form  $(-a, a)$  always lie on  
 a)  $x = a$                                         b)  $y = -a$   
 c)  $y = x$                                         d)  $x + y = 0$
13. The graph of  $y = x$  passes through the point ?  
 a)  $\left(\frac{5}{2}, -\frac{5}{2}\right)$                                 b)  $\left(0, \frac{5}{2}\right)$   
 c) (1,1)    d)  $\left(-\frac{1}{2}, \frac{1}{2}\right)$
14. Graph of  $x = 5$  is a line  
 a) Parallel to x - axis  
 b) Parallel to y - axis  
 c) Passes through origin  
 d) Lying on x- axis
15. Any solution of the linear equation  $5x + 0y + 7 = 0$  in two variables is of the form  
 a)  $\left(0, -\frac{7}{5}\right)$                                       b)  $\left(-\frac{7}{5}, 0\right)$   
 c)  $\left(-\frac{7}{5}, k\right)$                                       d)  $\left(k, -\frac{7}{5}\right)$
16. Any point on the x-axis is of the form  
 a) (x, y)    b) (o, y)  
 c) (o, x)    d) (x, o)





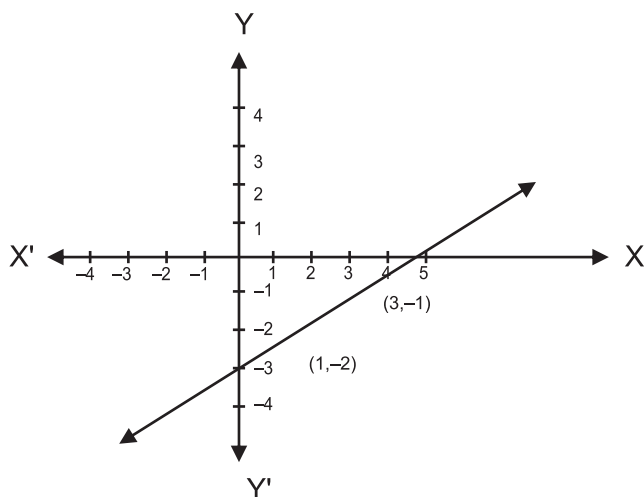
41. Express the linear equation  $\sqrt{2}x-4=5y$  in the form of  $ax+by+c=0$  and thus indicate the values of  $a$ ,  $b$  and  $c$ .
42. Express  $x$  in terms of  $y$  for the equation  $3x+4y=7$
43. Express  $y$  in the terms of  $x$ .  
 $3y+5x = 9$
44. Point  $(9,0)$  lie on which axis?
45. Find a solution of  $x + y = 5$  which lies on  $y$ -axis
46. Express the equation  $5y=9$  as linear equation in two variables.
47. Write the linear equation which is parallel to  $x$ -axis and is at a distance of 2 units from the origin in upward direction.
48. Check whether  $(1, -2)$  is a solution of  $2x - y = 6$ .
49. Check whether  $x = 2$  &  $y = -2$  is a solution of  $2x - y = 6$ .
50. How many solutions are there for equation  $y = 5x + 2$ .
51. Find the value of  $K$ , if  $x = -1$  &  $y = 1$  is a solution of equation  $Kx - 2y = 0$ .
52. If the graph of equation  $2x + Ky = 10$  intersects  $x$ -axis at point  $(5,0)$  find the value of  $K$ .
53. The graph of the linear equation  $4x=6$  is parallel to which axis?
54. At what point the graph of  $2x - y = 6$ , cuts  $x$ -axis?
55. On which side of  $y$  - axis,  $x + 3 = 0$  lies
56. On which side of  $y$ -axis,  $x + 3 = 0$  lies ?

### PART-B

57. Find any two solutions of equation  
 $2x+y = x+5$ .
58. Find the value of  $P$  if  $x=2$ ,  $y=3$  is a solution of equation  $5x+3Py = 4a$
59. If the points  $A(3,5)$  and  $B(1, 4)$  lies on the graph of line  $ax+by=7$ , find the value of  $a$ .

60. Write the coordinates of the point where the graph of the equation  $5x+2y=10$  intersect both the axes.
61. Write the equations of two lines passing through  $(3, 10)$ .
62. 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.
63. Draw the graph of equation  $x+y=5$ .
64. From the choices given below, choose the equation whose graph is given in figure –

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



65. The graph of linear equation  $2x - y = 6$  will pass through which quadrant(s).
66. How many solution of the equation  $3x - 2 = x - 3$  are there on the  
 (i) Number line  
 (ii) Cartesian plane..
67. 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.

### PART-C

68. 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.
69. Find the value of 'a' if  $(1, -1)$  is the solution of the equation  $2x + ay = 5$ . Find two more solutions of the equation.

70. Find two solutions of the equation  $4x + 5y = 28$ . Check whether  $(-2, 10)$  is solution of the given equation.
71. Write the equation of line passing through  $(3, -3)$  &  $(6, -6)$ .
72. If  $x = 3k - 2$ ,  $Y = 2k$  is a solution of equation  $4x - 7y + 12 = 0$ , then find the value of  $K$ .
73. If  $(m - 2, 2m + 1)$  lies on equation  $2x + 3y - 10 = 0$ , find  $m$ .
74.  $F = (9/5)C + 32$ .
- (i) If the temperature is  $35^{\circ}\text{C}$ , what is the temperature in Fahrenheit?
  - (ii) If the temperature is  $30^{\circ}\text{C}$ , what is the temperature in Fahrenheit?
75. 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.
76. Draw the graph for the linear equations  
 $3x + 4y = 12$ . If  $x = 8$ , find the value of  $y$  with the help of graph.
77. Draw the graph of  $y = x$  &  $2y = -5x$  on the same graph.
78. Give the geometrical representation of  $5x + 7 = 0$  as equation.
- (i) in one variable
  - (ii) in two variables
79. 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

80. 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?



81. 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.
82. Sarika distributes chocolates on the occasion of children's Day. She gives 5 chocolates to each child and 20 chocolates to adults. If number 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 number of children?
83. Priyanka and Arti decided to donate ₹ 1600 for the Army widows. Let 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.
84. 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 number of girls are 8, find number of boys.
85. Aftab 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.
86. 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.
87. We know that  $C = 2\pi r$ , taking  $\pi = \frac{22}{7}$ , 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**

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**ANSWER**

1. b)  $x^2 + 5 = 3x - 5$
2. c)  $ax^2 + by = c$
3. c) Infinite solution
4. c) a general straight line
5. a) 3
6. d)  $y = 0$
7. c) (a, a)
8. b) y-axis
9. b)  $x + 2y = 8$
10. c) (0,2)
11. d) infinitely many
12. d)  $x + y = 0$
13. c) (1,1)
14. b) Parallel to y - axis
15. c)  $\left(-\frac{7}{5}, k\right)$
16. d) (x, o)
17. d) All of these
18. a) -1
19. b)  $x + y = 0$
20. c)  $y = x$
21. b)  $2y + 2 = 0$
22. c)  $2x = 4$
23. b)  $\frac{8}{3}$
24. b) a point
25. b) 5
26. b) 3
27. b) 2
28. c)  $2x - 3y = 0$
29. c)  $a = 0, b = 3, c = -7$
30. b)  $x = \frac{-21 - 12y}{2}$
31. y
32. x
33. straight Line
34. a Point on number line
35. 1
36. False
37. False
38. True
39. False
40. False
41.  $\sqrt{2}x - 5y - 4 = 0,$   
Where  $a = \sqrt{2}, b = -5, c = -4$
42.  $x = \frac{7 - 4y}{3}$
43.  $y = \frac{9 - 5x}{3}$
44. x-axis
45. (0, 5)
46.  $0.x + 5.y = 9$

47.  $y = 2$
48. No
49. Yes
50. Infinitely many solutions
51.  $k = -2$
52.  $K = 1$
53. Parallel to y-axis.
54.  $(3, 0)$
55.  $y = mx$
56. On left side
57.  $(1, 4), (0, 5)$  (or any other two possible solutions)
58.  $p = \frac{4a - 10}{9}$
59.  $a = -1$
60.  $(0, 5)$  and  $(2, 0)$
61.  $3x - y + 1 = 0$  (or any other possible solution)  
 $12x + 7y = 106.$
62.  $3x - y = 21$  (Let the cost of coloured paper be ₹  $x$ , cost of white paper  
 63. by ₹  $y$ ).
64.  $x - 2y = 5$
65. I, II, III
66. (i) One Solution                      (ii) Infinitely many
67. (i)  $(3, 1)$                               (ii)  $(6, -2)$
68.  $a = -4, b = 4$
69.  $a = -3$  (any two solutions)
70.  $(2, 4), (7, 0),$  No
71.  $x + y = 0$

72.  $k = 2$

73.  $m = 11/8$

74.  $95^\circ \text{F}, 86^\circ \text{F}$

75.  $(3, 0), (0, 2)$

76.  $y = 3$

79. No

80.  $8x - 3y + 0 = 0$

$a = 8, b = -3, c = 0$

Infinitely many solutions.

81.  $x + y = 25$

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

(ii) 25

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

(ii) Priyanka = ₹1200, Arti = ₹400

84. (i)  $150x + 200y = 3600$ , (ii) Number of boys = 12

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

86.  $y = 20 + 10x$

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  $(2, -3)$ . (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  $120 \text{ cm}^3$ ?

## CHAPTER-5

# INTRODUCTION TO EUCLID'S GEOMETRY

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### 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**

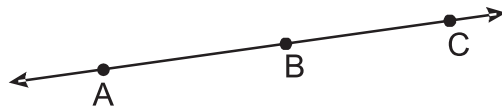
1. A Point is that which has no part.
2. A line is breadth less length.
3. The ends of a line are points.
4. A straight line is a line which lies evenly with the points on it self.
5. A surface is that which contain length and breadth only.
6. The edges of a surface are lines.
7. A plane surface is a 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?

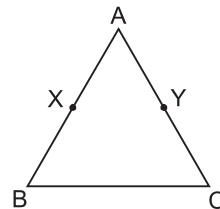


6. How many lines can pass through a single point ?
7. State Euclid's first postulate.
8. Write Euclid's fifth postulate.
9. If  $a + b = 15$  and  $a + b + c = 15 + c$   
which axiom of Euclid does the statement illustrate?
10. If A, B and C are three points on a line and B is between A and C then prove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

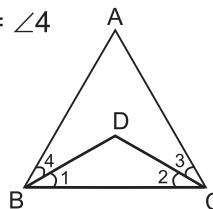


### Part – B

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

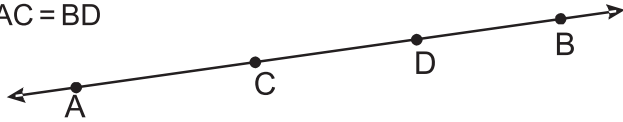


13. In given figure  $\angle ABC = \angle ACB$  and  $\angle 3 = \angle 4$   
Show that  $\angle 1 = \angle 2$





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



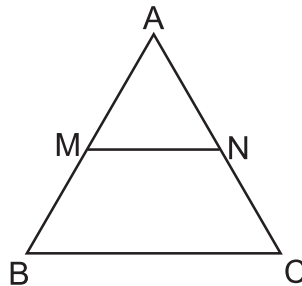
15. Solve the equation  $x - 10 = 15$ , State which axiom do you use here.  
16. If a point C lies between two points A and B such that  $AC = BC$  then prove that

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

17. In the given figure

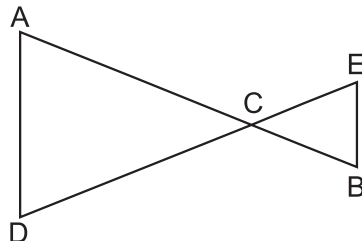
$$AM = \frac{1}{2} AB$$

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



show that  $AB = AC$

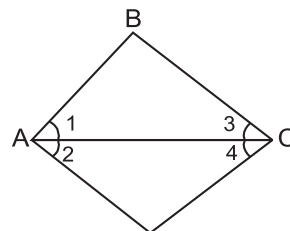
18. In the given figure  $AC = DC$ ,  $CB = CE$   
then show that  $AB = DE$



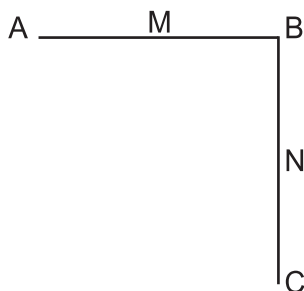
19. Prove that every line segment has one and only one mid point.  
20. State true or false  
(a) only one line can pass through a single point.  
(b) There are infinitely many number of lines which passes through the two distinct point.  
(c) Euclid belongs to Greece.

**Part – C**

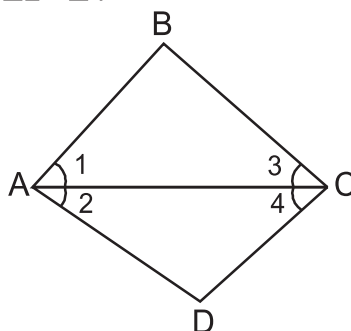
21. In the given figure  $\angle 1 = \angle 2$  and  $\angle 2 = \angle 3$   
then show that  $\angle 1 = \angle 3$



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  $60^\circ$  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**

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**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

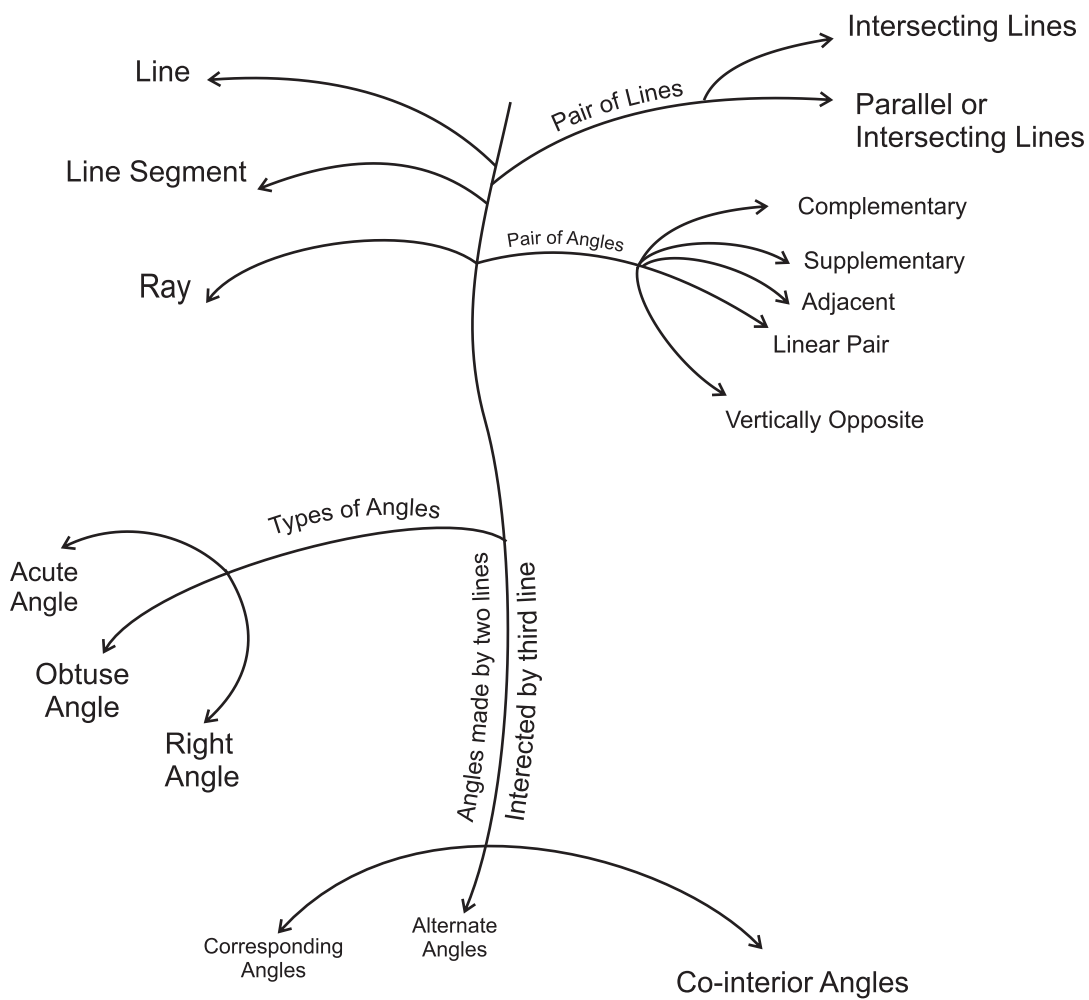
Choose the correct option:

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

**CHAPTER-6**  
**LINES & ANGLES MIND MAP**

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## CHAPTER-6

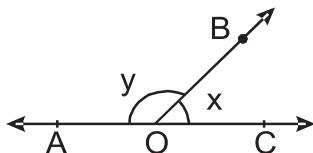
# LINES AND ANGLES

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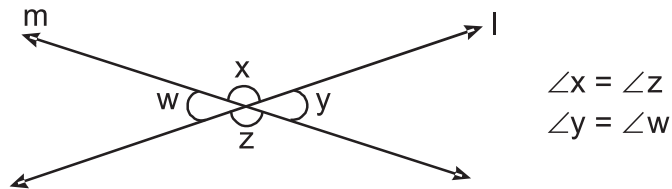
### KEY POINTS

- Line is a collection of points which has only length neither breadth nor thickness.
- **Line Segment** : A part or 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  $0^\circ$  and  $90^\circ$
- **Right angle** : Angle exactly equal to  $90^\circ$
- **Obtuse angle** : An angle greater than  $90^\circ$  but less than  $180^\circ$
- **Straight angle** : An angle exactly equal to  $180^\circ$
- **Reflex Angle** : An angle greater than  $180^\circ$  but less than  $360^\circ$
- **Complimentary Angles** : A pair of angles whose sum is  $90^\circ$
- **Supplementary angle** : A pair of angles whose sum is  $180^\circ$
- **Complete Angle** : An angle whose measure is  $360^\circ$ .
- **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  $180^\circ$



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

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



- **Intersecting lines**: 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

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

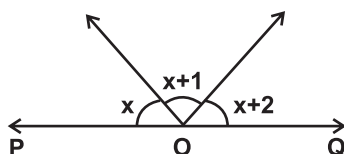
$\angle 3, \angle 6$  and  $\angle 4, \angle 5$  are called co-interior angles or allied angles or consecutive interior angles.

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

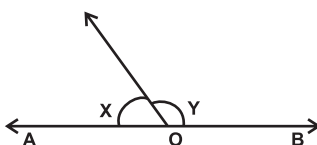
## LINES & ANGLES

### Part-A

- An angle which is greater than  $180^\circ$  & less than  $360^\circ$  is-
  - Obtuse Angle
  - Straight Angle
  - Reflex Angle
  - Complete Angle
- If three or more points does not lie on the same straight line the points are called –
  - Concurrent points
  - Collinear Points
  - Non Collinear Points
  - Adjacent Point
- Reflex angle of  $110^\circ$  is -
  - $70^\circ$
  - $90^\circ$
  - $250^\circ$
  - $190^\circ$
- If an angle is equal its complement, then the angle is –
  - $90^\circ$
  - $0^\circ$
  - $48^\circ$
  - 45
- If the figure POQ is a straight line. The three adjacent angles are consecutive numbers, the measure of these angles is –
  - $50^\circ, 60^\circ, 70^\circ$
  - $59^\circ, 60^\circ, 61^\circ$
  - $58^\circ, 60^\circ, 62^\circ$
  - All are correct



- In the figure, twice of  $x$  is  $30^\circ$  less than  $y$ , then the values of  $x$  &  $y$  are respectively, given OB & OA are opposite rays.
  - $130^\circ, 50^\circ$
  - $50^\circ, 130^\circ$
  - $100^\circ, 80^\circ$
  - $75^\circ, 105$







13. Which of the following options is correct :-

A pair of adjacent angles have.

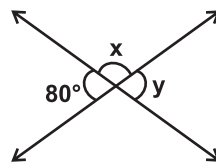
- (i) Common vertex
  - (ii) Common Arm.
  - (iii) Non Common arms are on opposite sides of common arms
  - (iv) Non Common arms are on the same side of common arms.
- a) (i) & (ii) are sufficient
  - b) (i), (ii) & (iii) are sufficient
  - c) (i), (ii) & (iv) are sufficient
  - d) All are sufficient

14. Angles  $x$  &  $y$  forms a linear pair and  $x+2y = 30^\circ$ , the value of  $y$  is

- a)  $70^\circ$
- b)  $110^\circ$
- c)  $210^\circ$
- d)  $60^\circ$

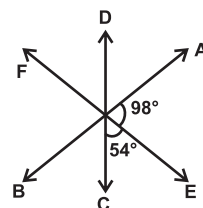
15. The degree measure of  $x$  &  $y$  respectively in the figure are –

- a)  $80^\circ, 100^\circ$
- b)  $100^\circ, 80^\circ$
- c)  $80^\circ, 80^\circ$
- d)  $100^\circ, 100^\circ$



16. In the figure  $AB$ ,  $CD$  &  $EF$  are three Straight lines intersecting at  $O$ . The measure of  $\angle AOF$  is –

- a)  $98^\circ$
- b)  $152^\circ$
- c)  $54^\circ$
- d)  $82^\circ$

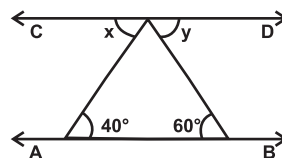


17. If  $\angle ABC + \angle DEF = 180^\circ$ , name the pair of angles  $\angle ABC$  &  $\angle DEF$

- a) Adjacent Angles
- b) Complementary Angles
- c) Supplementary Angle
- d) V.O.A

18. In the figure,  $AB \parallel CD$ , What is  $x+y$ .

- a)  $40^\circ$
- b)  $60^\circ$
- c)  $100^\circ$
- d)  $80^\circ$



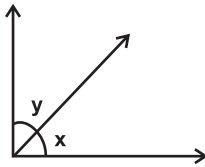




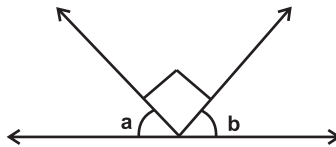


**Fill in the blanks :-**

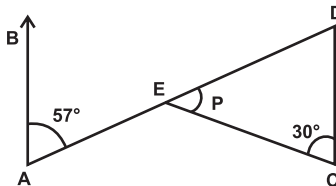
37. Two lines perpendicular to the same line are \_\_\_\_\_ to each other.
38. Two lines parallel to the same line are \_\_\_\_\_ to each other.
39. If one angle of a linear pair is acute, then its other angle will be \_\_\_\_\_
40. If the sum of two adjacent angles is  $180^\circ$ , then the \_\_\_\_\_ arms of the two angles are opposite rays.
41. If OB & OA are opposite rays, in the figure then the value of  $x+y$  is \_\_\_\_\_



42. If the figure AB is a straight line, then the value of  $a+b$  is \_\_\_\_\_



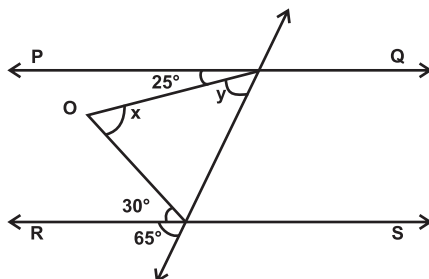
43. If  $(30-x)^\circ$  is supplement of  $(125+2x)^\circ$  then  $x$  is \_\_\_\_\_
44. If one of the angles of formed by two intersecting lines is a right angle then the lines are \_\_\_\_\_ to each other.
45. In the figure, if  $AB \parallel CD$  then measure of  $p$  is



46. Exterior angle of a triangle is always \_\_\_\_\_ than either of its interior opposite angles.

### PART-B

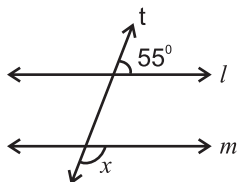
47. In the adjoining figure  $PQ \parallel RS$  find  $x$  and  $y$ .



48. 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.

49.  $BO$  and  $CO$  are external bisector of  $\angle B$  and  $\angle C$  of  $\triangle ABC$  Intersecting at  $O$ . If  $\angle A = 60^\circ$ ,  $\angle ABC = 70^\circ$ , Find  $\angle BOC$ .

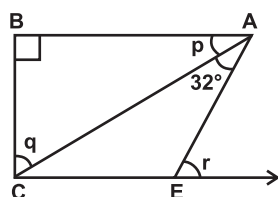
50. In the above question 18, if internal bisector of  $\angle B$  and  $\angle C$  intersect at  $P$ , prove that  $\angle PBO = 90^\circ$  and  $\angle BOC + \angle BPC = 180^\circ$



51. In the given figure if  $m$  and  $t$  is the transversal find  $x$ .

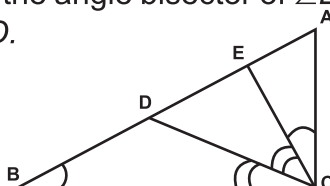
52. In the figure ,

It  $p : q = 11 : 19$ ,  $AB \parallel CE$ , then find the values of  $p$ ,  $q$  and  $r$ .

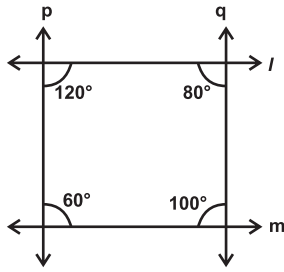


53. Prove that vertically opposite angles are equal.

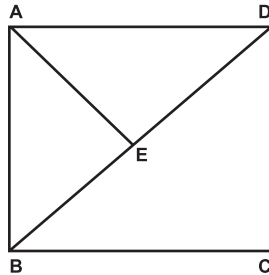
54. In the figure,  $CD$  is the angle bisector of  $\angle ECB$ ,  $\angle B = \angle ACE$ . Prove that  $\angle ADC = \angle ACD$ .



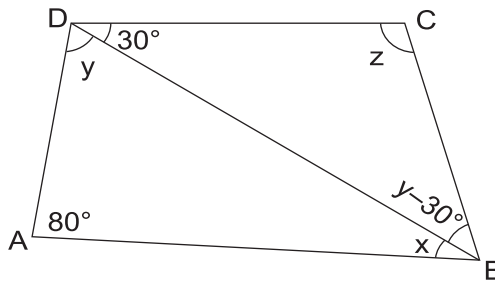
55. In the figure, choose the pair of lines which are parallel. Give reasons also.



56. The angles of a triangle are  $(x - 40^\circ)$ ,  $(x - 20^\circ)$ ,  $(\frac{x}{2} - 10^\circ)$   
Find the value of  $x$  & then find the angles of the triangle.
57. In the figure, if  $\angle AED = \angle BDC + \angle BAE$  then show that  $AB \parallel CD$



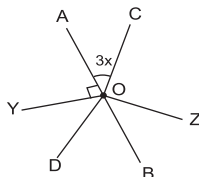
58. In the given figure if  $AB \parallel DC$  and  $\angle BDC = 30^\circ$   $\angle BAD = 80^\circ$  find  $\angle x$ ,  $\angle y$ ,  $\angle z$ .



### Part – C

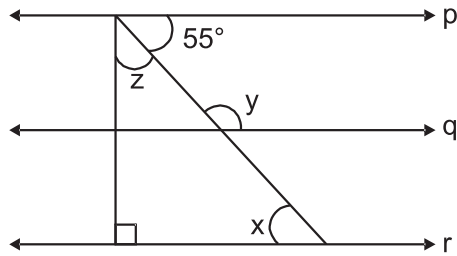
59. If one of the angle of two intersecting lines is right angle then prove that other three angles will also be right angles.

60. AB and CD are intersecting lines. OD is bisector of  $\angle BOY$ . Find  $x$ .

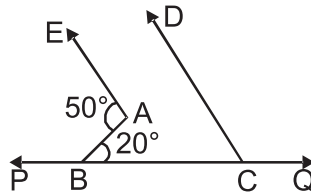




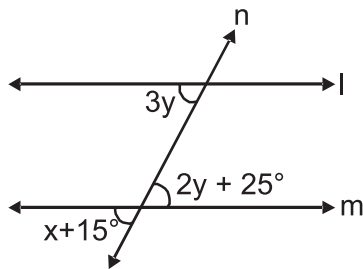
61. If  $p \parallel q \parallel r$ , find  $x, y, z$  from given figure.



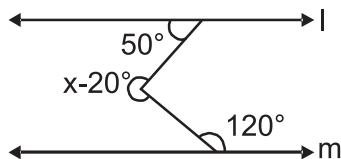
62. In the given figure find  $\angle DCB$  if  $AE \parallel CD$ .



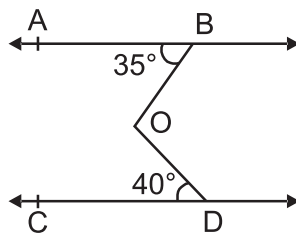
63. In the given figure  $l \parallel m$  and  $n$  is the transversal, find  $x$ .



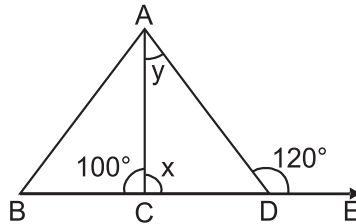
64. For what value of  $x$ ,  $l \parallel m$ .



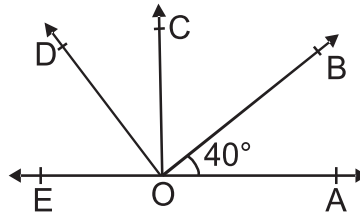
65. From the figure find reflex angle  $\angle BOD$  if  $AB \parallel CD$ .



66. If the angles of a triangle are in the ratio 5 : 3 : 7 then show that the triangle is acute angled triangle.
67. Two lines are respectively perpendicular to two parallel lines show that they are parallel to each other.
68. As shown in the figure find  $x$  &  $y$  if  $\angle ACB = 100^\circ$ ,  $\angle ADE = 120^\circ$ .



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



70. Prove that the bisectors of the angles of a linear pair are at right angle.
71. 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.
72. Prove that the sum of all exterior angles of a triangle is  $360^\circ$ .
73. If the bisectors of  $\angle Q$  and  $\angle R$  of a triangle  $\triangle PQR$  meet at point  $S$ , then prove that

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

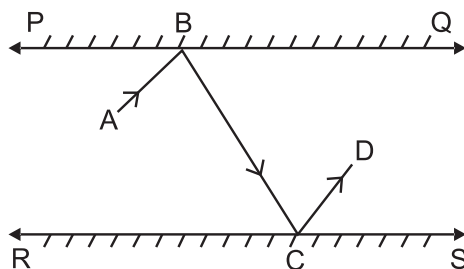
74. Show that if sum of the two angles of a triangle is equal to the third angle then the triangle is right angled triangle.

#### Part – D

75. 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.

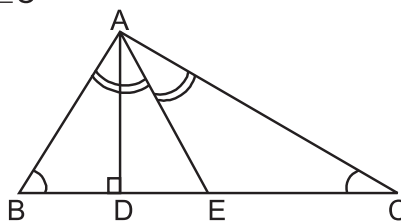
76. In the given figure PQ, RS are two mirrors placed parallel to each other. An incident ray AB strikes the mirror PQ at B; the reflected ray moves along the path BC again strikes the mirror RS at C and reflects back along CD.

Prove that  $AB \parallel CD$ .



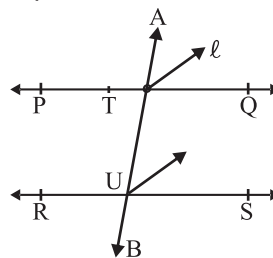
77. In the figure AE is the bisector of  $\angle A$ ,  $AD \perp BC$ . Show that

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



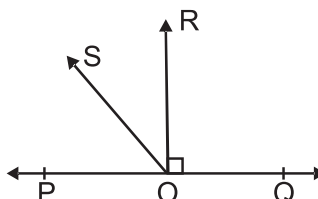
78. Prove that quadrilateral formed by the intersection of bisectors of interior angles made by a transversal on two parallel lines is a rectangle.

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

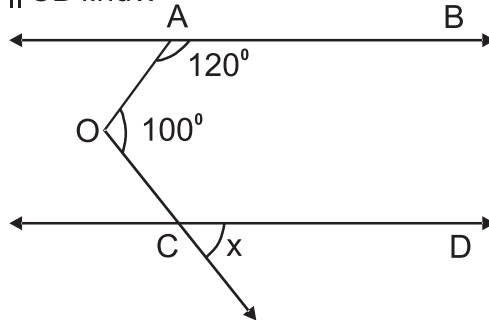


80. POQ is a straight line  $RO \perp PQ$ , SO is a ray from O then prove that

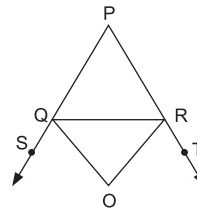
$$\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$$



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



82. 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. (c) Reflex Angle
2. (c) Non Collinear Points
3. (d)  $250^\circ$
4. (d)  $45^\circ$
5. (b)  $59^\circ, 60^\circ, 61^\circ$
6. (b)  $50^\circ, 130^\circ$
7. (c)  $89^\circ, 91^\circ$
8. (c)  $140^\circ$
9. (c)  $110^\circ, 70^\circ$
10. (c)  $150^\circ$
11. (b)  $50^\circ$
12. (d)  $115^\circ$
13. (b) (i), (ii) & (iii) are sufficient
14. (a)  $70^\circ$
15. (b)  $100^\circ, 80^\circ$
16. (d)  $82^\circ$
17. (c) Supplementary Angles
18. (c)  $100^\circ$
19. (c) (ii), (iii), (iv), (iv) are correct
20. (c) Supplementary
21. (b)  $55^\circ$
22. (c)  $30^\circ$
23. (a)  $30^\circ$
24. (b)  $90^\circ$
25. (b)  $60^\circ$
26. (a)  $36^\circ$
27. (b)  $145^\circ$
28. (d)  $35^\circ$
29. (b) Obtuse Angled Triangle.
30. (c)  $40^\circ$
31. (c)  $70^\circ$

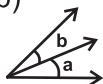
32. (b)  $140^\circ$

33. (a)  $90^\circ$

34. (a)  $90^\circ$

35. (b)  $59^\circ$

36. (b)



37. Parallel

38. Parallel

39. Obtuse

40. Non Common

41.  $180^\circ$

42.  $90^\circ$

43.  $25^\circ$

44. Perpendicular

45.  $93^\circ$

46. Greater

47.  $x = 55^\circ, y = 40^\circ$

48. 4 Friends =  $60^\circ$ , 1 friend  $60^\circ \times 2 = 120^\circ$

49.  $60^\circ$

51.  $125^\circ$

52.  $33^\circ, 57^\circ, 65^\circ$

53.  $l \parallel m$

56.  $x = 100^\circ, 60^\circ, 80^\circ, 40^\circ$

58.  $x = 30^\circ, y = 70^\circ, z = 110^\circ$

60.  $x = 15^\circ$

61.  $x = 55^\circ, y = 125^\circ, z = 35^\circ$

62.  $30^\circ$

63.  $60^\circ$

64.  $270^\circ$

65.  $285^\circ$

68.  $80^\circ, 40^\circ$

69.  $45^\circ, 40^\circ$

71.  $54^\circ$

77.  $17.5^\circ$

81.  $40^\circ$

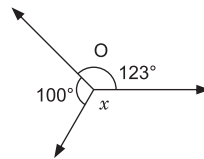
## PRACTICE TEST LINES AND ANGLES

Time : 50 Min.

M.M. 20

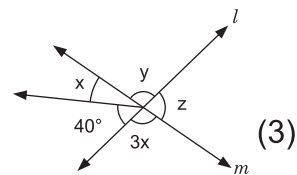
1. If  $\angle ABC = 142^\circ$ , find reflex  $\angle ABC$ . (1)
2. Two angles form a linear pair. If one of the angle is acute, what is the type of other angle? (1)

3. Find  $x$  in the given figure :



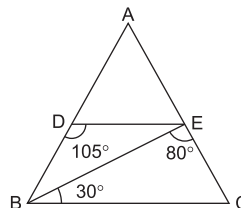
4. If two parallel lines intersected by a transversal, then name the pair of angles formed that are equal. (2)
5. In a  $\triangle ABC$ ,  $\angle A + \angle B = 125^\circ$  and  $\angle B + \angle C = 150^\circ$ . Find all the angle of  $\triangle ABC$ . (3)

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



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)

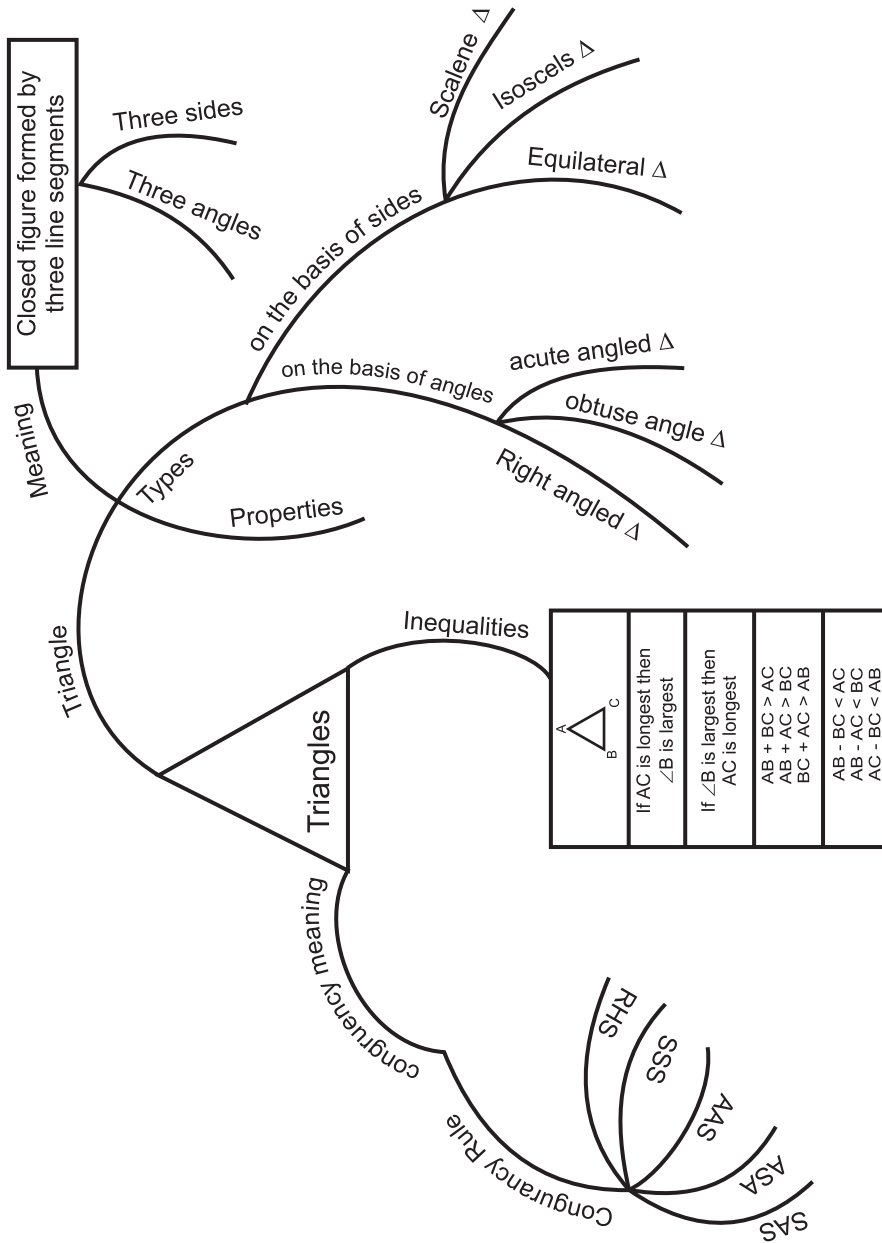
8.  $ABC$  is a triangle in which  $DE \parallel BC$ . Find  $\angle A$ .



# CHAPTER-7

## TRIANGLES

### MIND MAP





## CHAPTER-7

# TRIANGLES

### KEY POINTS

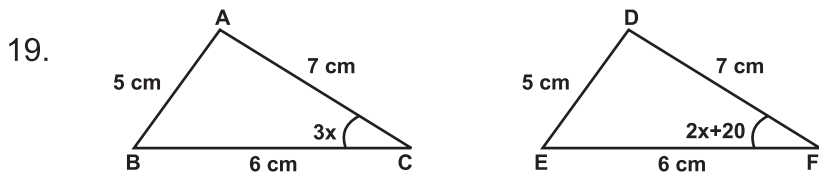
- Two figures having the same shape and size are called congruent figures.
- Two plane figures are congruent, if each one when superimposed on the other, covers the other exactly.
- Two line segments are congruent, if they are of equal lengths.
- Two angles of equal measures are congruent.
- Two circles 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 are 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 another 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.
- Difference of any two sides of a triangles is less than the third side.

### PART-A

- Which of the following is not a criterion for congruency of triangles ?
  - SSS
  - RHS
  - AAA
  - SAS
- If  $AB \cong CD$  then
  - $AB < CD$
  - $AB + CD = 0$
  - $AB = CD$
  - $AB > CD$
- If  $\triangle ABC \cong \triangle DEF$  then.
  - $AC = DE$
  - $BC = DF$
  - $FE = CB$
  - $AB = DF$
- If one angle of a triangle is equal to the sum of the other two angles, then the triangle is
  - an equilateral triangle
  - an isosceles triangles
  - an obtuse triangle
  - a right triangle
- If  $AB = QR$ ,  $BC = PR$  and  $CA = PQ$ , then
  - $\triangle ABC \cong \triangle PQR$
  - $\triangle CBA \cong \triangle PRQ$
  - $\triangle BAC \cong \triangle RPQ$
  - $\triangle PQR \cong \triangle BCA$
- In  $\triangle ABC$  and  $\triangle DFE$ ,  $AB = FD$ ,  $\angle A = \angle D$ . The two triangles will be congruent by SAS axiom if
  - $BC = EF$
  - $AC = DE$
  - $AC = EF$
  - $BC = DE$
- If  $\triangle ABC \cong \triangle FDE$ ,  $AB = 5 \text{ cm}$ ,  $\angle B = 40^\circ$ ,  $A = 80^\circ$ . Then which of the following is correct ?
  - $DF = 5\text{cm}$ ,  $\angle F = 60^\circ$
  - $DF = 5 \text{ cm}$ ,  $\angle E = 60^\circ$
  - $DF = 5\text{cm}$ ,  $\angle C = 60^\circ$
  - Both (B) and (C)
- In  $\triangle ABC$ ,  $AB = AC$ ,  $\angle B = 40^\circ$ . Then  $\angle C$  is equal to
  - $50^\circ$
  - $40^\circ$
  - $80^\circ$
  - $140^\circ$

9. In  $\triangle ABC$ ,  $AB = BC$ ,  $\angle B = 40^\circ$ , Then  $\angle A$  is equal to  
 a)  $70^\circ$     b)  $40^\circ$   
 c)  $140^\circ$     d)  $100^\circ$
10. In right  $\triangle ABC$ ,  $AB = BC$ . Then  $\angle A$  is equal to  
 a)  $45^\circ$     b)  $90^\circ$   
 c)  $60^\circ$     d) None of these
11. In  $\triangle PQR$ ,  $\angle R = \angle P$ ,  $QR = 4$  cm and  $PR = 5$  cm. Then  $PQ = \underline{\hspace{2cm}}$   
 a) 4 cm    b) 5 cm  
 c) 1 cm    d) 9 cm
12. If  $a, b, c$  are the lengths of the sides of a triangle, then  
 a)  $a - b > c$     b)  $a + b < c$   
 c)  $c = a + b$     d)  $c < a + b$
13. It is not possible to construct a triangle when the lengths of its sides are  
 a) 3 cm, 4 cm, 5 cm    b) 3 cm, 5 cm, 5 cm  
 c) 5.3 cm, 2.2 cm, 3.1 cm    d) 9.3 cm, 5.2 cm, 7.4 cm
14. In  $\triangle ABC$ ,  $\angle B = 90^\circ$  then  
 a)  $AC = AB$     b)  $AC < AB$   
 c)  $AC < BC$     d)  $AC > AB$
15. If  $\triangle ABC$  is obtuse angled at C, then  
 a)  $AB > BC$     b)  $AB = BC$   
 c)  $AB < BC$     d)  $AC > AB$
16. In  $\triangle PQR$ , if  $\angle R > \angle Q$ , then  
 a)  $QR > PR$     b)  $PQ > PR$   
 c)  $PQ < PR$     d)  $QR < PR$
17. In  $\triangle ABC$  and  $\triangle PQR$ . If  $AB = QP$ ,  $\angle B = \angle P$ ,  $BC = PR$  then which one of the following congruence conditions applies :  
 a) SAS    b) ASA  
 c) SSS    d) RHS
18. In  $\triangle ABC$  and  $\triangle DEF$ , if  $\angle A = \angle F$ ,  $\angle B = \angle D$  and  $AB = FD$ , then which one of the following congruence conditions applies :  
 a) SAS    b) ASA  
 c) SSS    d) RHS



In the given figure, the value of  $x$  is

- |       |        |
|-------|--------|
| a) 4  | b) 32  |
| c) 20 | d) 180 |

20. If  $\triangle PQR \cong \triangle LMN$  then  $NL =$  \_\_\_\_\_

- |       |                  |
|-------|------------------|
| a) PQ | b) QR            |
| c) RP | d) None of these |

21. If  $\triangle CAB \cong \triangle MLK$  then  $\angle K =$  \_\_\_\_\_

- |               |                  |
|---------------|------------------|
| a) $\angle A$ | b) $\angle B$    |
| c) $\angle C$ | d) None of these |

22. In  $\triangle ABC$ ,  $\angle C$  is the greatest angle, then

- |              |                     |
|--------------|---------------------|
| a) $AC > AB$ | b) $AB > AC$        |
| c) $AB > BC$ | d) Both (b) and (c) |

23. For  $\triangle ABC$ , which of the following is incorrect ?

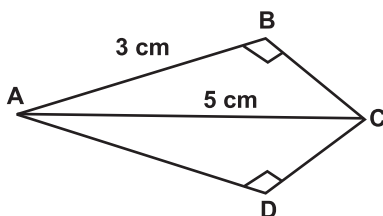
- |                     |                     |
|---------------------|---------------------|
| a) $(BC - AB) < AC$ | b) $(AC - BC) < AB$ |
| c) $(AC - AB) < BC$ | d) None of these    |

24. If  $\triangle ABC \cong \triangle ACB$ , then

- |              |                  |
|--------------|------------------|
| a) $AB = AC$ | b) $AB = BC$     |
| c) $AC = BC$ | d) None of these |

25. In the given figure  $AC$  is bisector of  $\angle BAD$ ,  $AB = 3 \text{ cm}$ ,  $AC = 5 \text{ cm}$ , then  $AD =$  \_\_\_\_\_

- |         |         |
|---------|---------|
| a) 2 cm | b) 5 cm |
| c) 3 cm | d) 8 cm |



**Fill in the blanks :-**

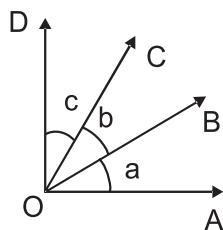
26. Two figures are congruent if they have the \_\_\_\_\_ shape and same \_\_\_\_\_.
27. Two circles are congruent if they have \_\_\_\_\_ radii.
28. Two equilateral triangles are congruent. if they have \_\_\_\_\_ sides.
29. Two square are congruent if they have \_\_\_\_\_ sides.
30. The sum of any two sides of a triangle is \_\_\_\_\_ than the third side.

31. The difference of any two sides of a triangle is \_\_\_\_\_ than the third side.
32. In a right triangle, the hypotenuse is the \_\_\_\_\_ side
33. If two angles of a triangle are unequal, then the smaller angle has the \_\_\_\_\_ side opposite to it.
34. If two sides of a triangle are unequal, then the larger side has \_\_\_\_\_ angle opposite to it.
35. In a triangle, sides opposite to equal angles are \_\_\_\_\_

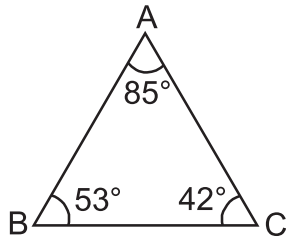
**State which of the following statements are true and false.**

36. In a triangle, the greatest angle has the longest side opposite to it.
37. Two triangles are congruent if three angles of one triangle are equal to three angles of the other triangle.
38. In a triangle, the shortest side has the smallest angle opposite to it.
39. It is necessary to write the correspondence of vertices correctly for writing congruence of triangles in symbolic form.
40. If all the line segments that can be drawn from a point to a line not containing it, the perpendicular line segment is the shortest one.
41. If  $\triangle ABC \cong \triangle DEF$  then
  - (i)  $AB =$  \_\_\_\_\_
  - (ii)  $BC =$  \_\_\_\_\_
  - (iii)  $CA =$  \_\_\_\_\_
  - (iv)  $\angle E =$  \_\_\_\_\_
  - (v)  $\angle EDF =$  \_\_\_\_\_
  - (vi)  $\angle BCA =$  \_\_\_\_\_
42. Circle  $O_1 \cong$  Circle  $O_2$ . If radius of circle  $O_1 = 6$  cm then diameter of circle  $O_2$  is \_\_\_\_\_.

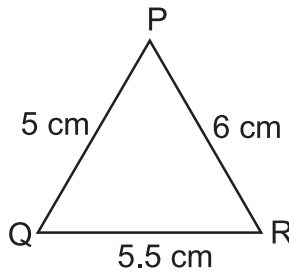
43. In the given figure, if  $a = b = c$  then  $\angle AOC \cong$  \_\_\_\_\_



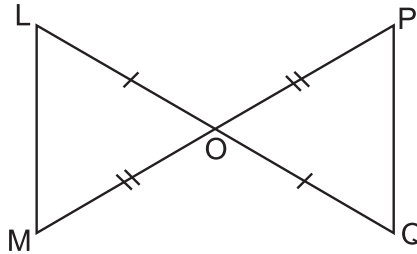
44. Which is the longest side of the triangles given in the figure ?



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



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

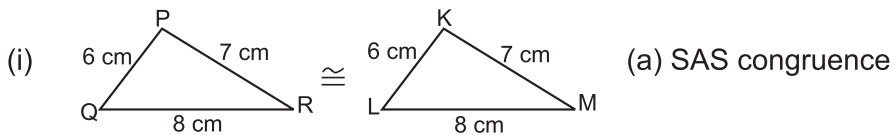


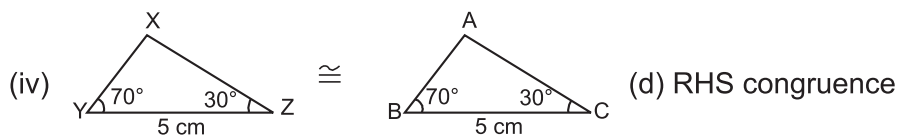
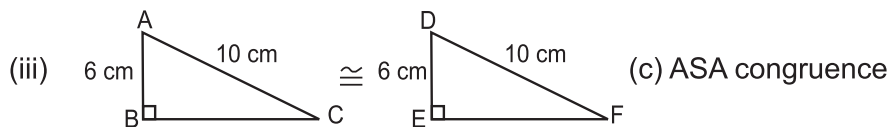
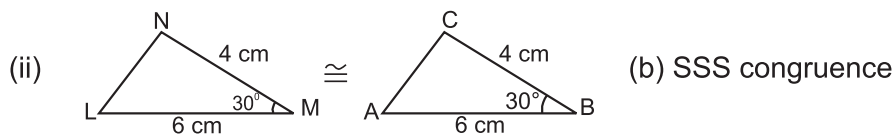
**Part – B**

47. Match the columns :

**Column A**

**Column B**

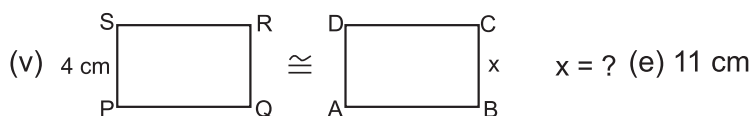
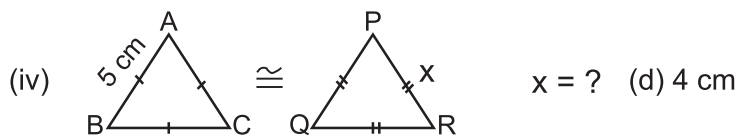
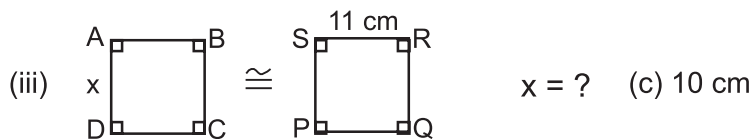
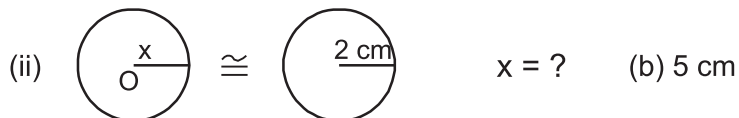
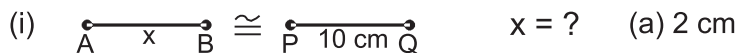




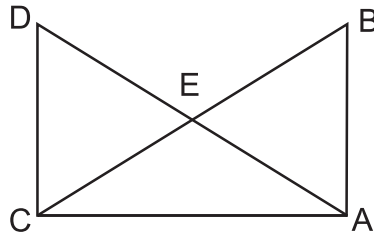
48. Match the columns :

**Column A**

**Column B**

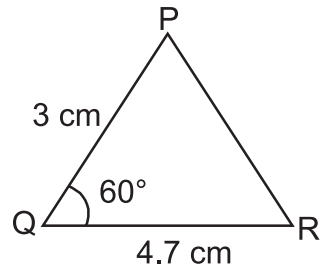
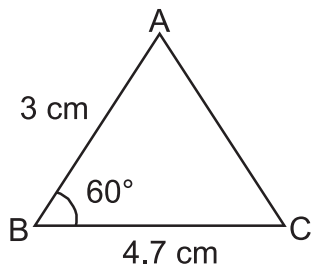


49. In the given figure. If  $AB = CD$ ,  $AD = BC$  then prove that  $\triangle ADC \cong \triangle CBA$



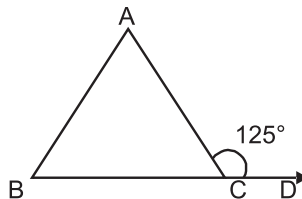
50. If  $\triangle ABC$  is an isosceles triangle such that  $AB = AC$ , then prove that altitude  $AD$  from  $A$  on  $BC$  bisects it.

51. Which criteria of congruence of triangles is satisfied in the given figure.



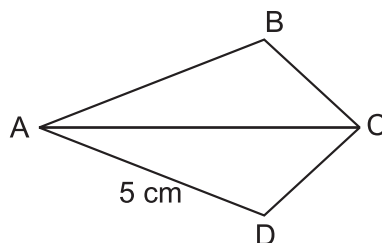
52. In a  $\triangle PQR$ ,  $\angle P = 110^\circ$ ,  $PQ = PR$ . Find  $\angle Q$  and  $\angle R$ .

53. In the given figure  $AB = AC$  and  $\angle ACD = 125^\circ$ . Find  $\angle A$



54. In  $\triangle ABC$ , if  $\angle A = 55^\circ$ ,  $\angle B = 75^\circ$  then find out the smallest and longest side of the triangle.

55. In the given figure,  $AC$  bisects  $\angle A$  and  $\angle C$ . If  $AD = 5$  cm find  $AB$ .

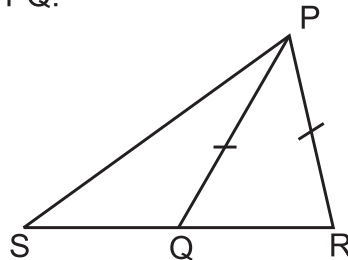




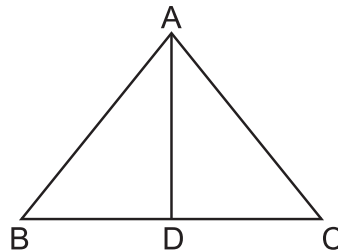
56. The vertex angle of an isosceles triangle is  $80^\circ$ . Find out the measure of base angles.

**Part – C**

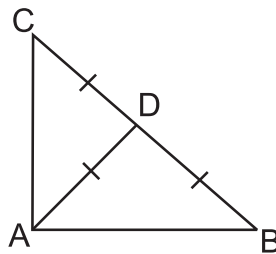
57. In the given figure, Q is a point on the side SR of  $\triangle PSR$  such that  $PQ = PR$ . Prove that  $PS > PQ$ .



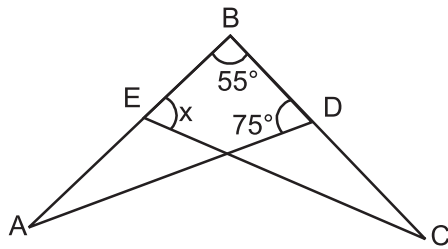
58. ABC is a triangle and D is the mid-point of BC. The Perpendicular from D to AB and AC are equal. Prove that triangle is isosceles.
59. Prove that angles opposite to the equal sides of an isosceles triangle are equal.
60. In the given figure,  $AC > AB$  and AD bisects  $\angle BAC$ . Prove that  $\angle ADC > \angle ADB$ .



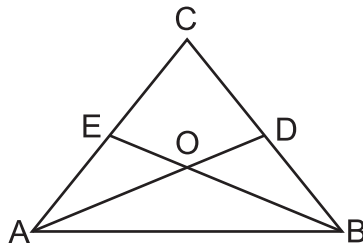
61. S is any point in the interior of a  $\triangle PQR$ . Prove that  $SQ + SR < PQ + PR$ .
62. In the given figure, if  $AD = BD = CD$ , Find  $\angle BAC$



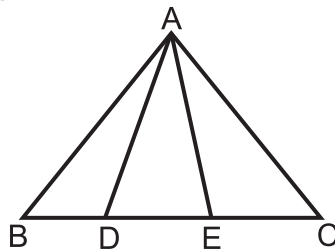
63. In the given figure, if  $AB = BC$  and  $\angle A = \angle C$  then find the value of  $x$ .



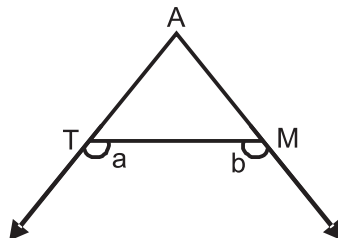
64. In the given figure  $\angle ABC = \angle BAC$ ,  $D$  and  $E$  are points on  $BC$  and  $AC$  respectively such that  $DB = AE$ . If  $AD$  and  $BE$  intersect at  $O$  then prove that  $OA = OB$ .



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



66. 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  $\angle EDF = 72^\circ$
67. Prove that the angles of an equilateral triangle are  $60^\circ$  each.
68. In the given figure,  $\angle a > \angle b$ , show that  $\angle ATM < \angle AMT$ .

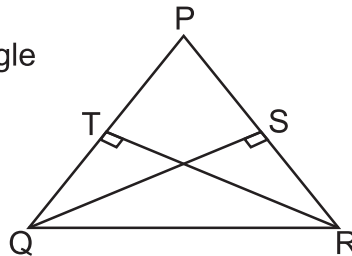


### Part-D

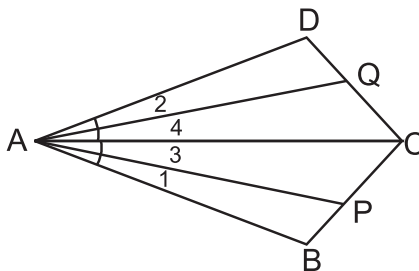
69. AF, BD and CE altitudes of  $\triangle ABC$  are equal. Prove that ABC is an equilateral triangle.
70. Prove that two triangles are congruent if two angles and the included side of one triangle are equal to the two angles and the included side of the other triangle.
71. O is any point in the interior of a  $\triangle ABC$ . Prove that  $(OA + OB + OC) > \frac{1}{2}(AB + BC + CA)$
72. Prove that the perimeter of a triangle is greater than the sum of its three altitudes.
73. 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.
- $\triangle ABM \cong \triangle PQN$
  - $\triangle ABC \cong \triangle PQR$

74. In the given figure, PQR is a triangle in which altitudes QS and RT to sides PR and PQ are equal. show that.

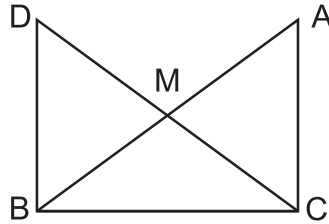
- $\triangle PQS \cong \triangle PRT$
- PQR is an isosceles triangle



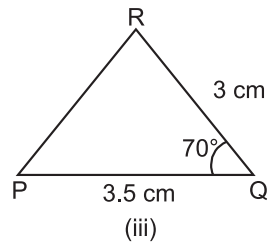
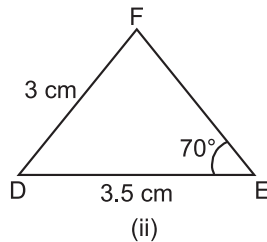
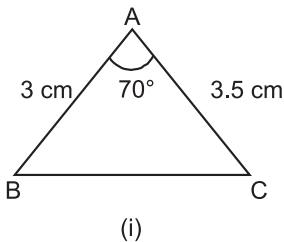
75. In the given figure,  $AB = AD$ ,  $\angle 1 = \angle 2$  and  $\angle 3 = \angle 4$ . Prove that  $AP = AQ$ .



76. 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  $CM = \frac{1}{2} AB$

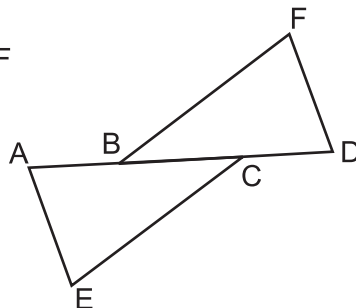


77. Prove that the sum of any two sides of a triangle is greater than its third side.
78. Vandana wishes to literate the poor children of the nearby slum area. She makes flash cards for them as shown in the given figure.



- (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.
79. Prove that the sum of any two sides of a triangle is greater than twice the median drawn to the third side.
80. In the given figure,  $AB = CD$ ,  $CE = BF$  and  $\angle ACE = \angle DBF$ . Prove that

- (i)  $\triangle ACE \cong \triangle DBF$   
 (ii)  $AE = DF$



**CHAPTER-7**  
**TRIANGLES**  
**ANSWERS**

1. c) AAA
2. c)  $AB = CD$
3. c)  $FE = CB$
4. d) a right triangle
5. b)  $\triangle CBA \cong \triangle PRQ$
6. b)  $AC = DE$
7. d) Both (B) and (C)
8. b)  $40^\circ$
9. a)  $70^\circ$
10. a)  $45^\circ$
11. a) 4cm
12. d)  $c < a + b$
13. c) 5.3 cm, 2.2 cm, 3.1 cm
14. d)  $AC > AB$
15. a)  $AB > BC$
16. b)  $PQ > PR$
17. a) SAS
18. b) ASA
19. c) 20
20. c) RP
21. b)  $\angle B$
22. d) Both (b) and (d)
23. d) None of these
24. a)  $AB = AC$
25. c) 3 cm
26. Same, Size
27. equal
28. equal
29. equal
30. greater
31. less
32. largest
33. smaller
34. greater

35. equal
36. True
37. False
38. True
39. True
40. True
41. (i) DE  
(ii) EF  
(iii) FD  
(iv)  $\angle B$   
(v)  $\angle BAC$   
(vi)  $\angle EFD$
42. 12cm
43.  $\angle BOD$
44. BC
45.  $\angle Q$
46.  $\triangle LOM \cong \triangle QOP$
47. (i) (b)  
(ii) (a)  
(iii) (d)  
(iv) (c)
48. (i) (c)  
(ii) (a)  
(iii) (e)  
(iv) (b)  
(v) (d)
51. SAS
52.  $\angle Q = \angle R = 35^\circ$
53.  $\angle A = 70^\circ$
54. Smallest Side = AB  
Longest Side = AC
55. AB = 5cm
56.  $50^\circ, 50^\circ$
62.  $\angle BAC = 90^\circ$
63.  $75^\circ$
78. (a) (i) and (iii)  
(b)  $\triangle ABC \cong \triangle QRP$  (SAS Congruency)  
(c) BC = PR

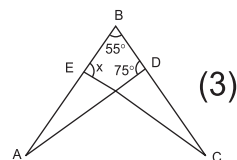
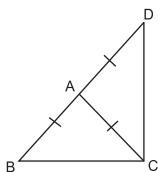
## PRACTICE TEST

Time : 50 Min.

### Triangles

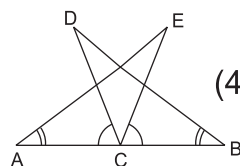
M.M. 20

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  $\angle A = 70$ . Find  $\angle B$  and  $\angle C$ . (2)
  
4. The vertical angle of an isosceles triangle is  $100^\circ$ . Find its base angles. (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)

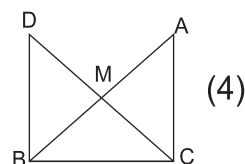


6. In the given figure, if  $AB = BC$  and  $\angle A = \angle C$ . Then find the value of  $x$ . (3)

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  $BD = AE$ . (4)



8. In the given figure  $ABC$  is a right angled triangle, right angled at  $C$ .  $M$  is the midpoint of hypotenuse is joined to  $M$  and produced to a point  $D$  such that  $DM = CM$ .  $D$  is joined to  $B$ . (4)

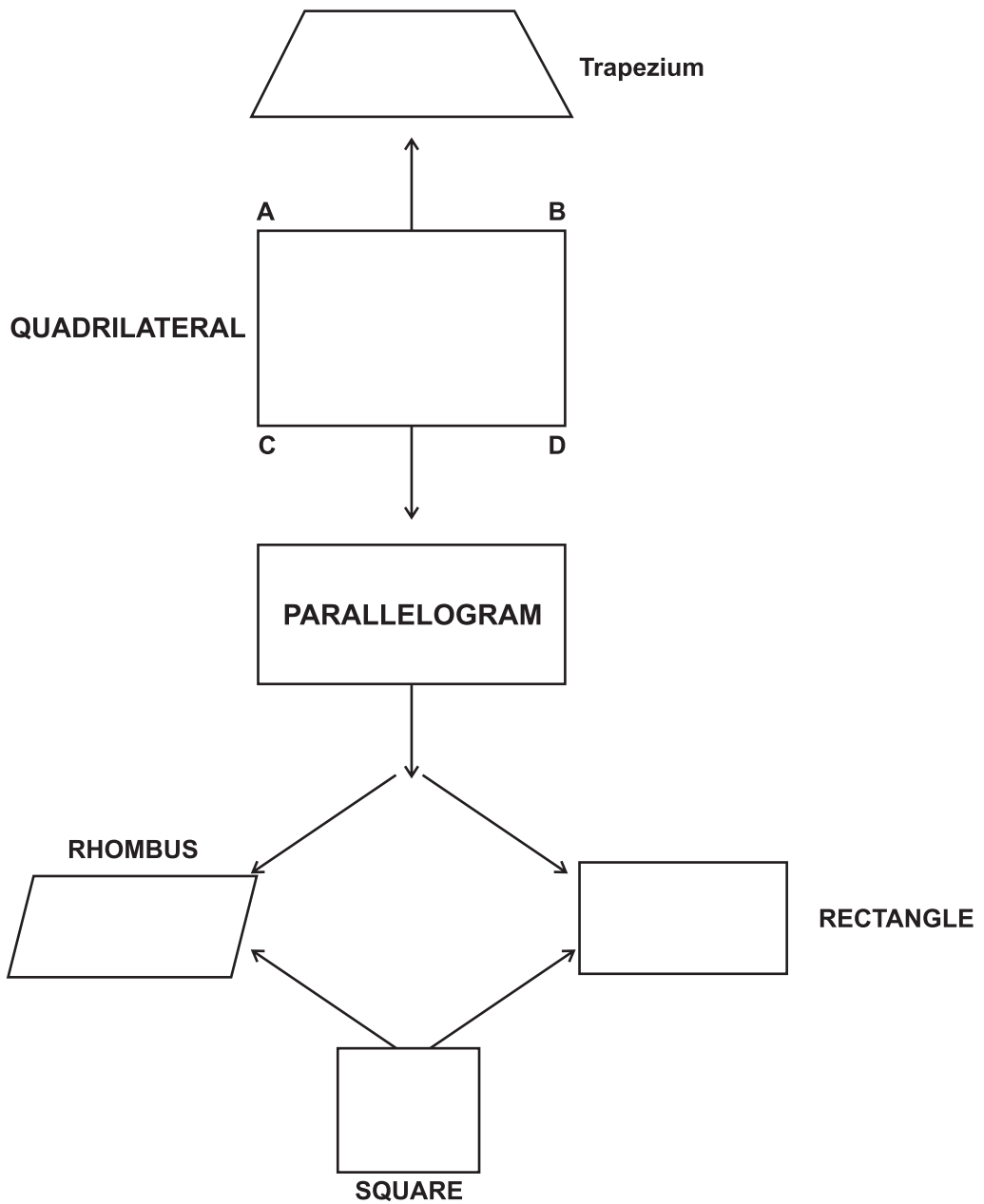


Show that  $CM = \frac{1}{2}AB$ .

CHAPTER-8  
QUADRILATERAL  
MIND MAPPING

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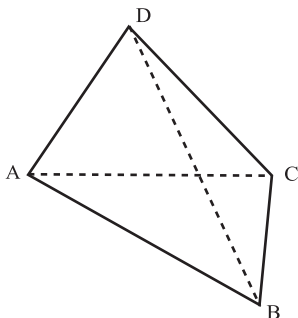


## CHAPTER-8

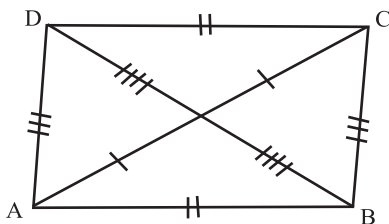
# QUARILATERAL

### KEY POINTS

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

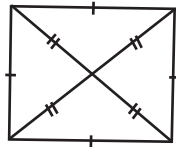


- i) Two pairs of opposite sides (no common point)  
e.g. AB & CD, BC & AD
  - ii) Two pairs of opposite angles  $\angle A$  &  $\angle C$  and  $\angle B$  &  $\angle D$ .
  - (iii) Four pairs of adjacent sides AB & BC, BC & CD, CD & AD and AD & AB (one common point)
  - (iv) Four pairs of adjacent 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  $360^\circ$ ,  $\angle A + \angle B + \angle C + \angle D = 360^\circ$ .
2. Parallelogram : A quadrilateral is a parallelogram if.

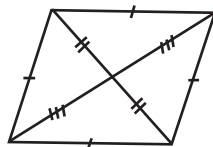


- Opposite sides are equal or
- Opposite angles are equal or
- Diagonals bisect each other or
- One pair of opposite sides is equal and parallel

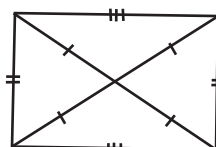
3. A diagonal of a parallelogram divides it into two congruent triangles.  
Examples of parallelogram:



Square

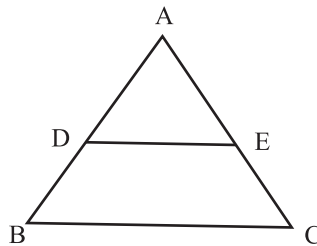


Rhombus



Rectangle

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  $DE = \frac{1}{2} BC$ .



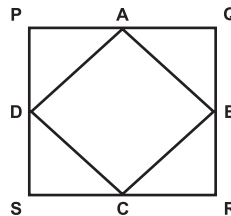
5. Converse of mid point theorem.

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

### PART-"A"

- Three angles of a quadrilateral are  $75^\circ$ ,  $90^\circ$ ,  $75^\circ$  the fourth angle is
  - $90^\circ$
  - $95^\circ$
  - $105^\circ$
  - $120^\circ$
- ABCD is a rhombus such that  $\angle ACB = 40^\circ$  the  $\angle ABD$  is
  - $40^\circ$
  - $45^\circ$
  - $50^\circ$
  - $60^\circ$
- The bisector of the angles of a parallelogram enclose a
  - Parallelogram
  - Square
  - Rhombus
  - Rectangle
- The figure obtained by joining the midpoints of the sides of quadrilateral taken in order is a
  - Square
  - Parallelogram
  - Rectangle
  - Rhombus

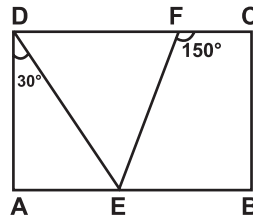
5. The diagonals  $AC$  and  $BD$  of a parallelogram  $ABCD$  intersect each other at point "O" If  $\angle DAC = 32^\circ$  And  $\angle AOB = 70^\circ$  then  $\angle DBC$  is equal to :
- a)  $24^\circ$     b)  $86^\circ$   
 c)  $38^\circ$     d)  $32^\circ$
6. The angles of a quadrilateral are in the ratio 3 : 4 : 5 : 6. The respective angles of the quadrilateral are
- a)  $60^\circ, 80^\circ, 100^\circ, 120^\circ$   
 b)  $120^\circ, 100^\circ, 80^\circ, 60^\circ$   
 c)  $120^\circ, 60^\circ, 80^\circ, 100^\circ$   
 d)  $80^\circ, 120^\circ, 100^\circ, 60^\circ$
7. Line segment joining the mid points of two sides of a triangle is parallel to the third side and \_\_\_\_\_ of it.
- a) Trisect    b) Bisect  
 c) Half    d) One Fourth
8. If two consecutive sides of a rhombus are represented by  $3x - 6$  and  $x + 14$  then the perimeter of the rhombus is
- a) 10    b) 24  
 c) 70    d) 96
9. Points A, B, C and D are midpoints of the sides of square PQRS. If the area of PQRS is 36 Sqcm, the area of ABCD is ..... Sqcm
- a)  $9\sqrt{2}$     b)  $18\sqrt{2}$   
 c) 9    d) 18



10. The perimeter of a rhombus is 60cm. If the length of its longer diagonal measures 24cm, the length of the shorter diagonal is ..... cm.
- a) 20    b) 18  
 c) 15    d) 9
11. Which statement is true about all parallelogram
- a) The diagonals are congruent.  
 b) The area is the product of two adjacent sides  
 c) The opposite angles are congruent  
 d) The diagonals are perpendicular to each other.

12. In the given figure  $ABCD$  is a rectangle  $m \angle ADE = 30^\circ$  and  $m \angle CFE = 150^\circ$ . What is  $m \angle DEF$

- a)  $90^\circ$                       b)  $75^\circ$   
 c)  $110^\circ$                       d)  $85^\circ$



13. Given four points  $A, B, C, D$  such that three points  $ABC$  are collinear. By joining these points in order to get a closed figure, we get.

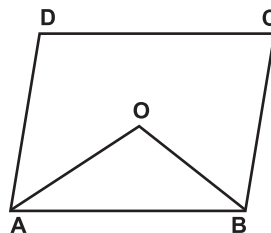
- a) A Straight Line              b) A Triangle  
 c) A quadrilateral              d) None of these

14. Consecutive angles of parallelogram are

- a) Equal                          b) Complimentary  
 c) Supplementary              d) None of these

15. In parallelogram  $ABCD$ , bisectors of angles  $A$  and  $B$  intersect each other at "O" the value of angle  $AOB$  is.

- a)  $90^\circ$                           b)  $30^\circ$   
 c)  $60^\circ$                           d)  $120^\circ$



16. If an angle of a parallelogram is two-third of its adjacent angle the smallest angle of the parallelogram is

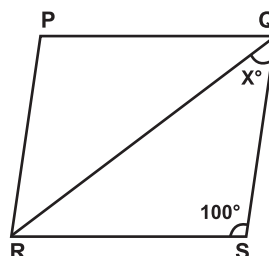
- a)  $108^\circ$                       b)  $54^\circ$   
 c)  $81^\circ$                           d)  $72^\circ$

17. A parallelogram must be a rectangle if its diagonals

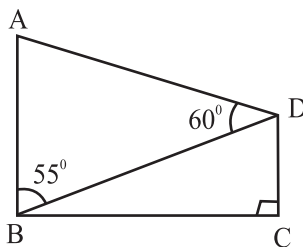
- a) Bisect each other  
 b) Are congruent  
 c) Are Perpendicular to each other  
 d) None of these

18. In the given figure  $PQRS$  is a rhombus, then the value of  $x$  is

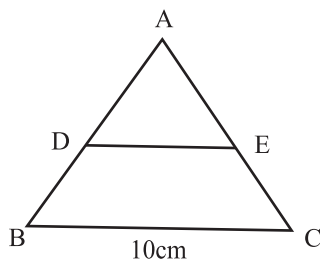
- a)  $40^\circ$                           b)  $50^\circ$   
 c)  $60^\circ$                           d)  $80^\circ$



19. If in a rectangle ABCD, diagonal AC bisect  $\angle A$  as well as  $\angle C$  then ABCD is a
- a) Parallelogram      b) Square  
c) Rhombus            d) Trapezium
20. Two adjacent angles in a parallelogram are in the ratio 2 : 4. The values of angles are
- a)  $80^\circ, 100^\circ$       b)  $40^\circ, 140^\circ$   
c)  $60^\circ, 120^\circ$       d)  $70^\circ, 140^\circ$
21. Which of the following statements are True (T) and which are false (F)?
- a) In a parallelogram, the diagonals are equal ( )  
b) In all the angles of a quadrilateral are equal it is a parallelogram ( )  
c) The diagonals of parallelogram bisect each other ( )  
d) The diagonals of rhombus are equal ( )  
e) All the angles of parallelogram are acute angles ( )  
f) In a trapezium both pair of opposite sides are parallel ( )
22. In a rhombus ABCD, if  $\angle A = 60^\circ$  find  $\angle B, \angle C$  &  $\angle D$ .
23. The angles of a quadrilateral are in the ratio 1:2:4:5. Find the measure of each angle.
24. If in a rhombus LMNP,  $\angle LNM = 40^\circ$  then what is the measure of  $\angle LPM$ ?
25. In a parallelogram if all the four angles are in the ratio 1:1:1:1 then, what type of parallelogram is this?
26. In the figure,  $AB \parallel CD$ , what will be the measure of  $\angle ADC$ ?

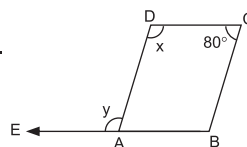


27. In the figure, if D & E are respectively the mid points of AB & AC, what will be the length of ED?

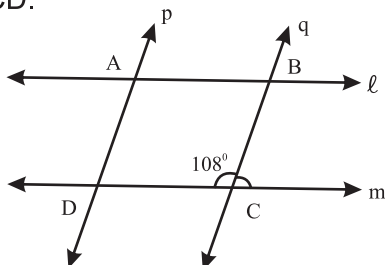


28. PQRS is a rhombus with  $\angle QPS = 50^\circ$ . Find  $\angle RQS$ .

29. In the figure, ABCD is a parallelogram find value of  $(x + y)$ .



30. In the figure line  $\ell \parallel m$  and  $p \parallel q$ ,  $\angle BCD = 108^\circ$  find all four angles of quadrilateral ABCD.



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

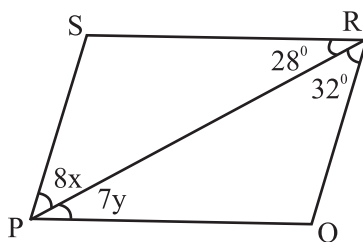
### Part – B

32. Prove that the sum of all the four angles of a quadrilateral is 360:

33. Show that opposite angles of a parallelogram are equal.

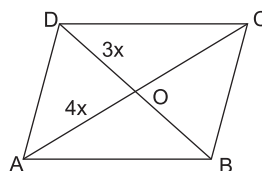
34. In a parallelogram ABCD  $\angle B = 110^\circ$  determine the measure of  $\angle A$  and  $\angle D$ .

35. In the figure if PQRS is a parallelogram, then find the value of  $x$  &  $y$ .



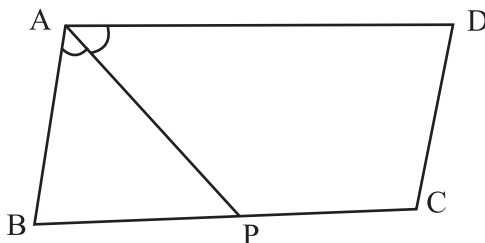
36. The diagonals of a parallelogram ABCD intersect at O. A line through O intersects AB at X & DC at Y. Prove that  $OX = OY$ .

37. 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.
38. Two opposite angles of a parallelogram are  $(5x-3)$  and  $(4x+12)$ . Find the measure of each angle of the parallelogram.
39. Diagonals of a quadrilateral ABCD bisect each other if  $\angle A=35^\circ$  determine  $\angle B$ .
40. The perimeter of a parallelogram is 30cm. If longer side is 9.5 cm then find the length of shorter side.
41. 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.
42. ABCD is a rhombus in which  $DO = 3x$  &  $AO = 4x$ , find perimeter of quadrilateral ABCD.
43. The angles of a quadrilateral are  $(x+20)$ ,  $(x-20)$ ,  $(2x+5)$ ,  $(2x-5)$ . Find the value of x.

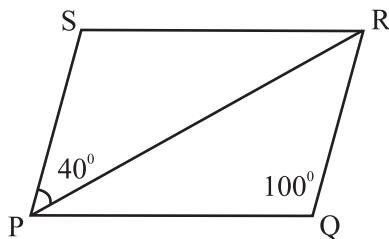


**Part – C**

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

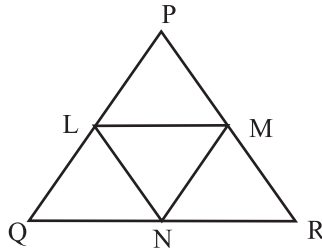


45. In the adjoining figure if PQRS is a parallelogram where  $\angle PQR = 100$  and  $\angle SPR = 40$ . Find  $\angle PRQ$  and  $\angle SRQ$ .

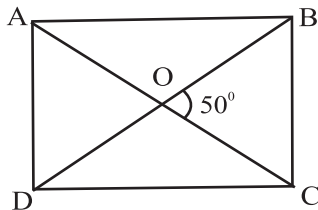


46. Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side.

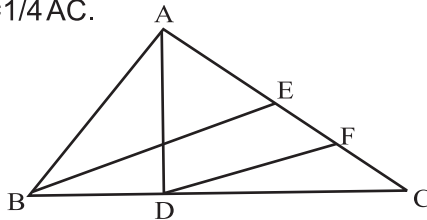
47. In the given figure L, M, and N are mid point of the sides PQ, PR and QR respectively of  $\triangle PQR$ . If  $PQ = 4.4\text{cm}$ ,  $QR = 5.6\text{ cm}$  and  $PR = 4.8\text{cm}$  then find the perimeter of  $\triangle LMN$ .



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



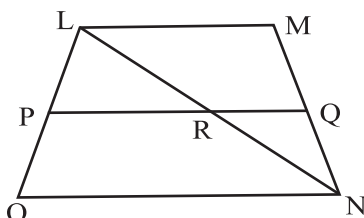
53. In the given figure AD and BE are the medians of  $\triangle ABC$  and  $BE \parallel DF$  prove that  $CF = \frac{1}{4} AC$ .



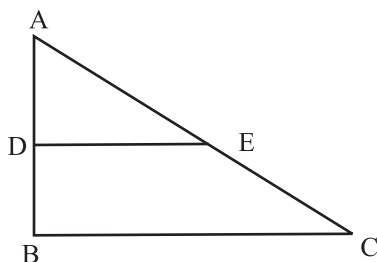


### Part – D

54. 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  $PQ = \frac{1}{2}(LM + ON)$ .



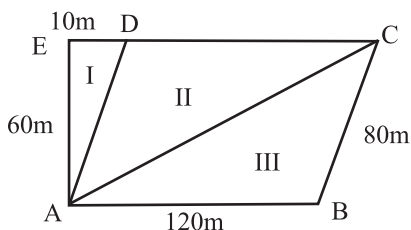
55. In the figure,  $\triangle ABC$  is right angled at B. If  $AB=9$  cm  $AC = 15$  cm. and D and E are the mid points of AB & AC respectively calculate.
- The length of BC
  - The area of trapezium BCED



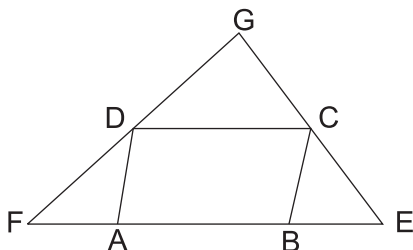
56. A farmer has divided his field into three parts as in the figure. Ist part is used to take care of his cattles. While II and III are used to grow two different crops.

Answer the following :-

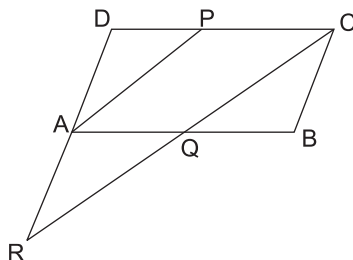
- How much area has been used to take care for cattles ?
- Are the two areas part II and part III equal? Justify.
- What is the total area of the field ?



57. 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.



58. 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. d)  $120^\circ$
2. c)  $50^\circ$
3. a) Parallelogram
4. b) Parallelogram
5. c)  $38^\circ$
6. a)  $60^\circ, 80^\circ, 100^\circ, 120^\circ$
7. c) Half
8. d) 96
9. d) 18
10. b) 18
11. c) The opposite angles are congruent
12. a)  $90^\circ$
13. b) A Triangle
14. c) Supplementary
15. a)  $90^\circ$
16. d)  $72^\circ$
17. c) Are Perpendicular to each other
18. a)  $40^\circ$
19. c) Rhombus
20. c)  $60^\circ, 120^\circ$
21. (a)T (b)F (c)T (d) F (e) F (g) F
22.  $120^\circ, 60^\circ, 120^\circ$
23.  $30^\circ, 60^\circ, 120^\circ, 150^\circ$
24.  $100^\circ$
25. Rectangle
26.  $115^\circ$
27. 5 cm
28.  $65^\circ$
29.  $200^\circ$
30.  $108^\circ, 72^\circ, 108^\circ, 72^\circ$
31.  $100^\circ, 80^\circ, 100^\circ, 80^\circ$

32. Prove
33. Prove
34.  $70^\circ, 110^\circ$
35.  $x = y = 4$
36. Prove
37. 3.7cm, 3.1cm
38.  $72^\circ, 108^\circ, 72^\circ, 108^\circ$
39.  $145^\circ$
40. 5.5cm
41. 6.3cm, 4.7cm
42. 20x units
43.  $x = 60^\circ$
44. Prove
45.  $40^\circ - 80^\circ$
46. Prove
47. 7.4cm
48. Prove
49. Prove
50. Prove
51. Prove
52.  $65^\circ$
53. Prove
54. Prove
55. 12cm,  $40.5\text{cm}^2$
56. (i)  $300\text{m}^2$   
(ii) Yes  
(iii)  $7500\text{m}^2$
57. Prove
58. Prove

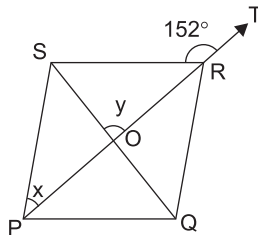
## PRACTICE TEST

Time : 50 Min.

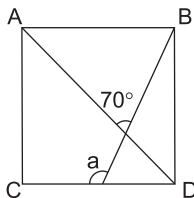
### Quadrilaterals

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 AND TRIANGLES

MIND-MAPPING

Same Base CD and Parallel Lines AQ || CD

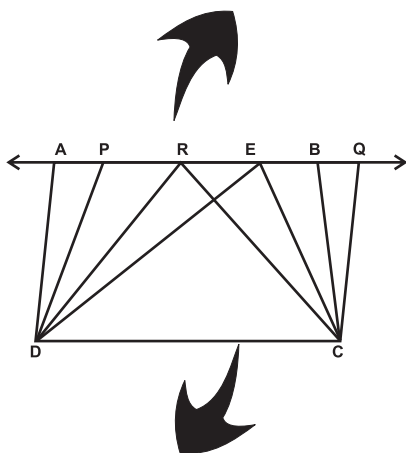
Parallelograms : ABCD and PQCD

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

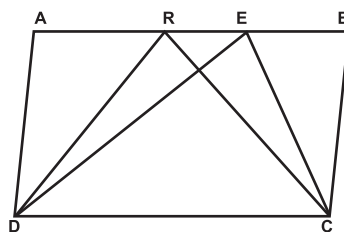
Triangles on Same Base :  $\Delta \text{RDC}$  and  $\Delta \text{EDC}$

$$\text{ar}(\Delta \text{RDC}) = \text{ar}(\Delta \text{EDC})$$

$$\therefore \text{ar}(\Delta \text{RDC}) = \frac{1}{2} \text{ar}(\text{ABCD}) = \frac{1}{2} \text{ar}(\text{PQCD}) = \text{ar}(\Delta \text{EDC})$$



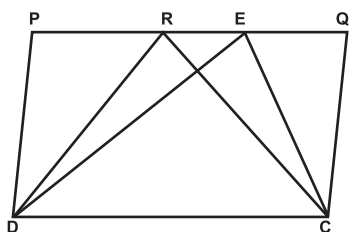
Same Base CD and Parallel Lines AB || CD



Triangles on Same Base =  $\Delta \text{RDC}$  and  $\Delta \text{EDC}$

$$\text{ar}(\Delta \text{RDC}) = \text{ar}(\Delta \text{EDC})$$

$$\text{Also ar}(\Delta \text{RDC}) = \frac{1}{2} \text{ar}(\text{ABCD}) = \text{ar}(\Delta \text{EDC})$$



Same Base CD and Same Parallel Lines PQ || DC

Triangles on same base =  $\Delta \text{RDC}$  and  $\Delta \text{EDC}$

$$\text{ar}(\Delta \text{RDC}) = \text{ar}(\Delta \text{EDC})$$

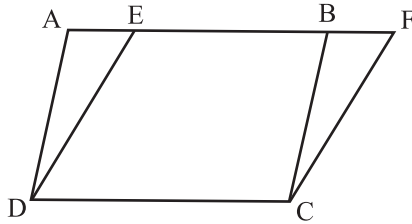
$$\text{Also ar}(\Delta \text{RDC}) = \frac{1}{2} \text{ar}(\text{PQCD}) = \text{ar}(\Delta \text{EDC})$$

### KEY POINTS

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

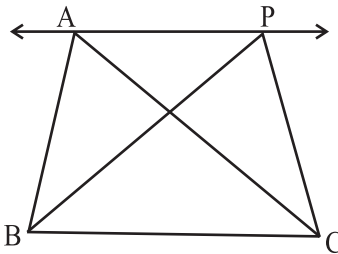
Two parallelograms ABCD and EFCD on the same base DC and between same parallels AF and DC

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



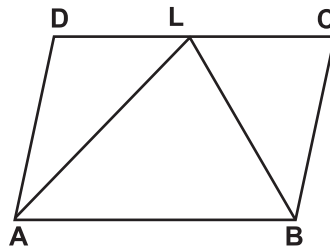
2. Two triangles on the same base and between the same parallels are equal in area.

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



4. If a triangle and a parallelogram are on the same base and between the same parallels then the area of the triangle is half of the area of parallelogram.

$$\text{ar}(\triangle LAB) = \frac{1}{2} \text{ar}(\text{ABCD})$$



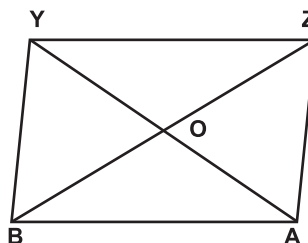
5. The median of a triangle divides it into two triangles of equal area.

## PART – A

1. Which of the following figures don't have equal areas if both the figures are on same base and between same parallels ?
  - a) Two parallelograms
  - b) One parallelograms and one rectangle
  - c) Two Triangles
  - d) One parallelogram and one triangle
2. Which statement is true ?
  - a) Two congruent figures have always equal areas.
  - b) Two figures having equal areas are always congruent.
  - c) A triangle and a quadrilateral can be congruent.
  - d) Two congruent figures have only some of its parts equal.
3.  $\triangle DEF$  is divided into two triangles  $\triangle DEM$  and  $\triangle DFM$  of equal areas. Which of the following statement is true ?
  - a)  $\triangle DEM$  and  $\triangle DFM$  have equal bases.
  - b)  $\text{ar}(\triangle DEM) = \frac{1}{3} \text{ar}(\triangle DEF)$
  - c) M is the mid - point of side EF.
  - d)  $\triangle DEM$  and  $\triangle DFM$  and congruent.
4. The ratio of the areas of the triangle and a parallel between same parallels and on the same base is :
 

a) 1 : 2	b) 4 : 1
c) 2 : 1	d) 1 : 4
5. The area of a parallelogram  $PQRS$  is  $36 \text{ cm}^2$ . M is any point on the side RS. The area of  $\triangle PMQ$  is.
 

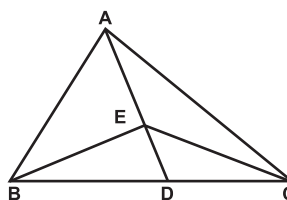
a) $18 \text{ cm}^2$	b) $9 \text{ cm}^2$
c) $36 \text{ cm}^2$	d) $12 \text{ cm}^2$
6. AY and BZ are the diagonals of a parallelogram ABYZ, intersecting at O.  $\text{ar}(\triangle BYZ) = ?$ 
  - a) greater than  $\text{ar}(\triangle ABZ)$
  - b) is equal to  $\text{ar}(\triangle BOA + \triangle BOY)$
  - c) more than  $\text{ar}(\triangle BOA + \triangle BOY)$
  - d) less than  $\text{ar}(\triangle BOA + \triangle BOY)$
7. AD is the median of  $\triangle ABC$  and E is any point on AD. Which of the





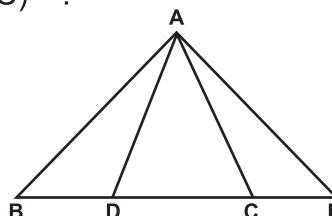
following statement is true ?

- a)  $\text{ar}(\triangle ABD) > \text{ar}(\triangle ACD)$
- b)  $\text{ar}(\triangle ABD) < \text{ar}(\triangle ACD)$
- c)  $\text{ar}(\triangle ABE) = \text{ar}(\triangle CED)$
- d)  $\text{ar}(\triangle ABE) = \text{ar}(\triangle ACE)$



8. In the given figure  $\text{ar}(\triangle ABC) = \text{ar}(\triangle ADE)$ . AC is the median of  $\triangle ADE$ . If  $\text{ar}(\triangle ACE) = 14 \text{ cm}^2$  then  $\text{ar}(\triangle ABC) = ?$

- a)  $14 \text{ cm}^2$
- b)  $7 \text{ cm}^2$
- c)  $21 \text{ cm}^2$
- d)  $28 \text{ cm}^2$

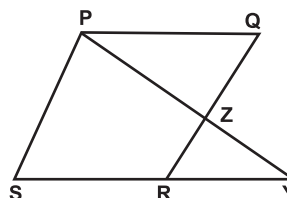


9. In the given figure  $\text{ar}(\triangle DEF) = 40 \text{ cm}^2$ , then  $\text{ar}(\triangle HDG) + \text{ar}(\triangle HEF) = ?$

- a)  $10 \text{ cm}^2$
- b)  $20 \text{ cm}^2$
- c)  $30 \text{ cm}^2$
- d)  $40 \text{ cm}^2$

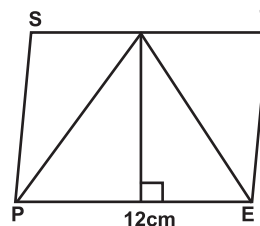
10. In the given figure PQRS is a parallelogram. Which of the following statements is true

- a)  $QZ = RZ$
- b)  $\text{ar}(\triangle PYZ) = \text{ar}(\triangle PQR)$
- c)  $\text{ar}(\triangle PQZ) = \frac{1}{2} \text{ar}(\triangle PQR)$
- d)  $\angle PQZ = \angle YRZ$



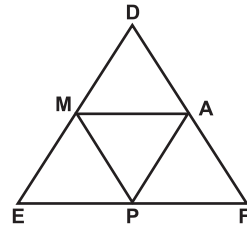
11. STEP is a parallelogram and  $\text{ar}(\triangle STEP) = 84 \text{ cm}^2$ . The length of the altitude of  $\triangle APE$  is

- a)  $\frac{7}{4} \text{ cm}$
- b)  $\frac{7}{2} \text{ cm}$
- c)  $7 \text{ cm}$
- d)  $14 \text{ cm}$



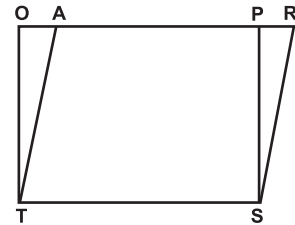
12. M, A and P are the mid-points of the sides DE, DF and EF of  $\triangle DEF$  respectively. Which of the following statements is true ?

- a)  $\text{ar}(\triangle MPF) = 2 \text{ar}(\triangle DEF)$
- b)  $\text{ar}(\triangle MPA) = \frac{1}{2} \text{ar}(\triangle DEF)$
- c)  $\text{ar}(\triangle AMP) = \frac{1}{4} \text{ar}(\triangle DEF)$
- d)  $\text{ar}(\triangle MPA) = \frac{1}{2} \text{ar}(\triangle DEF)$



13. STOP is a rectangle STAR is a parallelogram in the given figure. Which of the following statement is true ?

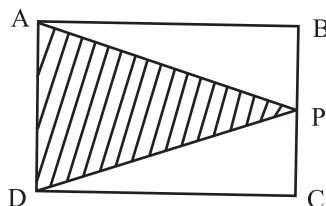
- a) Perimeter (STAR) > Perimeter (STOP)
- b) Perimeter (STAR) < Perimeter (STOP)
- c) Perimeter (STAR) = Perimeter (STOP)
- d) Perimeter (STAR) =  $\frac{1}{2}$  Perimeter (STOP)



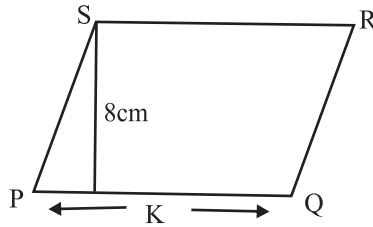
Fill in blanks :

- 14. The area of a parallelogram is the product of any of its sides and its corresponding \_\_\_\_\_
- 15. The area of parallelogram on the same base and between the same \_\_\_\_\_ are equal.
- 16. The diagonal of a parallelogram divides it into triangles having equal \_\_\_\_\_.
- 17. Area of trapezium =  $\frac{1}{2}$  x height x \_\_\_\_\_  
State True or False :
- 18. The median of a triangle divides it into two triangles of equal area.
- 19. The diagonals of a parallelogram are equal.
- 20. If both the diagonals of a quadrilateral divides it into four triangles of equal area, then the quadrilateral is a rhombus.
- 21.

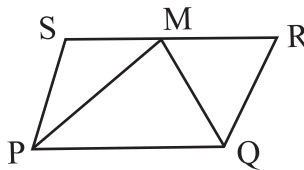
If area of Parallelogram ABCD is  $80 \text{ cm}^2$ . Find the area of  $\triangle APD$ .



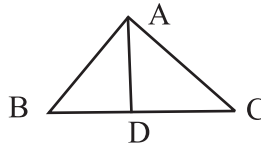
22. If area of Parallelogram PQRS is  $88 \text{ cm}^2$  find K.



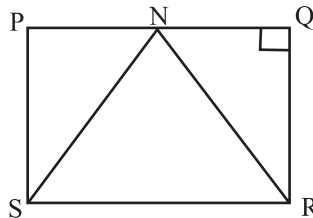
23. PQRS is a Parallelogram and PQM is a triangle. If area of  $PQM = 18 \text{ cm}^2$ . Find the area of PQRS.



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



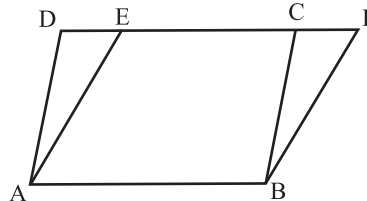
25. In the given figure area of  $\triangle SRN = 21 \text{ cm}^2$   $RQ = 6 \text{ cm}$  find PQ.



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

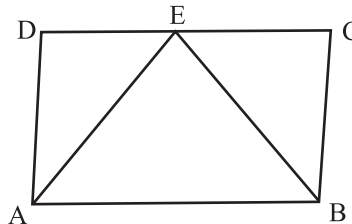
If  $\text{ar} (ABCE) = 18 \text{ cm}^2$

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



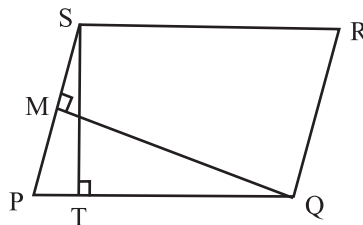
27. If two parallelogram are on equal base and between the same parallels, then what is the ratio of their areas?

28. 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  $\triangle ABC$ .
29. If the base of a parallelogram is 8 cm and its altitude is 5 cm then find its area.
30. If two triangles are on the same base and between the same parallels. Then find the ratio of area of the two triangles.
31. In given figure. If area of parallelogram ABCD is  $30 \text{ cm}^2$  then find  $\text{ar}(\triangle ADE) + \text{ar}(\triangle BCE)$

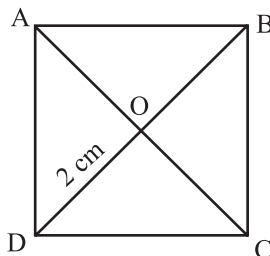


**Part – B**

32. Show that the median of a triangle divides it into two triangles of equal areas.
33. P and Q are any two points lying on the side DC and AD respectively of a parallelogram ABCD. Show that  $\text{ar}(\triangle APB) = \text{ar}(\triangle BQC)$ .
34. If the ratio of altitude and area of the parallelogram is 2:11 then find the length of the base of parallelogram.
35. 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.

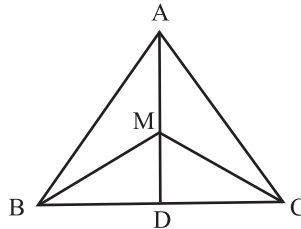


36. In given fig. ABCD is a square whose diagonals are intersecting at O. If  $OD = 2 \text{ cm}$  then find the length of AB.



37. Show that the diagonals of a parallelogram divides it into four triangles of equal area.

38. M is any point on the median AD of  $\triangle ABC$ . Show that  $\text{ar}(\triangle MB) = \text{ar}(\triangle MC)$ .



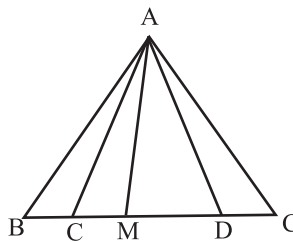
39. If D, E and F are respectively the mid points of sides BC, CA, and AB of  $\triangle ABC$  show that.

i) BDEF is a parallelogram.

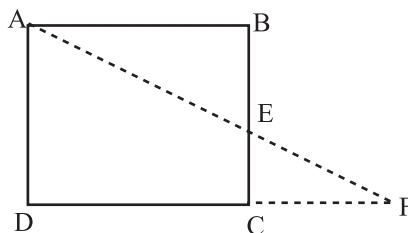
ii)  $\text{ar}(\triangle DEF) = \frac{1}{4} \text{ar}(\triangle ABC)$

40. In the given figure  $BC = CD = DE$

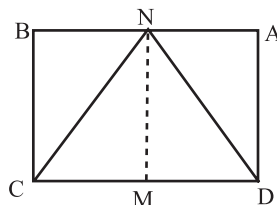
M is the mid point of CD then find the area of  $\triangle AMC$ .



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



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

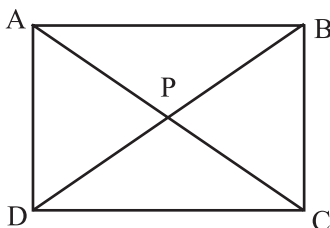


## Part-C

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

(i)  $\text{ar}(\text{APB}) + \text{ar}(\text{PCD}) = \frac{1}{2} \text{ar}(\text{ABCD})$

(ii)  $\text{ar}(\text{APD}) + \text{ar}(\text{PBC}) = \text{ar}(\text{APB}) + \text{ar}(\text{PCD})$



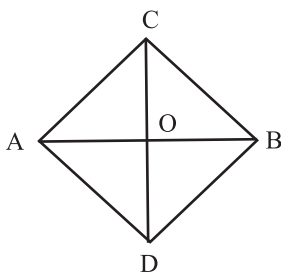
44. ABCD is a trapezium in which the  $AB \parallel DC$ . If diagonal AC and BD intersect at O. Prove that  $\text{ar}(\text{AOD}) = \text{ar}(\text{BOC})$ .

45. 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  $\text{ar}(\triangle POA) = \text{ar}(\triangle QOC)$ .

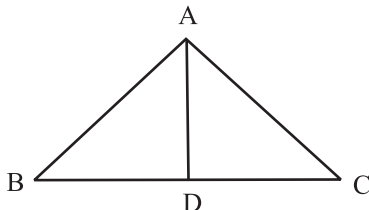
46. Diagonal PR and QS of quadrilateral PQRS intersect at T such that  $PT = TR$  and  $PS = QR$ , show that

$\text{ar}(\triangle PTS) = \text{ar}(\triangle RTQ)$ .

47. In the figure, ABC and ABD are two triangles on the same base AB. If line segment CD bisects AB at O show that  $\text{ar}(\triangle ABC) = \text{ar}(\triangle ABD)$ .

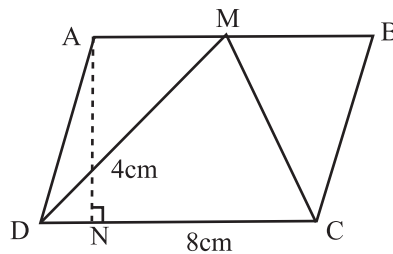


48. In given figure AD is median of  $\triangle ABC$ . Prove that  $\text{ar}(\triangle ABD) = \text{ar}(\triangle ACD)$ .



### Part – D

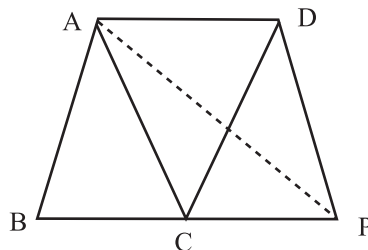
49. Prove that parallelogram on the same base and between same parallels are equal in area.
50. Prove that the two triangles on the same base and between the same parallels are equal in area.
51. If a triangle and parallelogram are on the same base and between the same parallels then prove that the area of triangle is equal to the half the area of parallelogram. Using this find ar ( $\triangle CMD$ ).



52. 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  $\text{ar}(\triangle ABE) = \text{ar}(\triangle ACF)$ .
53. If E, F, G and H are respectively the mid points of the sides of a parallelogram ABCD. Show that  $\text{ar}(\triangle EFGH) = \frac{1}{2} \text{ar}(\triangle ABCD)$ .
54. 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.

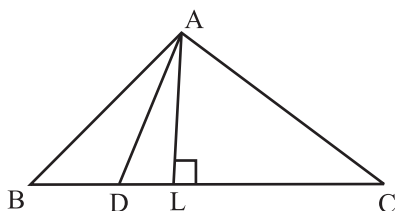
Later he decided to construct playground of shape  $\triangle ABP$  for children. If  $AC \parallel DP$  then

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

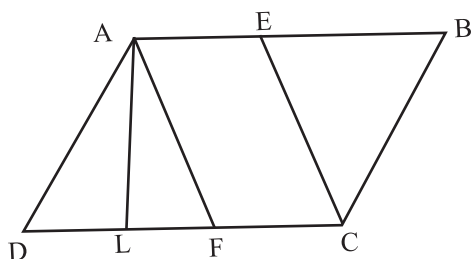


55. A farmer has a square plot of land where he wants to grow five different crops at a time. On half of the area in the middle he want to grow different crops.

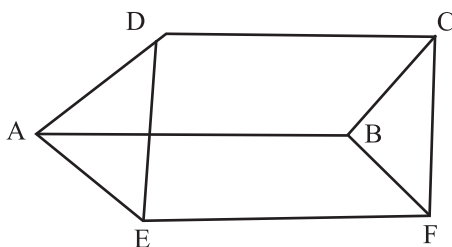
- a) Explain by diagram how he can divide the area to fulfill his purpose.
- b) For same base and between the same parallels write the relation between area of triangle and parallelogram formed.
56. In the adjoining figure, the point D divides the side BC of  $\triangle ABC$  in the ratio  $m:n$ . Prove that  $\text{ar}(\triangle ABD) : \text{ar}(\triangle ADC) = m : n$ .



57. 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.

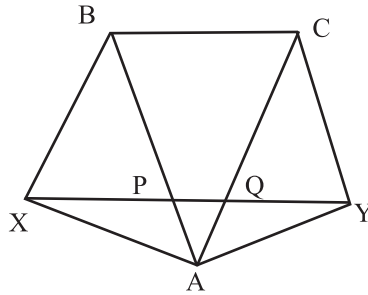


58. In the adjoining figure, two parallelogram ABCD and AEFB are drawn on opposite sides of AB. Prove that
- $$\text{ar}(\square ABCD) + \text{ar}(\square AEFB) = \text{ar}(\square EFCD)$$

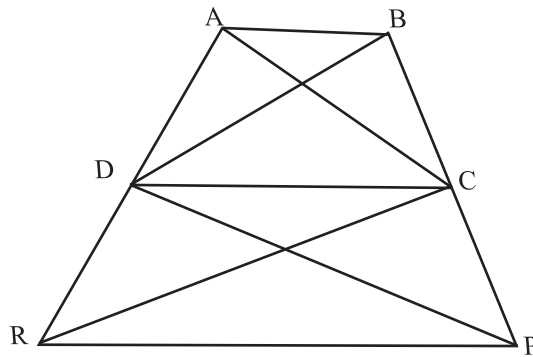




59. In the given figure  $BC \parallel XY$ ,  $BX \parallel CA$  and  $AB \parallel YC$ . Prove that  $\text{ar}(\triangle ABX) = \text{ar}(\triangle ACY)$



60. 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. d) One parallelogram and one triangle
2. a) Two congruent figures have always equal areas.
3. c) M is the mid - point of side EF.
4. a) 1 : 2
5. a)  $18 \text{ cm}^2$
6. b) is equal to ar ( $\Delta BOA + \Delta BOY$ )
7. d) ar ( $\Delta ABE$ ) = ar ( $\Delta ACE$ )
8. b)  $28 \text{ cm}^2$
9. b)  $20 \text{ cm}^2$
10. d)  $\angle PQZ = \angle YRZ$
11. c) 7 cm
12. b) ar (AMPF) =  $\frac{1}{2}$  ar ( $\Delta DEF$ )
  
13. A) Per (STAR) > Per (STOP)
14. altitude
15. parallels
16. areas
17. distance between the parallels
18. True
19. False
20. False
21.  $40 \text{ cm}^2$
22. 11 cm
23.  $36 \text{ cm}^2$
24.  $50 \text{ cm}^2$
25. 7 cm

- 26.  $7 \text{ cm}^2$
- 27.  $1 : 1$
- 28.  $1 : 4$
- 29.  $40 \text{ cm}^2$
- 30.  $1 : 1$
- 31.  $15 \text{ cm}^2$
- 34.  $\frac{11}{2}$  units
- 35.  $18 \text{ cm}$
- 36.  $\sqrt{8} \text{ cm}$
- 39.  $\frac{1}{6} \triangle ABC$
- 42.  $10 \text{ cm}^2$
- 51.  $16 \text{ cm}^2$
- 54.  $\text{ar}(\text{ADPC}) = 2 \times \text{ar}(\triangle ACD)$
- 55. Area of triangle =  
 $\frac{1}{2} \times \text{area of parallelogram}$

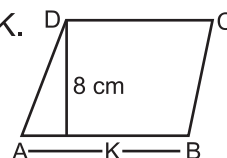
## PRACTICE TEST

# AREAS OF PARALLELOGRAMS & TRIANGLES

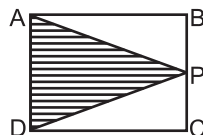
Time : 50 Min.

M.M. 20

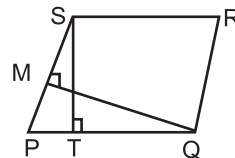
1. If area of parallelogram ABCD is  $96 \text{ cm}^2$ , find K.



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

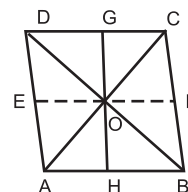


3. Show that the median of a triangle divides it into two triangles of equal area.
4. In figure if PQRS is a parallelogram in which  $PQ = 12 \text{ cm}$ ,  $ST = 9 \text{ cm}$ ,  $QM = 6 \text{ cm}$ ,  $ST \perp PQ$ ,  $QM \perp SP$ , then find length of SP.

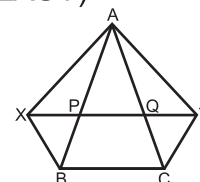


5. The base BC of  $\triangle ABC$  is divided at D. Such that  $BD = \frac{1}{2} DC$ . Prove that  $\text{ar}(\triangle ABD) = \frac{1}{3} \text{ar}(\triangle ABC)$

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

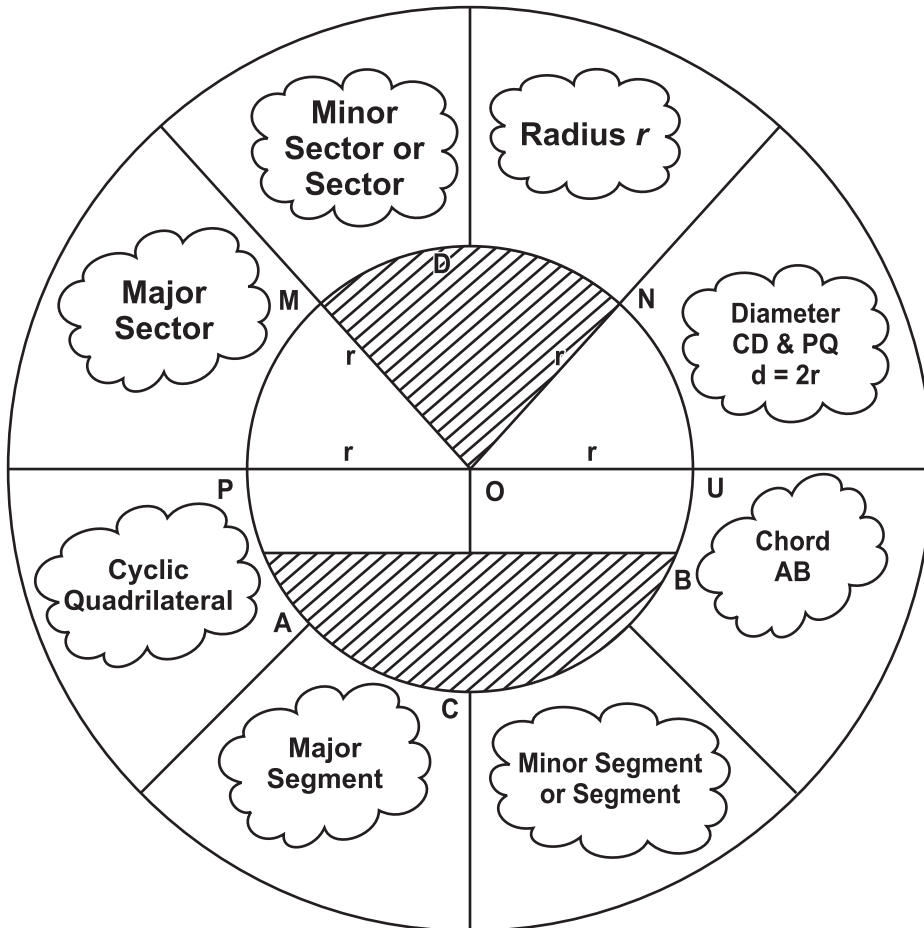


7. In the adjoining figure, PQ is a line parallel to the side BC to  $\triangle ABC$ . If  $BX \parallel CA$  and  $Cy \parallel BA$  meet the line PQ produced in X and Y respectively. Show that  $\text{ar}(\triangle ABX) = \text{ar}(\triangle ACY)$



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

**CHAPTER-10**  
**CIRCLES**  
**MIND MAPPING**



Centre of Circle = O  
 Radius of Circle =  $OP = OQ = OM = ON = r$   
 Diameter of Circle =  $PQ = d = 2r$   
 Chord of Circle = AB  
 Sector of Circle =  $MON =$  Region  
 = between two radii and Corresponding arc

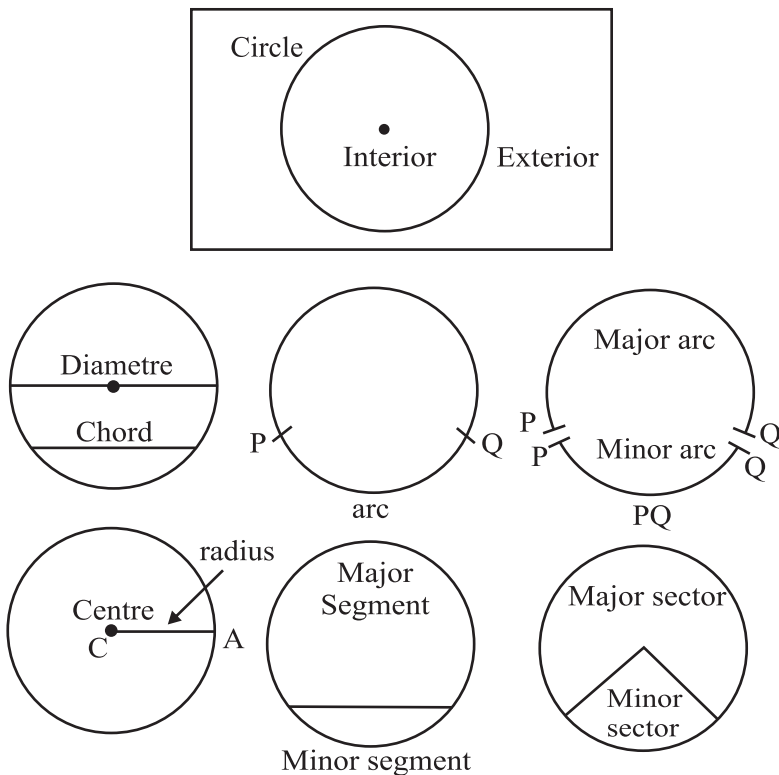
Segment = ACB  
 Region between  
 Chord and Corresponding  
 Cyclic Quadrilateral :-  
 If the sum of pair of opposite angles  
 of quadrilateral is  $180^\circ = \square PABQ$

# CHAPTER-10 CIRCLES

## KEY POINTS

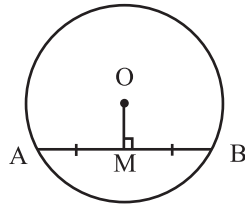
- The collection of those points in a plane which are at a fixed distance from a given fixed point is called a circle. The fixed point is called centre of the circle and the fixed distance is called radius.

Circle and related Terms !

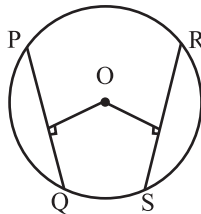


- There is one and only one circle passing through three non-collinear points.
- Equal chords of a circle subtend equal angles at centre.
- If angles subtended by chords at centre are equal then chords are equal.
- The perpendicular from centre to a chord of a circle, bisects the chord.

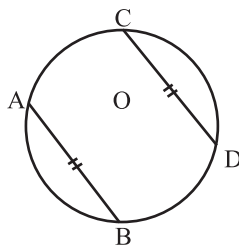
- The line joining the centre of a circle to the mid point of a chord is perpendicular to the chord.



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

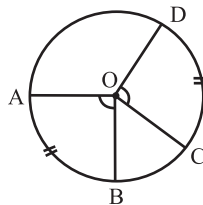


- If two chords of a circle are equal then corresponding arcs are equal.
- If arcs of a circle are equal then corresponding chords are also equal.



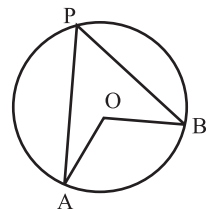
- Congruent arcs (or equal arcs) of a circle subtends equal angles at centre.

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



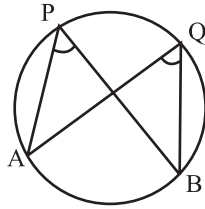
- The angle subtended by an arc at the centre of circle is twice the angle which is subtended at remaining part of the circle.

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



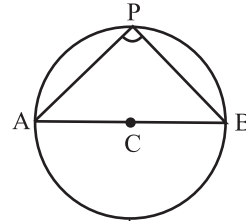
- Any two angles in the same segment of the circle are equal.

$$\Rightarrow \boxed{\angle APB = \angle AQB}$$



- Angle in semi circle is right angle.

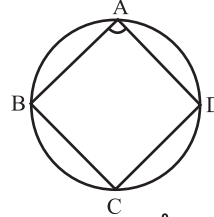
$$\Rightarrow \boxed{\angle APB = 90^\circ}$$



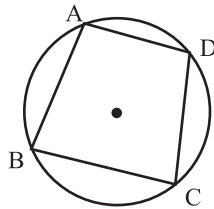
- In a cyclic quadrilateral the sum of opposite angles is  $180^\circ$ .

$$\Rightarrow \boxed{\angle A + \angle C = 180^\circ}$$

$$\Rightarrow \boxed{\angle B + \angle D = 180^\circ}$$



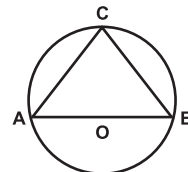
- If sum of opposite angles of a quadrilateral is  $180^\circ$  then that quadrilateral is cyclic quadrilateral.



### PART – A

- In fig. AOB is a diameter of the circle and  $AC = BC$  the  $\angle CAB$  is equal to:

- |               |               |
|---------------|---------------|
| a) $30^\circ$ | b) $45^\circ$ |
| c) $60^\circ$ | d) $90^\circ$ |

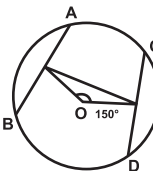


- In fig. AB and CD are two equal chords of a circle with centre O. OP and OQ are perpendiculars on chords AB and CD respectively. If  $\angle POQ = 150^\circ$  then  $\angle APQ$  is equal to

- |               |               |
|---------------|---------------|
| a) $30^\circ$ | b) $75^\circ$ |
| c) $15^\circ$ | d) $60^\circ$ |

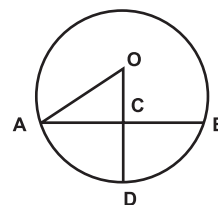


3. Angles in the same segment of a circle are
- a) Equal                                      b) Complementary  
 c) Supplementary                          d) Vertically Opposite Angles

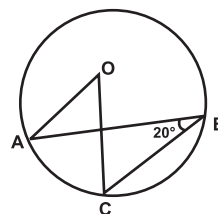


4. In fig, if  $OA = 5\text{cm}$ ,  $AB=8\text{cm}$  and  $OD$  is perpendicular to  $AB$ . Then  $CD$  is equal to :
- a) 2 cm                                      b) 3 cm  
 c) 4 cm                                      d) 5 cm

5. The radius of a circle is 13cm and the length of one of its chords is 10cm. The distance of the chord from the centre is .
- a) 11.5 cm                                  b) 12 cm  
 c)  $\sqrt{69}$  cm                              d) 23 cm

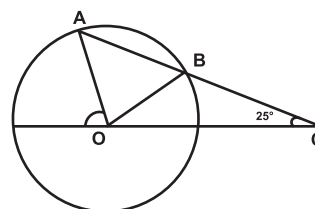


6. In fig. if  $\angle ABC = 20^\circ$ , then  $\angle AOC$  is equal to
- a)  $20^\circ$                                       b)  $40^\circ$   
 c)  $60^\circ$                                       d)  $10^\circ$



7. If  $AB = 12\text{cm}$ ,  $BC=16\text{cm}$  and  $AB$  is perpendicular to  $BC$ , then the radius of the circle passing through the point  $A$ ,  $B$  and  $C$  is :
- a) 6 cm                                      b) 8 cm  
 c) 10 cm                                      d) 12 cm

8. In the given figure,  $AB$  is 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  $\angle ACD = 25^\circ$ , then  $\angle AOD$  ?
- a)  $50^\circ$                                       b)  $75^\circ$   
 c)  $90^\circ$                                       d)  $100^\circ$

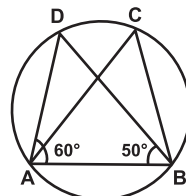


9. AD is a diameter of a circle and AB is a chord. If AD = 34 cm, AB = 30 cm the distance of AB from the center of the circle is :

- a) 17 cm                      b) 15 cm  
c) 4 cm                        d) 8 cm

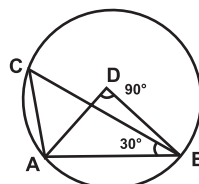
10. In the given figure;  $\angle DAB = 60^\circ$  and  $\angle ABD = 50^\circ$  then  $\angle ACB = ?$

- a)  $50^\circ$                         b)  $60^\circ$   
c)  $70^\circ$                         d)  $80^\circ$



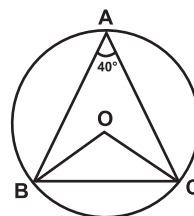
11. In fig.  $\angle AOB = 90^\circ$  and  $\angle ACB = 30^\circ$ , then  $\angle CAO$  is equal to :

- a)  $30^\circ$                         b)  $45^\circ$   
c)  $90^\circ$                         d)  $60^\circ$



12. In the given figure O is the center of a circle and  $\angle BAC = 40^\circ$ , then  $\angle OBC = ?$

- a)  $40^\circ$                         b)  $50^\circ$   
c)  $80^\circ$                         d)  $20^\circ$

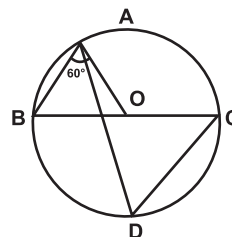


13. An equilateral triangle of side 9 cm is inscribed in a circle. The radius of the circle is :

- a) 3 cm                        b)  $3\sqrt{2}$  cm  
c)  $3\sqrt{3}$  cm                d) 6 cm

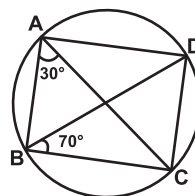
14. In fig. BC is a diameter of the circle and  $\angle BAO = 60^\circ$  Then  $\angle ADC$  is equal to :

- a)  $30^\circ$                         b)  $60^\circ$   
c)  $120^\circ$                       d)  $45^\circ$



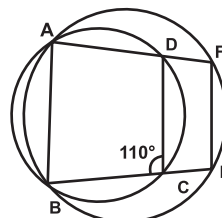
15. In the given figure , the measure of  $\angle BCD$  is

- a)  $80^\circ$                       b)  $30^\circ$   
 c)  $70^\circ$                       d)  $100^\circ$



16. In the given figure ABCD and ABEF are cyclic quadrilaterals. If  $\angle BCD = 110^\circ$  then  $\angle BEF = ?$

- a)  $110^\circ$                       b)  $55^\circ$   
 c)  $90^\circ$                       d)  $70^\circ$



17. ABCD is a cyclic quadrilateral such that AB is a diameter of the circle circumscribing it and  $\angle ADC = 140^\circ$ , then  $\angle BAC$  is equal to :

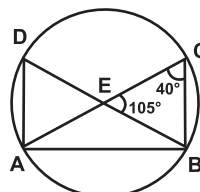
- a)  $80^\circ$                       b)  $30^\circ$   
 c)  $50^\circ$                       d)  $40^\circ$

18. The length of the chord which is at a distance of 12cm from the centre of a circle of radius 13 cm is :

- a) 5cm                      b) 10 cm  
 c) 12 cm                      d) 13 cm

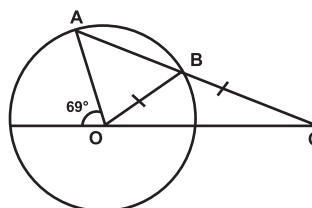
19. In the given figure,  $\angle ECB = 40^\circ$  and  $\angle CEB = 105^\circ$  Then,  $\angle EAD = ?$

- a)  $35^\circ$                       b)  $20^\circ$   
 c)  $50^\circ$                       d)  $40^\circ$



20. In the following figure,  $BC =$  radius  $OB$ . Then find the value of  $\angle OCB$ .

- a)  $69^\circ$                       b)  $46^\circ$   
 c)  $92^\circ$                       d)  $23^\circ$



Fill in the blanks :-

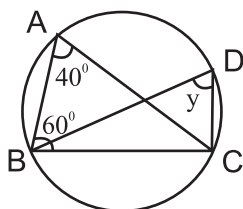
21. A segment of a circle is the region between an arc and a \_\_\_\_\_ of the circle.
22. An arc of a circle is called a \_\_\_\_\_ if the ends of the arc on the ends of a diameter.
23. Two circles having the same centre and different radii are called \_\_\_\_\_.

Write T for True and F for False "

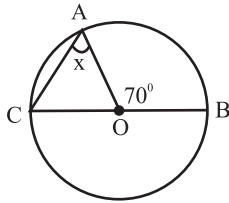
24. The degree measure of a semi circle is  $180^\circ$  (T / F)
25. A circle divides the plane into three parts. (T/F)
26. A circle can have only a finite number of equal chords . (T/F)
27. Write True or False and Justify your answer.

The angles subtended by a chord at any two points of a circle are equal.

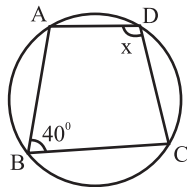
28. Through three collinear points a circle can be drawn.
29. If A, B, C and D are four points such that  $\angle BAC = 45^\circ$  and  $\angle BDC = 45^\circ$  then A, B, C, D are concyclic.
30. A circle of radius 3cm can be drawn through two points A, B such that  $AB = 6\text{cm}$ .
31. If the sum of a pair of opposite angles of a quadrilateral is  $180^\circ$ , then quadrilateral is \_\_\_\_\_.
32. A round pizza is cut into 4 equal pieces. What does each piece represent?
33. AD is a diameter of a circle and AB is a chord if  $AD = 34\text{cm}$ ,  $AB = 30\text{cm}$  then find the distance of AB from the centre of chord.
34. Given two concentric circles with centre O. A line cut the circle at A, B, C and D respectively. If  $AB = 10\text{cm}$ , then find the length of CD.
35. Find y in given figure



36. Find x



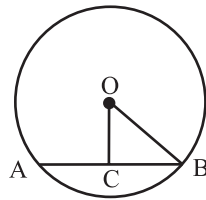
37. Find x



38. Diameter is the \_\_\_\_\_ Chord of a circle.

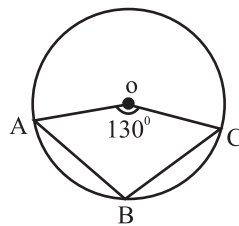
39. Circle having the same centre and different radii are called \_\_\_\_\_ circles.

40. 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.

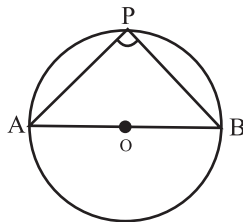


41. In given figure O is centre of circle.

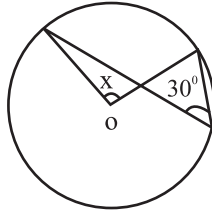
If  $\angle AOC = 130^\circ$  then find  $\angle ABC$



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

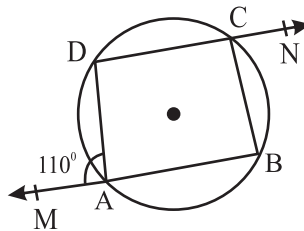


43. Find the value of  $x$  in given figure.

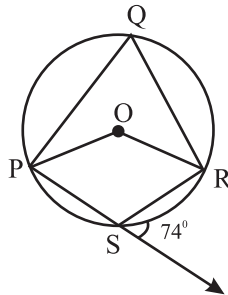


**Part – B**

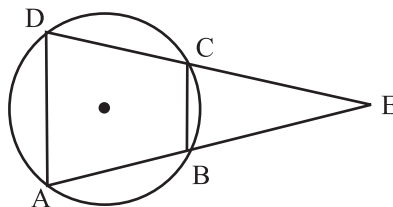
44. Prove that cyclic parallelogram is a rectangle.
45. A chord of a circle is equal to the radius of the circle. Find the angle subtended by the chord at a point on the minor arc and also at a point on the major arc.
46. In the following figure. Find the value of  $\angle BCN$ .



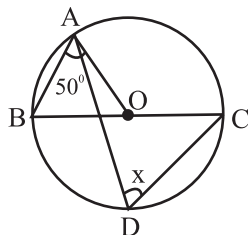
47. In the given figure. Find the value of reflex angle POR.



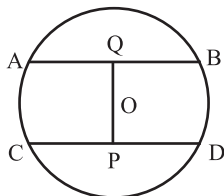
48. In given figure ABCD is a cyclic quadrilateral, chords AB and CD are produced to meet E, show that  $EA \times EB = EC \times ED$ .



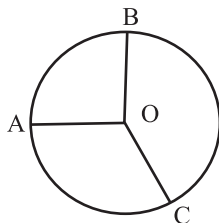
49. Find the value of  $x$  in figure if  $O$  is centre of circle and  $\angle OAB = 50^\circ$ .



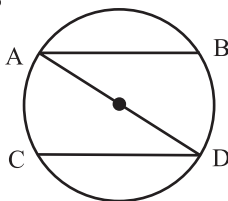
50. In the given figure,  $O$  is centre of the circle with radius 5 cm,  $OP \perp CD$ ,  $OQ \perp AB$ ,  $AB \parallel CD$ ,  $AB = 6$  cm and  $CD = 8$  cm. Determine  $PQ$ .



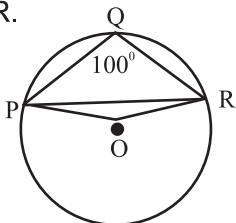
51. In the given figure,  $O$  is the centre of a circle,  $\angle AOB = 90^\circ$ ,  $\angle BOC = 120^\circ$ , what is measure of  $\angle ABC$ ?



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

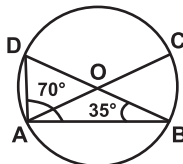


53. In given figure  $\angle PQR = 100^\circ$  where  $P, Q$  &  $R$  are points on the circle with centre  $O$ . Find  $\angle OPR$ .



### PART-B

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



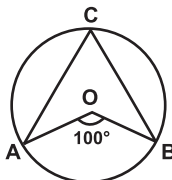
55. Match the following Columns.

Column I

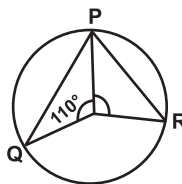
- (a) Angle in a semicircle measures

Column II

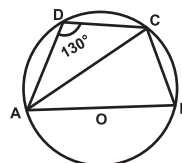
- (p)  $40^\circ$



- (b) In the given figure, O is the centre of a circle. If  $\angle AOB = 100^\circ$ , then  $\angle ACB = ?$  (q)  $80^\circ$



- (c) In the given figure, O is the centre of a circle. If  $\angle POR = 90^\circ$  and  $\angle POQ = 110^\circ$  then  $\angle QPR = ?$  (r)  $90^\circ$



- (d) In cyclic quadrilateral ABCD, it is given that  $\angle ADC = 130^\circ$  and AOB is a diameter of the circle through A, B, C and D, Then  $\angle BAC = ?$

The correct answer is

- a) \_\_\_\_\_ b) \_\_\_\_\_ c) \_\_\_\_\_ d) \_\_\_\_\_

56. MCQ based on synthesis

Three statements are given below:

- (i) If a diameter of a circle bisects each of the two chords of a circle, then the chords are parallel.

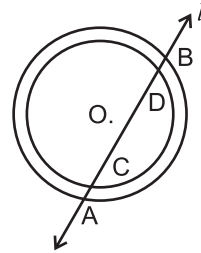


(ii) Two circles of radii 10 cm and 17 cm intersect each other and the length of the common chord is 16 cm. Then, the distance between their centres is 23 cm.

(iii) Line  $l$  intersects two concentric circles with centre  $O$  at point  $A, B, C$  and  $D$  as shown. Then  $AC = DB$

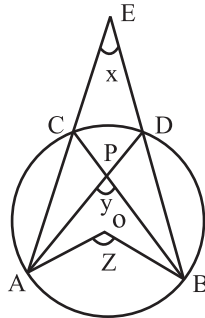
Which is true ?

- a) I and II
- b) I and III
- c) II and III
- d) II only



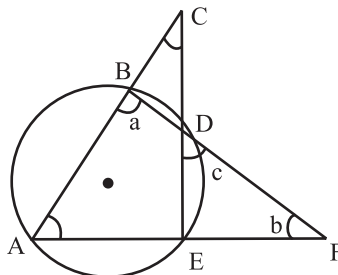
**PART – C**

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

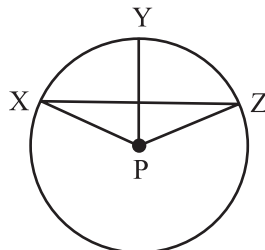


58. If two non parallel sides of a trapezium are equal prove that it is cyclic quadrilateral.

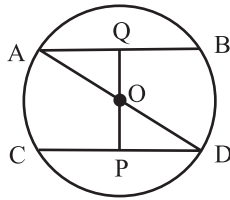
59. In the given figure determine  $a, b$  &  $c$  if  $\angle BCD = 43^\circ, \angle BAF = 62^\circ$ .



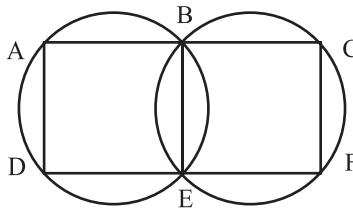
60. In the figure  $P$  is the centre prove that  $\angle XPZ = 2(\angle XZP + \angle YXZ)$



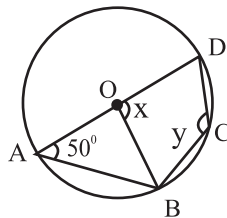
61. In the given figure AD is diameter of the circle whose centre is O and  $AB \parallel CD$  prove that  $AB = CD$ .



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



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



65. 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.
66. Prove that if a pair of opposite angles of a quadrilateral is supplementary then the quadrilateral is cyclic.

#### Part – D

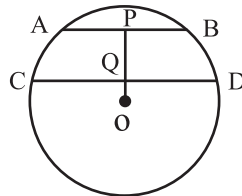
67. Bisector of angle A, B and C of a  $\triangle ABC$  intersect its circum circle at D, E and F respectively, prove that the angles of a triangle DEF are

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

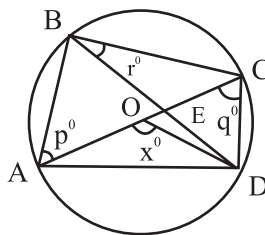
68. Find the sum of the angles in the four segments exterior to a cyclic quadrilateral.
69. Let the vertex of an angle  $ABC$  be located outside a circle and let the sides of the angle intersect equal chords  $AD$  and  $CE$  with the circle. Prove that  $\angle ABC$  is equal to half the difference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

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

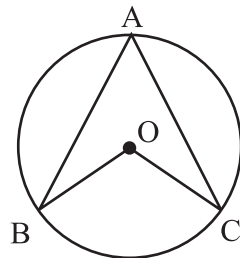
70. In the given figure  $O$  is centre of the circle of radius 5 cm,  $OP \perp CD$ ,  $AB \parallel CD$   
 $AB = 6$  cm and  $CD = 8$  cm  
 Determine  $PQ$



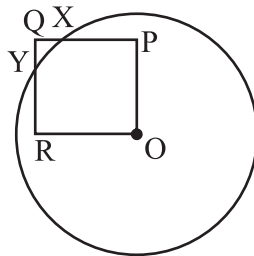
71. In the adjoining figure  $AC$  is diameter of a circle with centre  $O$  and chord  $BD \perp AC$ , intersecting each other at  $E$ . Find out the values of  $p$ ,  $q$ ,  $r$  in terms of  $x$ , if  $\angle AOD = x^\circ$ ,  $\angle BAC = p^\circ$ ,  $\angle ACD = q^\circ$ .



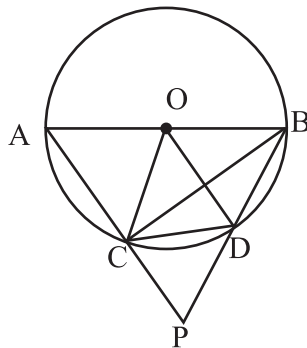
72. During a practical activity in maths lab students were using circular geo board. The angle subtended by an arc at the centre is  $(2a+50^\circ)$ . Pallavi calculated  $\angle BAC$  as  $(a+25^\circ)$ .
- Is her finding correct? Justify it.
  - Find  $\angle BAC$  if  $a = 30^\circ$
  - What will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



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

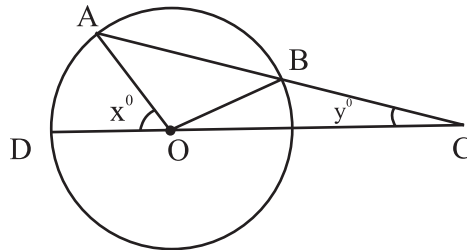


77. Prove that the opposite angles of a cyclic quadrilateral are supplementary.
78. In the given figure, AB is a diameter of a circle (o, r) and chord CD = radius oc. If AC and BD when produced meet at P. Prove that  $\angle APB$  is constant.

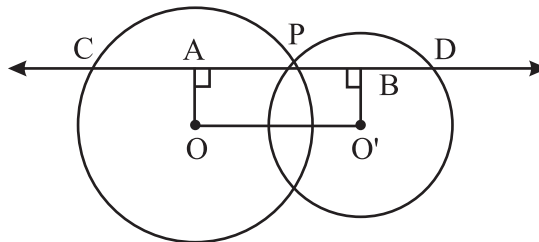


79. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.

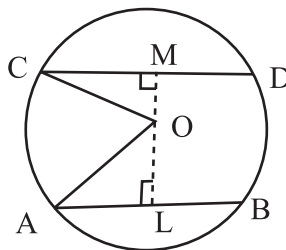
80. In the given figure, AB is a chord of a circle with centre O and AB is produced to C such that  $BC = OB$ . Also, CO is joined and produced to meet the circle in D. If  $\angle ACD = y^\circ$  and  $\angle AOD = x^\circ$ . Prove that  $x = 3y$ .



81. 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  $CD = 2OO'$ .



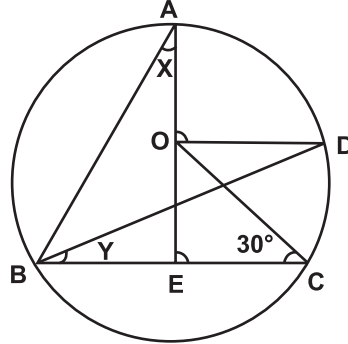
82. AB and CD are two parallel chords of a circle which are on opposite sides of the centre O such that  $AB = 10\text{cm}$ ,  $CD = 24\text{cm}$  and the distance between AB and CD is 17 cm. Find the radius of the circle.



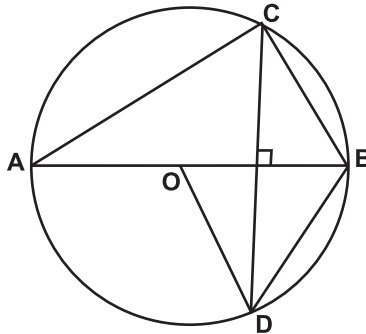
**PART-D**

83. AB and AC are two chords of a circle of radius r such that  $AB = 2 AC$ . If p and q are the distance of AB and AC from the centre, Prove that  $4q^2 = P^2 + 3r^2$

84. In figure, O is the centre of the circle,  $\angle BCO = 30^\circ$  Find x and y.



85. In figure, O is the centre of the circle,  $BD = OD$  and  $CD \perp AB$ , Find  $\angle CAB$ .



**CHAPTER-10**  
**CIRCLES**  
**ANSWERS**

1. b)  $45^\circ$
2. b)  $75^\circ$
3. a) Equal
4. a) 2 cm
5. b) 12 cm
6. b)  $40^\circ$
7. c) 10 cm
8. b)  $75^\circ$
9. d) 8 cm
10. c)  $70^\circ$
11. d)  $60^\circ$
12. b)  $50^\circ$
13. c)  $3\sqrt{3}$  cm
14. b)  $60^\circ$
15. a)  $80^\circ$
16. a)  $110^\circ$
17. c)  $50^\circ$
18. b) 10 cm
19. a)  $35^\circ$
20. d)  $23^\circ$
21. Chord
22. Semicircle
23. Concentric
24. True (T)
25. True (T)
26. False (F)
27. False, If two points lie in the same segment (major or minor) only, then the angles will be equal otherwise they are not equal.
28. False, Because a circle through two points cannot pass through a point which is collinear to these two points.
29. True, Angles in the same segment.
30. True, Because AB will be the diameter
31. Cyclic Quadrilateral
32. Sector
33. 8 cm

34. 10 cm
35.  $y = 40^\circ$
36.  $x = 35^\circ$
37.  $x = 140^\circ$
38. longest
39. concentric
40. 8 cm
41.  $115^\circ$
42.  $90^\circ$
43.  $60^\circ$
45.  $30^\circ, 150^\circ$
46.  $70^\circ$
47.  $212^\circ$
49.  $50^\circ$
50. 7 cm
51.  $75^\circ$
52. 14 cm
53.  $10^\circ$
54.  $75^\circ$
55. (A)–(R), (B)–(S)  
(C)–(Q), (D)–(P)
56. (B) I and III (Distance between centres = 21 cm  $\neq$  23 cm)
59.  $a = 105^\circ, b = 13^\circ, c = 62^\circ$
64.  $x = 100^\circ, y = 130^\circ$
68.  $540^\circ$
70. 1 cm
71.  $p = 90^\circ - \frac{1}{2}x$
- $q = \frac{1}{2}x$
- $r = 90^\circ - \frac{1}{2}x$
72. i) yes  
ii)  $55^\circ$   
iii)  $80^\circ$   
iv)  $250^\circ$
82. 13 cm
84.  $x = 30^\circ, y = 15^\circ$
85.  $30^\circ$



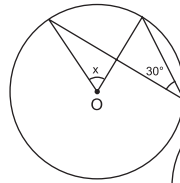
## PRACTICE TEST

Time : 50 Min.

### Circles

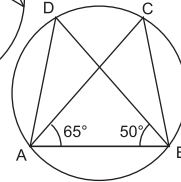
M.M. 20

1. Find the value of  $x$  in the given figure



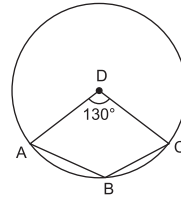
(1)

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



(1)

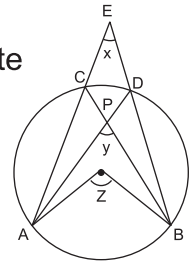
3. In given figure O is the centre of circle. If  $\angle AOC = 130^\circ$  then find  $\angle ABC$ .



(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  $180^\circ$ .

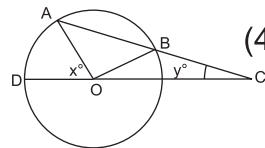


(2)

(3)

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

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



(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.

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 angles of  $60^\circ$ ,  $120^\circ$ ,  $30^\circ$ ,  $90^\circ$ , 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 lines parallel 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.  
 $90^\circ$ ,  $22\frac{1}{2}^\circ$ ,  $15^\circ$ ,  $75^\circ$ ,  $105^\circ$ ,  $135^\circ$
7. Construct a rhombus whose side is 3.4 cm and one of its angle is  $45^\circ$ .

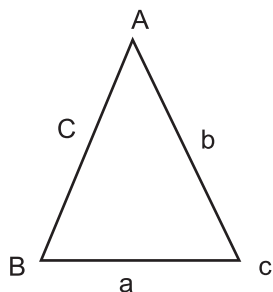
8. Construct  $\triangle XYZ$  in which  $XY = 4.5$  cm,  $YZ = 5.0$  cm. and  $ZX = 6.0$  cm. Also draw angle bisector of largest angle.
9. Construct an equilateral triangle of side 6 cm. and label its vertices as P, Q and R. From point Q draw a median QT.
10. Draw a line segment  $AB = 13.2$  cm. Find  $\frac{1}{4}AB$  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  $\ell$  and take a point P which is not on  $\ell$ . 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  $80^\circ$  and  $60^\circ$ .
27. Construct an isosceles triangle XYZ with  $YZ = ZX = 8$  cm. and median  $YT = 4$  cm.

# CHAPTER-12

## HERON'S FORMULA

### MIND MAPPING

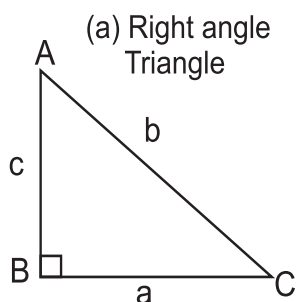


$$\text{Semi-Perimeter} = \frac{a+b+c}{2} = S$$

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

Heron's Formula

Perimeter and Area of Triangles



$$b^2 = a^2 + c^2$$

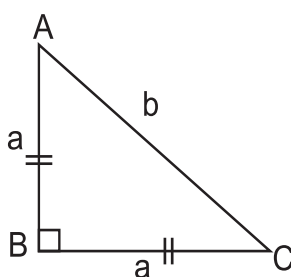
(Pythagorus Thorem)

$$\text{Perimeter} = a+b+c$$

$$\text{Area} = \frac{1}{2} axc$$

$$= \frac{1}{2} \text{ basexheight}$$

(b) Isosceles Right Triangle



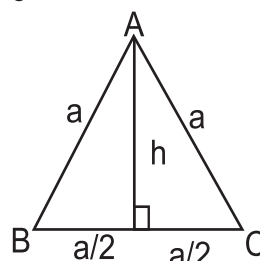
$$b^2 = 2a^2$$

(Pythagorus Thorem)

$$\text{Perimeter} = 2a+ b$$

$$\text{Area} = \frac{1}{2} a^2$$

(c) Equilateral Triangle



$$\text{Perimeter} = 3a$$

$$\text{Height} = \frac{\sqrt{3}}{2} a$$

$$\text{Area} = \frac{1}{2} \times a \times h$$

$$= \frac{1}{2} ax \frac{\sqrt{3}}{2} a$$

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

# CHAPTER-12

## HERON'S FORMULA

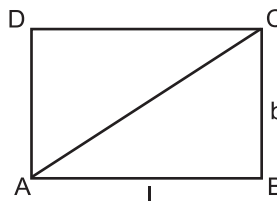
### KEY POINTS

- 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

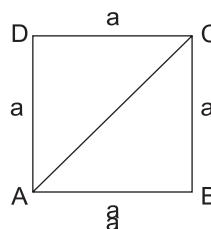


- Square : If 'a' is the length of side of a square

(i) Perimeter of square =  $4a$  units

(ii) Area of square =  $(\text{side})^2 = (a)^2$  sq. units

(iii) Area of square =  $\frac{1}{2} \times (\text{diagonal})^2$



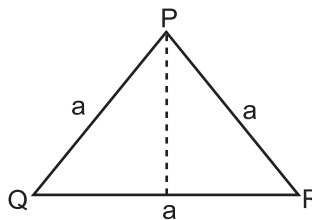
- Triangle :

- (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

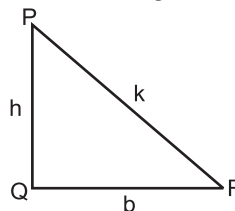


- (B) Right Angled Triangle : If one of the angles of a triangle is  $90^\circ$ .

(i) Hypotenuse  $k = \sqrt{b^2 + h^2}$  units

(ii) Perimeter =  $b + h + k$  units

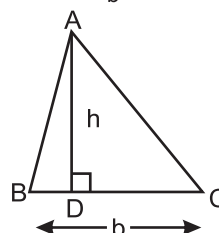
(iii) Area =  $\frac{1}{2} \times b \times h$  sq. units



Area of triangle (General Formula)

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

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



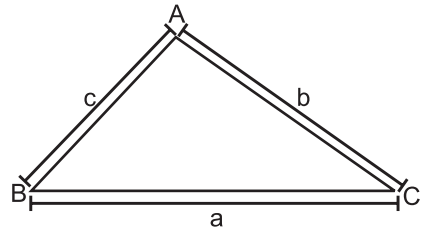
## HERON'S FORMULA

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

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

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

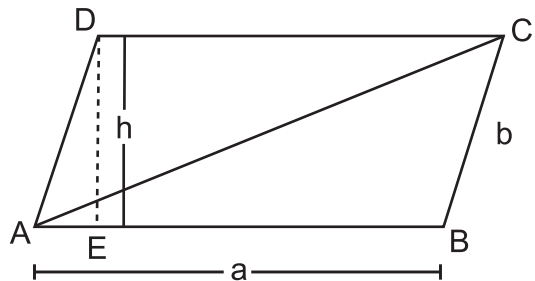
(iii) Area of Triangle ( $\Delta ABC$ ) =  $\sqrt{s(s-a)(s-b)(s-c)}$



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.

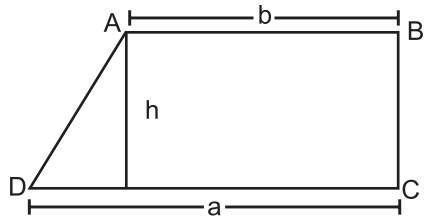
Area of parallelogram (ABCD)  
 = Base x Corresponding Height  
 = AB x DE  
 =  $a \times h$  sq. units



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

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

Area of trapezium  
 =  $\frac{1}{2} \times (a + b) \times h$   
 =  $\frac{1}{2} \times (\text{sum of parallel sides}) \times \text{height}$

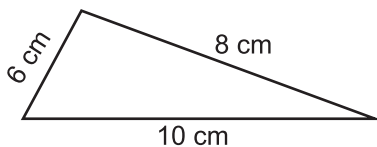


### PART "A"

- The sides of a triangle are 3cm, 4cm and 5cm. What is its area ?  
(a)  $6\text{cm}^2$  (b)  $8\text{cm}^2$   
(c)  $5\text{cm}^2$  (d)  $10\text{cm}^2$
- What is the area of an equilateral triangle with side 2cm?  
(a)  $4\sqrt{3}\text{cm}^2$  (b)  $3\sqrt{3}\text{cm}^2$   
(c)  $6\text{cm}^2$  (d)  $\sqrt{3}\text{cm}^2$
- The area of a triangle is  $150\text{cm}^2$  and its sides are in the ratio 3:4:5. What is its perimeter.  
(a) 10cm (b) 30cm  
(c) 45cm (d) 60cm
- Area of equilateral triangle of side "a" unit is  
(a)  $\frac{\sqrt{3}}{2}a^2$  (b)  $\frac{\sqrt{3}}{4}a^2$   
(c)  $\frac{\sqrt{3}}{2}a$  (d)  $\frac{\sqrt{3}}{4}a$
- The area of an isosceles triangle each of whose equal sides is 13cm and whose base is 24 cm is.  
(a)  $45\text{cm}^2$  (b)  $48\text{cm}^2$   
(c)  $60\text{cm}^2$  (d)  $75\text{cm}^2$
- The height of an equilateral triangle is 6cm. Then the area of the triangle is  
(a)  $15\sqrt{3}\text{cm}^2$  (b)  $32\sqrt{3}\text{cm}^2$   
(c)  $12\sqrt{3}\text{cm}^2$  (d)  $17\sqrt{3}\text{cm}^2$
- Sides of a triangle are in the ratio 12:17:25 and its perimeter is 540cm. Its area will be -  
(a)  $6000\text{cm}^2$  (b)  $9000\text{cm}^2$   
(c)  $12000\text{cm}^2$  (d) None of these
- The area of a triangle two sides of which are 18cm and 10 cm and its perimeter is 42 cm will be -  
(a)  $14\sqrt{11}\text{cm}^2$  (b)  $21\sqrt{11}\text{cm}^2$   
(c)  $35\sqrt{11}\text{cm}^2$  (d) None of these

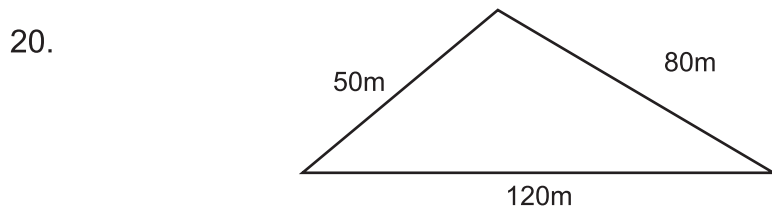


9. The height corresponding to the longest side of the triangle whose sides are 42cm, 34cm and 20cm in length is .
- (a) 15cm (d) 36cm  
(c) 16cm (d) 23cm
10. A park, in the shape of a quadrilateral ABCD has  $\angle C=90^\circ$ , AB=9M, BC=12m, CD=5m and AD=8m. How much area does it occupy ?
- (a)  $56.4\text{m}^2$  (b)  $55.4\text{m}^2$   
(c)  $65.4\text{m}^2$  (d) None of These
11. The altitude of a triangular field is one-third of its base. If the cost of sowing the field at Rs. 58 per hectare is Rs. 783 then its altitude is
- (a) 900m (b) 600m  
(c) 300m (d) None of these
12. The height of an equilateral triangle is 6 cm., Then the area of the triangle is.
- (a)  $9\sqrt{3}\text{ cm}^2$  (b)  $3\sqrt{3}\text{ cm}^2$   
(c)  $12\sqrt{3}\text{ cm}^2$  (d)  $17\sqrt{3}\text{ cm}^2$
13. An isosceles triangle has perimeter 30cm and each of equal sides is 12cm. Find the area of the triangle in  $\text{cm}^2$  is
- (a)  $9\sqrt{15}$  (b)  $17\sqrt{15}$   
(c)  $12\sqrt{15}$  (d)  $6\sqrt{15}$
14. The base of a right angled triangle is 48cm and its hypotenuse is 50cm then its area is
- (a)  $150\text{ cm}^2$  (b)  $336\text{ cm}^2$   
(c)  $300\text{ cm}^2$  (d)  $475\text{ cm}^2$
15. An isosceles right triangle has area  $8\text{ cm}^2$  The length of its hypotenuse is.
- (a)  $\sqrt{32}\text{ cm}$  (b)  $\sqrt{16}\text{ cm}$   
(c)  $\sqrt{48}\text{ cm}$  (d)  $\sqrt{24}\text{ cm}$
16. The cost of painting the given sign board at the rate of 9 paise per  $\text{cm}^2$  is



- (a) Rs. 2.00 (b) Rs. 2.16  
(c) Rs. 2.48 (d) Rs. 3.00

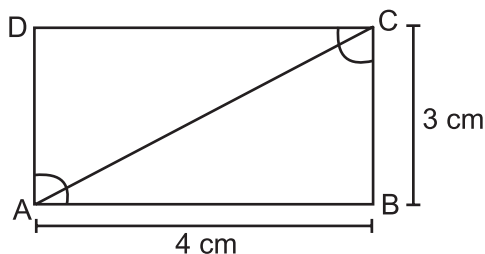
17. The perimeter of an equilateral triangle is 60m. The area is  
 (a)  $10\sqrt{3} \text{ m}^2$  (b)  $15\sqrt{3} \text{ m}^2$   
 (c)  $20\sqrt{3} \text{ m}^2$  (d)  $100\sqrt{3} \text{ m}^2$
18. The sides of a triangle are 35cm, 54cm and 61cm. The length of its longest altitude is  
 (a)  $16\sqrt{5} \text{ cm}$  (b) 28 cm  
 (c)  $10\sqrt{5} \text{ cm}$  (d)  $24\sqrt{5} \text{ cm}$
19. The base of a triangle is 12cm and height is 8cm then area of triangle is  
 (a)  $48 \text{ cm}^2$  (b)  $24 \text{ cm}^2$   
 (c)  $96 \text{ cm}^2$  (d)  $56 \text{ cm}^2$



A gardener want to plant grass inside the given piece of land. How much area does he need to plant.

- (a)  $85\sqrt{15} \text{ m}^2$  (b)  $110\sqrt{15} \text{ m}^2$   
 (c)  $375\sqrt{15} \text{ m}^2$  (d)  $97\sqrt{15} \text{ m}^2$
21. Find the area of a triangle whose base and altitudes are 8cm and 5cm.  
 22. Find the area of an equilateral triangle whose sides are 4cm each.  
 23. If sum of two sides of a triangle is 17cm and its perimeter is 30cm, then what is the length of third side.  
 24. If perimeter of a triangle is 24cm and sides are in the ration 2:1:3, then find the longest side ?  
 25. If each side of a triangle is double then how many times the perimeter of triangle increased ?  
 26. If area of a triangle is  $50\text{cm}^2$  and one of its sides is 10cm then find the length of corresponding altitude.  
 27. 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?

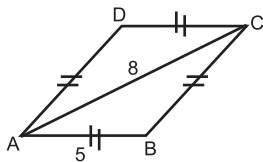
28. Find the ratio between the area  $\triangle ABC$  and area  $\triangle ACD$  of the given rectangle.



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

### Part-B

32. If  $(s-a) = 5$  cm  
 $(s-b) = 10$  cm  
 $(s-c) = 1$  cm, Find a, b & c  
 where a, b & c are sides of the triangle.  
 33. The ratio between the sides of a triangle are 3 : 5 : 7 and its perimeter is 300cm find the sides of triangle.  
 34. Find the cost of fencing the ground in the form of triangle with sides 16 m, 12 m and 18 m, The rate of fencing is Rs. 25 per meter.  
 35. Find the area of isosceles triangle whose non equal side are of 12 cm having the corresponding altitude 7.5 cm.  
 36. The parallel side of trapezium is 77m and 60m and its non parallel sides are 26m and 25m. Find the area of trapezium.  
 37. Find the area of rhombus in which  $AB = 5$ cm and  $AC = 8$ cm.



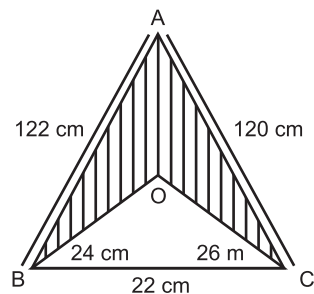
38. If in a triangle  $AB = 15$  cm,  $BC = 14$  cm and  $AC = 13$  cm. Find the area of  $\triangle ABC$  and hence its altitude corresponding to side BC.

39. Show that the Area of an equilateral triangle is  $\frac{\sqrt{3}}{4} x^2$ , where side is  $x$ .
40. 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

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

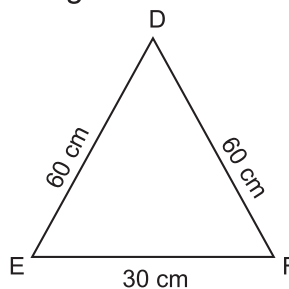
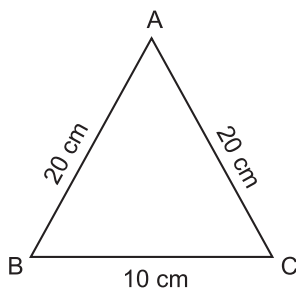
44. Find the area of shaded region in the figure.



How many triangular flower beds of  $6\text{m}^2$  can be made from this area.

use  $\sqrt{105} = 10.25$

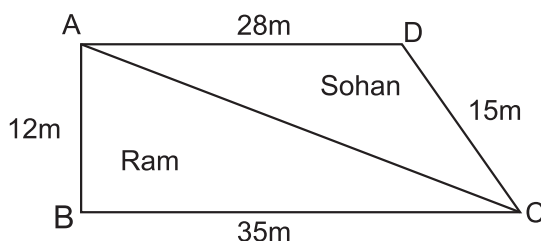
45. Find the area of rhombus whose perimeter is 100m and one of whose diagonal is 30 m.
46. The sides of a triangle shaped sheet are 5 cm, 12 cm and 13 cm. Find the cost of painting on the sheet at the rate of ₹ 30 per  $\text{cm}^2$ .
47. One side of a right angled triangle is 20 cm and the difference in lengths of its hypotenuses & other side is 8 cm. Find the other side and area of the triangle.
48. Find the ratio between the area of triangle  $\triangle ABC$  and  $\triangle DEF$ .



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

### Part – D

50. A triangular park ABC has sides 120m, 80m and 50m. A gardener 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 5cm wide for the gate on one side.
  - Find its area where gardener may plant the tree.
51. 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  $\sqrt{10}=3.15$ ]



52. A triangular hoarding of dimensions 11m, 6m and 15m is used for commercial activities. The hoarding yield an earining of ₹ 5000 per  $m^2$  per month.
- Calculate the total earning by the hoarding in a month. [Use  $\sqrt{2} = 1.41$ ]
53. 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**

- 
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- |     |     |   |     |     |   |
|-----|-----|---|-----|-----|---|
| 1.  | (a) | $6 \text{ cm}^2$  | 2.  | (d) | $\sqrt{3} \text{ cm}^2$                               |
| 3.  | (d) | $60 \text{ cm}$   | 4.  | (b) | $\sqrt{\frac{3}{4}}a^2$                               |
| 5.  | (c) | $60 \text{ cm}^2$   | 6.  | (b) | $3\sqrt{3}$   |
| 7.  | (b) | $9000 \text{ cm}^2$   | 8.  | (b) | $21\sqrt{11} \text{ cm}^2$                            |
| 9.  | (c) | $16 \text{ cm}$   | 10. | (c) | $65.4 \text{ cm}^2$                                   |
| 11. | (d) | None of these   | 12. | (c) | $12\sqrt{3}$  |
| 13. | (a) | $9\sqrt{15}$  | 14. | (b) | $336 \text{ cm}^2$                                    |
| 15. | (a) | $\sqrt{32} \text{ cm}$  | 16. | (b) | $2.16 \text{ Rs.}$                                    |
| 17. | (d) | $100\sqrt{3} \text{ m}^2$   | 18. | (d) | $24\sqrt{5} \text{ cm}$                               |
| 19. | (a) | $48 \text{ cm}^2$   | 20. | (c) | $375\sqrt{15} \text{ m}^2$                            |
| 21. |     | $20 \text{ cm}^2$   | 22. |     | $4\sqrt{3} \text{ cm}^2$                              |
| 23. |     | $13 \text{ cm}$   | 24. |     | $12 \text{ cm}$                                       |
| 25. |     | one time  | 26. |     | $10 \text{ cm}$                                       |
| 27. |     | $8 \text{ cm}$  | 28. |     | $1 : 1$   |
| 29. |     | $5\sqrt{2} \text{ cm}$  | 30. |     | $40 \text{ cm}^2$                                     |
| 31. |     | $57 \text{ m}^2$  | 32. |     | $11 \text{ cm}, 6 \text{ cm}, 15 \text{ cm}$          |
| 33. |     | $60 \text{ cm}, 100 \text{ cm}, 140 \text{ cm}$                   | 34. |     | $\text{₹ } 1150$                                      |
| 35. |     | $45 \text{ cm}^2$   | 36. |     | $1644 \text{ m}^2$                                    |
| 37. |     | $24 \text{ cm}^2$   | 38. |     | $84 \text{ cm}^2, 12 \text{ cm}$                      |
| 39. |     | —   | 40. |     | $32\sqrt{2} \text{ cm}^2$                             |
| 41. |     | $40 \text{ m}$  | 42. |     | $20\sqrt{2} \text{ m}^2$                              |
| 43. |     | $75 \text{ km}$   | 44. |     | $1047 \text{ m}^2, 179$                               |
| 45. |     | $600 \text{ m}^2$   | 46. |     | $\text{₹ } 900$                                       |
| 47. |     | $29 \text{ cm}, 21 \text{ cm}$                                    | 48. |     | $1 : 9$   |
| 49. |     | $\sqrt{\frac{x}{2}(\frac{x}{2}-p)(\frac{x}{2}-q)(\frac{x}{2}-r)}$ | 50. |     | (i) $\text{₹ } 12250$ (ii) $375\sqrt{15} \text{ m}^2$ |
| 51. |     | Ram $210 \text{ m}^2$   | 52. |     | $\text{₹ } 141000$                                    |
| 53. |     | (i) $1 : 4$ (ii) $300\%$  |     |     |   |
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## PRACTICE TEST

### HERON'S FORMULA

Time : 50 Min.

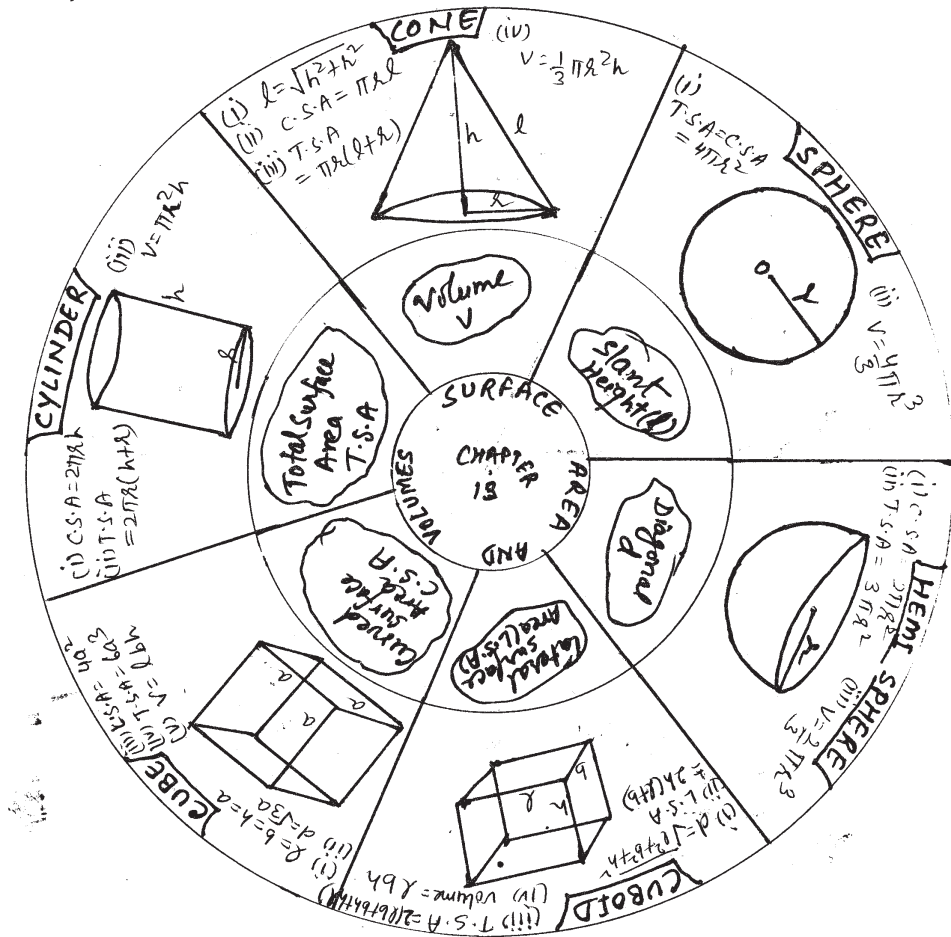
M.M. 20

1. Find the length to sides of an equilateral triangle 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  $475 \text{ cm}^2$  & 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

### MIND MAPPING



(i) Total surface Area (T.S.A) = Curved Surface Area (C.S.A) + Base Area

(ii) For plane Figure

For Curved figure

Lateral surface Area (L.S.A)

curved surface area (C.S.A)

(iii) Volume of cylinder

=

3x volume of cone

Volume of hemisphere

=

2x volume of cone

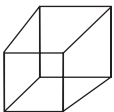
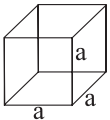
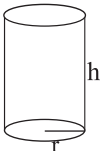
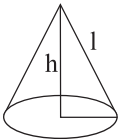
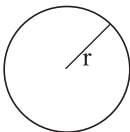

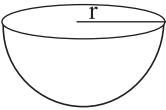
volume of cone : volume of hemisphere : volume of cylinder = 1 : 2 : 3

=  $v_1 : v_2 : v_3 = 1 : 2 : 3$



# 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		$\pi rl$	$\pi r(l+r)$	$\frac{1}{3} \pi r^2 h$	$h$ =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

**CHAPTER-13**  
**SURFACE AREAS AND VOLUMES**  
**PART - A**

1. If the volume of a sphere is numerically equal to its surface area. Then radius of sphere is.  
(a) 1 unit (b) 3 unit  
(c) 2 unit (d) 6 unit
2. Th surface area of a solid hemisphere having radius r.  
(a)  $2\pi r^2$  (b)  $3\pi r^2$   
(c)  $4\pi r^2$  (d)  $\frac{2}{3} \pi r^3$
3. In a cylinders, If radius is halved and height is doubled the volume will be.  
(a) Same (b) double  
(c) halved (d) four times
4. Th height of a cone of diameter 10cm and slant height 13cm, is  
(a) 12cm (b) 13cm  
(c)  $\sqrt{69}$  cm (d)  $\sqrt{194}$  cm
5. The radius of a hemispherical balloon increases from 6 cm to 12cm as air is being pumped into it. The ratios of the surface areas of the balloon in the two cases is.  
(a) 1 : 4 (b) 1 : 3  
(c) 2 : 3 (d) 2 : 1
6. How many bricks will be required to construct a wall 13.5m long; 6m high and 22.5cm thick if each brick measures (27cm x 12.5cm x 9cm) ?  
(a) 6000 (b) 7500  
(c) 5000 (d) 3750
7. The radius of a sphere is 2r, then its volume will be.  
(a)  $\frac{32}{3} \pi r^3$  (b)  $4\pi r^3$   
(c)  $\frac{4}{3} \pi r^3$  (d)  $\frac{8\pi r^3}{3}$

8. The radius of a sphere is 21cm. What is the surface area of the sphere?
- (a)  $12932 \text{ cm}^2$  (b)  $4312 \text{ cm}^2$   
(c)  $9702 \text{ cm}^2$  (d)  $5544 \text{ cm}^2$
9. The length of the longest pole that can be put in a room of dimensions (10m x 10m x 5m) is
- (a) 15m (b) 16m  
(c) 12m (d) 10m
10. A copper sphere of diameter 6cm is melted and drawn into 36cm long wire of uniform circular cross-section. Then, its radius is
- (a) 2cm (b) 1.5cm  
(c) 1.2cm (d) 1cm
11. The number of planks of dimension (4m x 50cm x 20cm) that can be stored in a pit which is 16m long, 12m wide and 4m deep is.
- (a) 1900 (b) 1920  
(c) 1800 (d) 1840
12. If the radius of a sphere is increased by 10% then its volume will be increased by
- (a) 11.1% (b) 22.1%  
(c) 33.1% (d) 44.1%
13. In a cylinder, radius is double and height is halved, surface area will be.
- (a) halved (b) doubled  
(c) Same (d) four times
14. Two cubes have their volumes in the ratio 1 :27. The ratio of their surface area is.
- (a) 1 :3 (b) 1 :8  
(c) 1 :9 (d) 1 :18

15. A cone is 8.4cm high and the radius of its base is 2.1cm. It is melted and recast into a sphere. The radius of the sphere is :
- (a) 4.2 cm (b) 2.1 cm  
(c) 2.4 cm (d) 1.6 cm
16. If the length of diagonal of a cube is  $8\sqrt{3}$  cm, then its surface area is.
- (a)  $768 \text{ cm}^2$  (b)  $512 \text{ cm}^2$   
(c)  $384 \text{ cm}^2$  (d)  $192 \text{ cm}^2$
17. The total surface area of a cube is  $96 \text{ cm}^2$ . The volume of the cube is :
- (a)  $8 \text{ cm}^3$  (b)  $512 \text{ cm}^3$   
(c)  $64 \text{ cm}^3$  (d)  $27 \text{ cm}^3$
18. If each side of a cube is doubled, then its volume,
- (a) Becomes Doubled (b) Becomes 4 times  
(c) becomes 6 times (d) become 8 times
19. If a sphere is inscribed in a cube, then the ratio of the volume of the cube to the volume of the sphere will be :
- (a)  $6 : \pi$  (b)  $3 : \pi$   
(c)  $2 : \pi$  (d)  $3 : 2\pi$
20. If each edge of a cube is increased by 50%, then the percentage increase in its surface area is.
- (a) 50 % (b) 75 %  
(c) 100 % (d) 125 %
21. The lateral surface area of a cube is  $256 \text{ cm}^2$ . Find its volume.
22. A matchbox measures 4cm x 2.5 cm x 1.5 cm. What will be the volume of a packet containing 12 such boxes ?
23. 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.

24. Find the area of canvas required for a conical tent of height 24m and base radius 7m.
25. Find the ratio of total surface area of a sphere and a hemisphere of same radius.
26. 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.
27. If the radius and slant height of a cone are  $r/2$  and  $2l$ . Then find its total surface area.
28. A cone and a hemisphere have equal base and equal volumes. Find the ratio of their heights.
29. The radius of a spherical balloon increase from 6cm to 12 cm as air is being pumped into it. Find the ratio of the surface areas of the balloon in two cases.
30. The largest possible right circular cone is cut out of a cube of edge  $r$  cm. What is the volume of cone ?

### **PART – B**

31. A rectangular sheet of dimension 33 cm x 18 cm is rolled along its breadth to form a cylinder. Find the radius of the cylinder.
32. 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 m x 33 m ?
33. The dimensions of a cuboid are in the ratio of 1 : 2 : 3 and its total surface area is  $88\text{m}^2$ . Find its dimensions.
34. A solid cylinder has a total surface area of  $231\text{ cm}^2$ . The curved surface area is  $2/3$  of the total surface area. Find the volume of cylinder.
35. The total surface area of a cube is 150sq. cm. Find the perimeter of any one of its faces.
36. Three metal cubes whose edge measures 3cm, 4cm and 5cm respectively are melted to form a single cube. Find the edge of the cube.

37. 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 ₹ 7.50 per  $m^2$ .
38. Three spheres of radii 3cm, 4cm and 5cm are melted together to form a single sphere. Find the radius of new sphere.
39. The curved surface area of a cylinder is  $176 \text{ cm}^2$  and its base area is  $38.5 \text{ cm}^2$ . Find the volume of the cylinder.
40. A cylinder and a cone have the same height and the same radius. The volume of the cylinder is  $24 \text{ cm}^3$ . What will be the volume of the cone ?
41. What is the volume of the largest cone that can be inscribed completely in a hollow hemisphere of radius 7 cm?
42. Find the maximum length of the rod that can be placed in a cuboid of dimensions  $22.5 \text{ cm} \times 7.5 \text{ cm} \times 10 \text{ cm}$ .
43. Which is false in case of a hollow cylinder. Write the correct answer.
- (a) curved surface area of a hollow cylinder =  $2\pi h (R + r)$
  - (b) Total surface area of a hollow cylinder =  $2\pi (R + r) (h + R - r)$
  - (c) Inner curved surface area of a hollow cylinder =  $2\pi h (R - r)$
  - (d) Area of each end of a hollow cylinder =  $\pi (R^2 - r^2)$
44. Which is false ? Write the correct answer.
- A metal pipe is 63cm long. Its inner diameter is 4 cm and the outer diameter is 4.4 cm. Then
- (a) Its inner curved surface area =  $792 \text{ cm}^2$
  - (b) Its outer curved surface area =  $871.2 \text{ cm}^2$
  - (c) Surface area of each end =  $2.64 \text{ cm}^2$
  - (d) Its total surface area =  $1665.84 \text{ cm}^2$

45. Which is false ? Write the correct answer.
- (a) Volume of the hollow sphere =  $\frac{4}{3} \pi(R^3 - r^3)$
  - (b) Volume of a hemisphere =  $\frac{2}{3} \pi r^3$
  - (c) Total surface area of a hemisphere =  $3\pi r^2$
  - (d) Curved surface area of a hemisphere =  $\pi r^2$

46. Which is false ? write the correct answer.

For a right circular cylinder of base radius = 7cm and height = 14 cm.

- (a) curved surface area =  $616\text{cm}^2$
  - (b) Total surface area =  $924\text{cm}^2$
  - (c) Volume =  $2156\text{cm}^3$
  - (d) Total area of the end face =  $154\text{cm}^2$
47. Write true or false.

The largest possible right circular cone is cut out of a cube of edge  $r$  cm. The volume of the cone is  $\frac{1}{12} \pi r^3$ . (T/F)

### PART – C

48. A cuboidal vessel is 10m long and 8m wide. How high must it be made to hold  $380\text{m}^3$  of a liquid ?
49. 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 ?
50.  $1.1\text{cm}^3$  of gold is drawn into a wire of 0.1 mm in diameter. Find the length of the wire in metre.
51. A hemispherical bowl of internal diameter 36cm contains a liquid. This liquid is to be filled in cylindrical bottles of radius 3cm and height 6cm. How many bottles are required to empty the bowl ?

52. 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  $\frac{1}{12}$  of steel actually used was wasted in making the closed tank?
53. 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)
54. The radius of a sphere is 10 cm. If the radius is increased by 1cm, then prove that volume of the sphere is increased by 33.1%.
55. The diameter of a hemisphere is decreased by 30%. What will be the percentage change in its total surface area ?
56. A sphere and a cube have the same surface area. Find the ratio of their volumes.
57. The volume of a sphere is  $4851 \text{ cm}^3$ . How much should its radius be reduced so that its volume becomes  $\frac{4312}{3} \text{ cm}^3$  ?
58. A semicircular sheet of paper of diameter 14 cm is bent to form an open conical cup. Find the capacity of the cup.
59. 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

60. 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 wall of the tank are 5 cm thick, then what is the thickness of the bottom of the tank ?
61. 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.



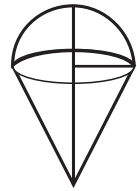
62. A right triangle having side 6cm, 8cm and 10cm is revolved about the side of length 8cm. Find the volume of the solid so formed.
63. A right circular cone is 5.4 cm high and radius of its base is 2cm. It is melted and recast into another right circular one with radius of base as 1.5 cm. Find the height of new cone formed.
64. A cylindrical tub of radius 12cm 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 radius of ball ?
65. 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.
66. A plot of land is in the form of rectangle with dimension 240m x 180m. A drainlet 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.
67. 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 48m x 27m x 25m to collect the rain water.
- For how many days the water of this tank is sufficient-fi during rain the height of water level is 5m.
68. 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 100 m<sup>2</sup>.
69. 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 4m x 3m. Assuming stitching margin is negligible.

70. Twenty Seven solid iron spheres each of radius  $r$  and surface area  $S$  are melted to form a sphere with surface area  $S'$ . Find the
- radius  $R$  of the new sphere.
  - Ratio of  $S$  and  $S'$ .
71. 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  $\text{cm}^3$ .
72. 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.
73. 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 ?
74. 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  $\text{m}^2$ , What will be the cost of painting all these cones ? (Use  $\pi=3.14$  and  $\sqrt{1.04} = 1.02$ )
75. A sphere of diameter 6cm is dropped in a right circular cylindrical 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 ?
76. Marbles of diameter, 1.4cm are dropped into a cylindrical beaker, of diameter 7cm. Containing some water. Find the number of marbles

that should be dropped into the beaker, so that the water level rises by 5.6cm.

77. Right circular cylinder having diameter 12cm and height 15 cm 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.



78. A toy is in the form of a cone mounted 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  $\pi = \frac{22}{7}$ )
79. If h, c and v respectively, are the height, the curved surface and volume of the cone, prove that

$$3\pi v h^3 - c^2 h^2 + 9v^2 = 0$$

80. A wooden box with dimensions 36 cm x 24 cm x 12 cm is 2cm thick. Find the weight of the wood if density of the wood is 100 gm/m<sup>3</sup>.
81. A rectangular reservoir is 210m long and 75m 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.
82. A hemispherical bowl is to be painted from inside at the rate of Rs. 20 per 100m<sup>2</sup>. The total cost of painting is Rs. 30.80. Find
- Inner surface area of the bowl.
  - Volume of air inside the bowl.

#### PART-D

83. The volumes of the two spheres are in the ratio 64 : 27 find the ratio of their surface areas.
84. A cube of side 4cm contains a sphere touching its sides. Find the volume of the gap in between.
85. A sphere and a right circular cylinder of the same radius have equal volumes. By what percentage does the diameter of the cylinder exceeds its heights ?

**CHAPTER-13**  
**SURFACE AREAS AND VOLUMES**  
**ANSWERS**

- |     |     |                         |     |     |   |
|-----|-----|-------------------------|-----|-----|---|
| 1.  | (b) | 3 Units                 | 2.  | (b) | $3\pi r^2$                                    |
| 3.  | (c) | halved                  | 4.  | (a) | 12 cm   |
| 5.  | (a) | 1 : 4                   | 6.  | (a) | 6000  |
| 7.  | (a) | $\frac{32}{3} \pi r^3$  | 8.  | (d) | 5544cm <sup>2</sup>                           |
| 9.  | (a) | 15m                     | 10. | (d) | 1cm   |
| 11. | (b) | 1920                    | 12. | (c) | 33.1%   |
| 13. | (c) | same                    | 14. | (c) | 1 : 9   |
| 15. | (b) | 2.1 cm                  | 16. | (c) | 384cm <sup>2</sup>                            |
| 17. | (c) | 64cm <sup>3</sup>       | 18. | (d) | becomes 8 times                               |
| 19. | (a) | 6 : $\pi$               | 20. | (d) | 125%  |
| 21. |     | 512 cm <sup>2</sup>     | 22. |     | 180 cm <sup>2</sup>                           |
| 23. |     | 20 : 27                 | 24. |     | 550 m <sup>2</sup>                            |
| 25. |     | 4 : 3                   | 26. |     | 28 cm   |
| 27. |     | $\pi r(l+r/4)$          | 28. |     | 2 : 1   |
| 29. |     | 1 : 4                   | 30. |     | $v = \frac{1}{12} \pi r^3$                    |
| 31. |     | 2.8 cm                  | 32. |     | 500   |
| 33. |     | 2m, 4m, 6m              | 34. |     | 269.5 cm <sup>2</sup>                         |
| 35. |     | 20cm                    | 36. |     | 6cm   |
| 37. |     | ₹ 555                   | 38. |     | 6cm   |
| 39. |     | 308 cm <sup>3</sup>     | 40. |     | 8cm <sup>3</sup>                              |
| 41. |     | 359.33cm <sup>3</sup>   | 42. |     | 25.7cm  |
| 43. | (c) | $2\pi h(R-r) = 2\pi rh$ | 44. | (d) | $1665.84 \text{ cm}^2 = 1668.48 \text{ cm}^2$ |
| 45. | (d) | $\pi R^2 = 2\pi R^2$    | 46. | (d) | $154 \text{ cm}^2 = 308 \text{ cm}^2$         |
| 47. |     | True                    | 48. |     | 4.75 cm                                       |
| 49. |     | 5000                    | 50. |     | 140m  |
| 51. |     | 72                      | 52. |     | 59.4m <sup>2</sup> , 95.04m <sup>2</sup>      |
| 53. |     | 4,00,000m <sup>2</sup>  | 55. |     | 51%   |
| 56. |     | $\sqrt{6} : \sqrt{\pi}$ | 57. |     | 6.5cm   |

58.  $79.2 \text{ cm}^3$
61.  $5120 \text{ cm}^3$
64.  $9 \text{ cm}$
66.  $1.227 \text{ m}$
68. ₹ 3511.20
70. (i)  $R=3r$  (ii)  $s:s^1=1:9$
72.  $5.28 \text{ cm}^3, 0.11 \text{ cm}^3$
74.  $384.34$
76.  $150$
78.  $231 \text{ cm}^3, 204.05 \text{ cm}^2$
81.  $58.8 \text{ km}$
83.  $16:9$
85.  $50\%$
60.  $10 \text{ cm}$
62.  $96 \pi \text{ cm}^3$
63.  $9.6 \text{ cm}$
65.  $v_1 : v_2 : v_3 = 42:33:11$
67.  $20 \text{ days}$
69.  $47 \text{ m}^2$
71.  $345.39 \text{ g}$
73. Plastic Cylinders  $85 \text{ cm}^3$
75.  $1 \text{ cm}$
77.  $10$
80.  $3968 \text{ g}$
82. (i)  $154 \text{ m}^2$  (ii)  $251.5 \text{ m}^3$
84.  $30.48 \text{ cm}^3$

## PRACTICE TEST

Time : 50 Min.

### Surface Areas and Volumes

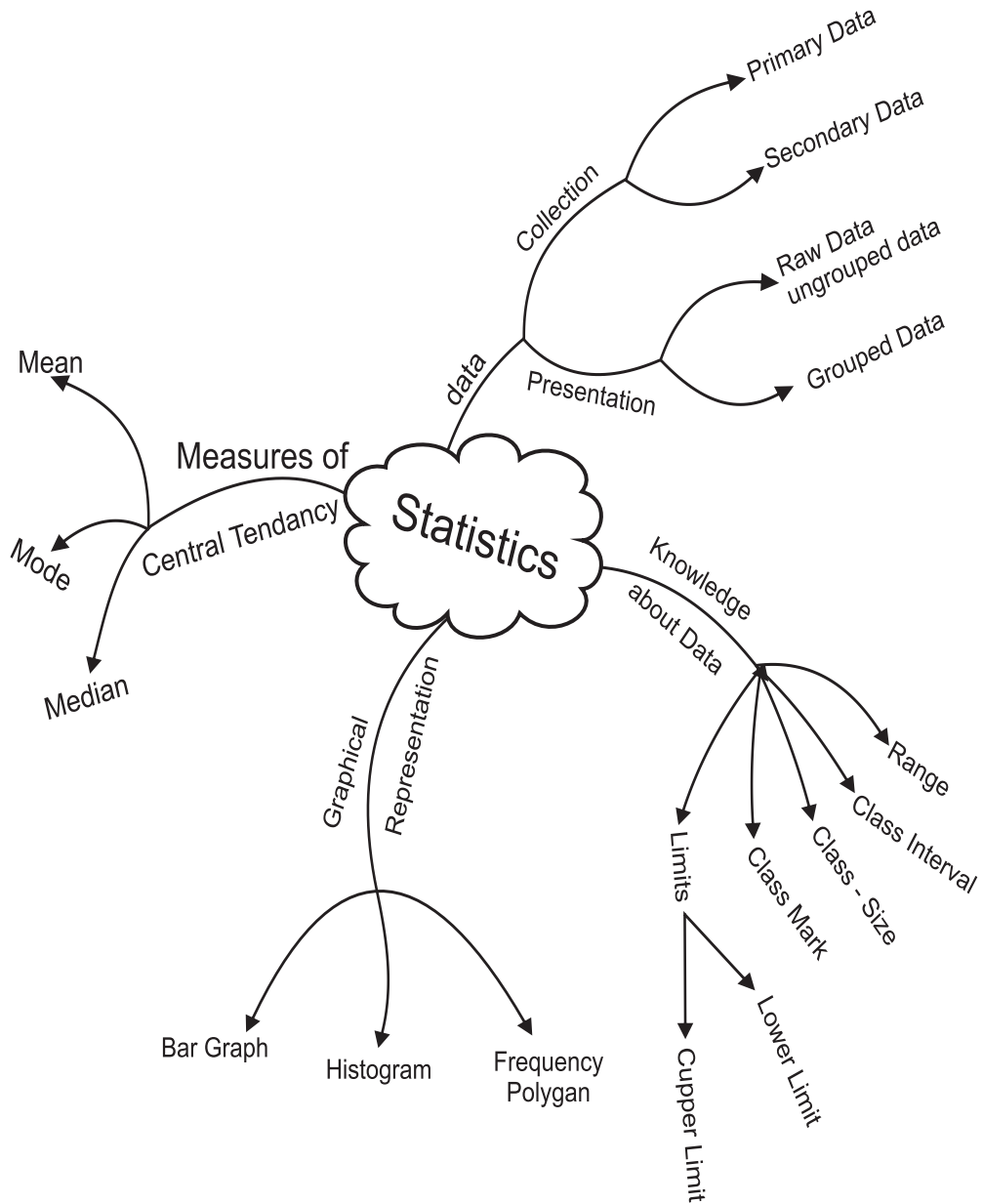
M.M. 20

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  $310.4 \text{ cm}^3$ . Find its radius. (1)
3. The circumference of the base of a cylinder is  $30.8 \text{ cm}$ . Its curved surface area is  $289.52 \text{ cm}^2$ . 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  $13.7 \text{ cm}$  and its radius is  $4.2 \text{ cm}$ . 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  $30 \text{ cm}$  diameter. He distributed the dish in cylinder cups of diameter  $15 \text{ cm}$  and height  $4 \text{ cm}$  among his friends and himself. How many friends were with Ajay? (4)
8. A river  $15 \text{ m}$  deep  $50 \text{ m}$  wide is flowing at the rate of  $2 \text{ cm}$  per second. How many litres of water will fall from the river into the sea in  $9 \text{ hours}$ ? (4)

# CHAPTER-14

# STATISTICS

## MIND MAP



# 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.
- Class 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 order.

If number of observation ' $n$ ' is odd

Then Median =  $\frac{(n+1)^{\text{th}}}{2}$   
 If number of observation ' $n$ ' is even

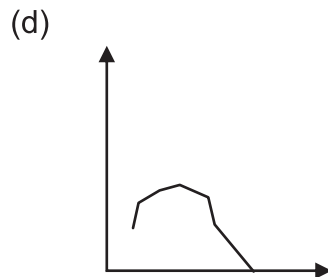
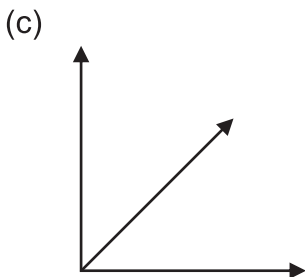
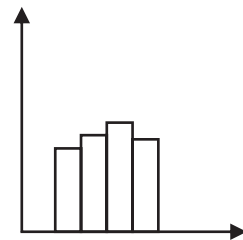
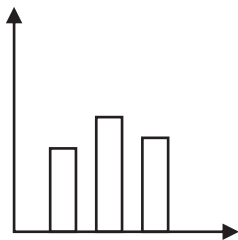
Then Median =  $\frac{\left(\frac{n}{2}\right)^{\text{th}} \text{term} + \left(\frac{n}{2} + 1\right)^{\text{th}} \text{term}}{2}$



# STATISTICS

## PART-A

- Facts or Figures, collected with a definite purpose are -
  - Frequency
  - Data
  - Tally Marks
  - Bars
- To compare this years result with last years result, teacher went to the class and collected this years number of distinctions from the students. For last years number of distinctions, she opened the result register & wrote the required number of distinctions. The data Collected by her from the students & register respectively, are examples of -
  - Primary data & secondary data
  - Primary data & raw data
  - Both primary data
  - Secondary data & Primary data
- How is a histogram different from bar graph.
  - Histogram is same as bar graph but joined together.
  - no difference
  - We use class - intervals in histogram instead to variables.
  - (A) & (B) both are correct.
- Which of the figures represent a histogram correctly-
  - 
  -



5. In a Histogram when we join midpoints of the tops of the rectangles (bars) we get :
- (a) Bar Graph (b) line graph  
(c) Frequency Polygon (d) Pie graph
6. To draw a frequency polygon we need \_\_\_\_\_ of the class interval for x-axis and frequency of the respective class for y-axis.
- (a) upper limit (b) lower limit  
(c) class-mark (d) range
7. In a continuous frequency distribution, class mark of a class is 15 and lower limit is 13, then its upper limit is :
- (a) 16 (b) 14  
(c) 13 (d) 17
8. If class mark of a class-interval is 8.5. The class size is 5, then the class limits of the corresponding class-interval is
- (a) 6.5-11.5 (b) 6-11  
(c) 5.5-10.5 (d) 7-12
9. Let  $x$  be the class mark &  $y$  be the upper limit of a class- interval in a continuous frequency-distribution.  
The lower limit of the class is :
- (a)  $2x+y$  (b)  $2x-y$   
(c)  $x-y$  (d)  $x+y$
10. The mean of  $x_1, x_2, \dots, x_n$  is 10, then the mean of  $5x_1, 5x_2, \dots, 5x_n$  is .....
- (a) 50 (b) 10  
(c) 15 (d) 5
11. The mean of first five prime numbers is
- (a) 3.6 (b) 5  
(c) 5.6 (d) 6
12. The mean of 5 observations is 10. If each observation of the data is increased by 5, the new mean is -
- (a) 50 (b) 15  
(c) 5 (d) No change, 10
13. The mean of 10 observations is 15. The sum of all observations is -
- (a) 15 (b) 10  
(c) 75 (d) 150

14.  $a_1, a_2, a_3, a_4$  &  $a_5$  are five consecutive odd integers, then their mean is .
- (a)  $a_1 + 4$  (b)  $5(a_1 + a_2 + \dots + a_5)$   
(c)  $\frac{a_1 \times a_2 \times a_3 \times a_4 \times a_5}{5}$  (d)  $a_1 + 5$
15. If the mean of  $x, x+2, x+4, x+6, x+8$  is 11, then the mean of first three observations is -
- (a) 9 (b) 10  
(c) 8 (d) 11
16. The mean of first three observations is 15 and the mean of next two observation is 20. The mean of all five observations is -
- (a) 45 (b) 15  
(c) 17 (d) 40
17. The mean of first two observations is 6 & the mean of first three observations is 7. The third observation is-
- (a) 8 (b) 7  
(c) 6 (d) 9
18. Mean of 20 observations is 15.5. Later on it was found that the observation 24 was taken as 42. The correct mean is -
- (a) 14 (b) 14.2  
(c) 14.4 (d) 14.6
19. If the mode of the data.  
13, 27, 24, 13, 17, 16, 17, 21, 22, x, 13, 17, is 17 then the value of x is -
- (a) 16 (b) 17  
(c) 21 (d) 13
20. If the median of the data arranged in ascending order-  
7, 10, 14, x+4, x+8, x+11, 27, 30 is 19 then x is -
- (a) 13 (b) 19  
(c) 26 (d) 20
21. The mean of the prime factors of 24 is -
- (a) 2 (b) 2.5  
(c) 4 (d) 7.5
22. If 9 observations are arranged in descending order which observation will be the median ?
- (a) 3rd (b) 4th  
(c) 5th (d) 6th

23. 15 observations are arranged in ascending order. 9th observation is increased by 2. Then the new median will.
- (a) increases by 2 (b) Decrease by 2  
(c) no change (d) Becomes two times
24. Out of total of 20 observations arranged in ascending order. 9th, 10th & 11th observations are 36, 40 and 44 then median is .
- (a) 36 (b) 42  
(c) 40 (d) 44
25. If mode of 4, 9, 5, 4, 9, 4, 9 and  $x-10$  is 9 then  $x$  is-
- (a) 10 (b) 12  
(c) 14 (d) 19
26. In a frequency distribution table the numbers 4, 6 and 8 have frequencies  $(x-3)$ ,  $x$  &  $(x+1)$  respectively. If their mean is 8 then  $x$  is -
- (a) 8 (b) 0  
(c) 1 (d) 2

**Fill in the Blanks :-**

27. In a bar graph 0.2 cm length of a bar represents 100 people. The length of bar which represents 1300 people is \_\_\_\_\_ .
28. The marks of 5 students in a subject out of 50 are 32, 48, 50, 27 & 37, the range is \_\_\_\_\_ .
29. A set of data contains 64 as the highest value and its range is 13, the lowest value of the data is \_\_\_\_\_ .
30. The mid point of a class is called \_\_\_\_\_ .
31. The class mark of the class interval 4.7 – 6.3 is \_\_\_\_\_ .

**Write True or False :-**

32. The difference of the highest & the lowest value in the data is called class - size of the data.
33. Cumulative frequency of the last class is the total of all frequencies in the data.
34. The mean of 35 observations is 45. If the new mean is 51, then each of the observations is increased by 8.

35. Match the columns

Column 1	Column 2
(1) The mean of one digit prime numbers is	(a) $\bar{x}-3$
(2) The median of 11 observations is	(b) 2
(3) The value of x for which mode of 2, 2, 8, 4, 4, x, 6 is 2 is	(c) $\bar{x}+3$
(4) If 3 is subtracted from each observation whose mean is $\bar{x}$ then new mean is	(d) 4.25
	(e) 6th term

**PART-B**

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

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

39. 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 ?
40. 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.
41. 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.
42. 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 ?
43. For what value of  $x$  the mode of the following data : 13, 24, 13, 27, 17, 16, 17,  $x, 22, 21, 13, 17$  is 17 ?
44. 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.

45. 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

46. In three unit tests of Mathematics Priyal 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 ?

47. 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, 28, 43, 46, 46, 48, 49, 52, 58, 59, 60, 64, 52.

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

48. Find the mean from the following table

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

49. Draw the histogram from the following data

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

50. 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.

51. 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.

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

$x_i$	2	4	6	10	$p+5$
$f_i$	3	3	3	1	2

53. Given 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.

54. 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

55. 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

56. 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' & the frequencies for  $x_i = 30$  &  $x_i = 70$

57. 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

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

(i) The mean and median of the numbers corresponding to the vowels.

(ii) Which alphabet corresponds to the median.

59. 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 ?

60. 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

a) Make a frequency distribution table for the above data.

b) Mr. 'X' meets an accident and needs blood, His blood group is AB. How many of these students are universal Donars and how many are Universal Receptient.

61. 15 students of Govt. school spend the following numbers of hours in a month for cleanliness of 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.



62. A doctor suggests two ways for treatment of a particular disease 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 polygons for the above data on the graph.
63. Represent the marks of both the sections on the same graph by two frequency polygons.

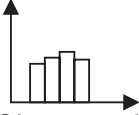
The following table shows number of voluntary blood donors as per day in voluntary blood donation camp organized in Delhi.

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 information.
- ii) On which day donation was maximum and on which day it was minimum.

# STATISTICS

## Answers

1. (b) Data
2. (d) Secondary data & Primary Data
3. (c) We use class - intervals in histogram
4. (b)  5. (c) Frequency Polygon.
6. (c) Class mark
7. (d) 17
8. (b) 6-11
9. (b)  $2x-y$
10. (a) 50
11. (c) 5.6
12. (b) 15
13. (d) 150
14. (a)  $a_1 + 4 \frac{(a_1 + a_1 + 2 + a_1 + 4 + a_1 + 6 + a_1 + 8)}{5}$
15. (a) 9
16. (c) 17
17. (d) 9
18. (d) 14.6
19. (b) 17
20. (a) 13
21. (b) 2.5
22. (c) 5th
23. (c) No change
24. (b) 42
25. (d) 19
26. (d)  $2 \{18x-4 = 8x(x-3+x+x+1)\}$
27. 2.6 cm
28. 23
29. 51
30. Class- Mark
31. 5.5
32. False
33. True
34. False
35. (i) d, (ii) e, (iii) b, (iv) a
36. 10, 99-109, 109-119, 119-129, 129-139
37. 37
38. 6
39. 35
40. 15:14
41.  $x + 3000$
42.  $x-300$
43. 17
44. 21 years
45.  $x=7, y=14$
46. 93
- 47.

15-25	25-35	35-45	45-55	55-65
3	6	4	7	5

48. 25

50. 

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

52.  $p=8$

55. 2:1

56. 5, 28, 24

58. 102, 9, I

59. 79.83, 80.33 Vinayak

60. (b) -6, 30

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

63. 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 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 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

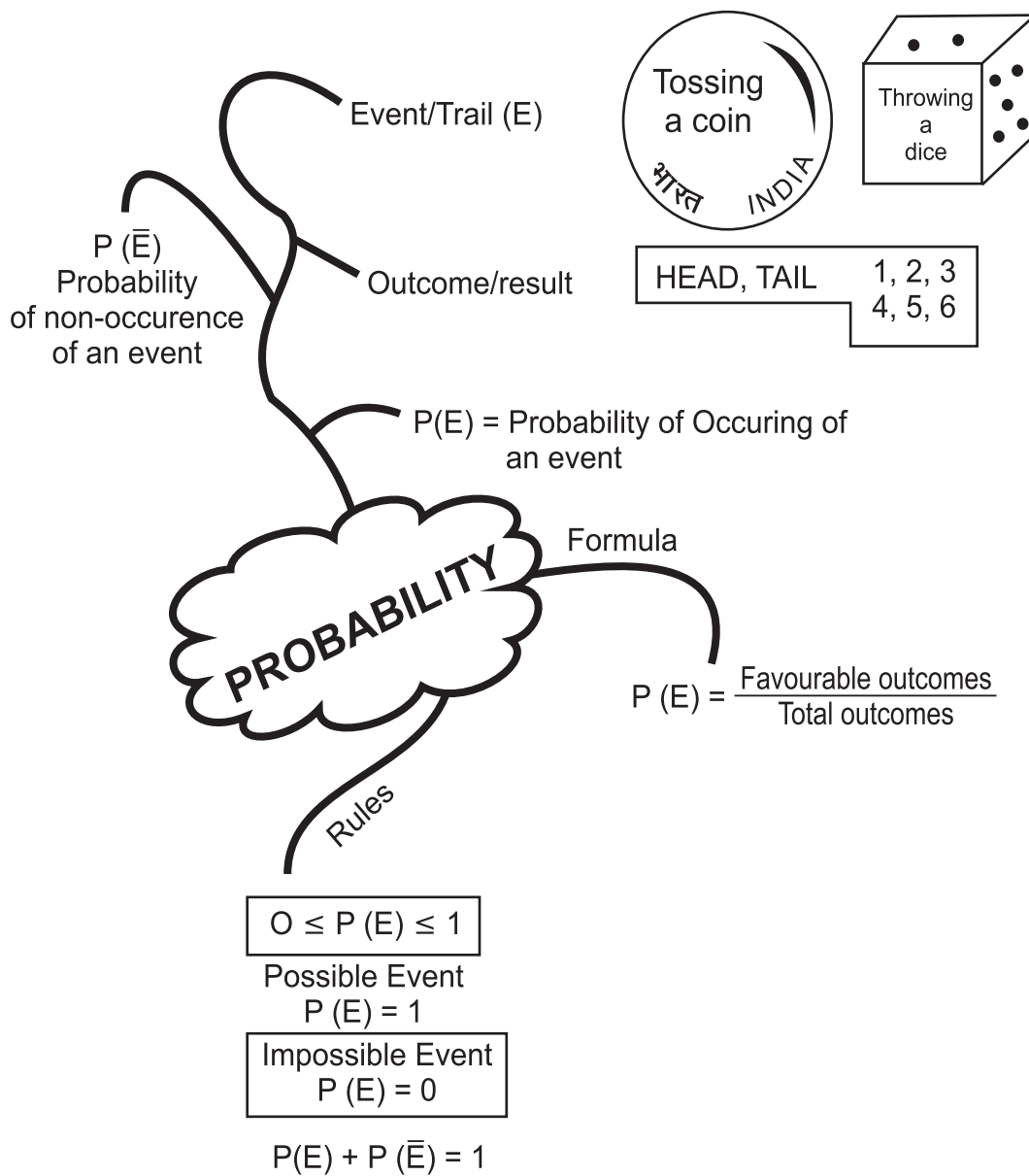
8. Draw Histogram and Frequency polygon. (4)

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

### MIND MAP



## KEY – POINTS

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

Example :

- (i) Tossing of a coin every time is a trial.
- (ii) Throwing a dice every time is a trial.

• Probability of an event E is given by

$$P(E) = \frac{\text{Number of favorable outcomes}}{\text{Total number of trials}}$$

The probability of an 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 unsure event B is 0.

$$P(B) = 0$$

The sum of all the probabilities of all the trials of an event is 1.

$$P(E_1) + P(E_2) + P(E_3) + \dots = 1$$

The sum of probabilities of happening and non-happening of an event is 1.

$$P(E) + P(\bar{E}) = 1$$

## PART – A

- Which of the following cannot be a probability of happening of an event?  
(a) 0 (b) Less than 0  
(c) More than 0 but less than 1 (d) 1
- Which of the following result is possible on throwing a dice ?  
(a) 0 (b) -1  
(c) 7 (d) 5
- A fruit basket contains 8 apples, 5 mangoes and 10 Oranges. The probability of choosing a mango from the basket is :  
(a)  $\frac{1}{5}$  (b) 5  
(c)  $\frac{1}{6}$  (d) 6
- A letter is chosen at random from English alphabets. The probability of that letter to be one of the letters of the word CYLINDER is.  
(a)  $\frac{4}{13}$  (b)  $\frac{13}{4}$   
(c)  $\frac{2}{13}$  (d)  $\frac{13}{2}$
- The probability of not happening of an event is  $\frac{0}{63}$ . The probability of happening of that event is :  
(a) 0.36 (b)  $\frac{3}{6}$   
(c)  $\frac{3}{7}$  (d) 0.37
- The probability of having a multiple of 5 an throwing a dice is :  
(a) 0 (b) 1  
(c)  $\frac{1}{6}$  (d)  $\frac{5}{6}$

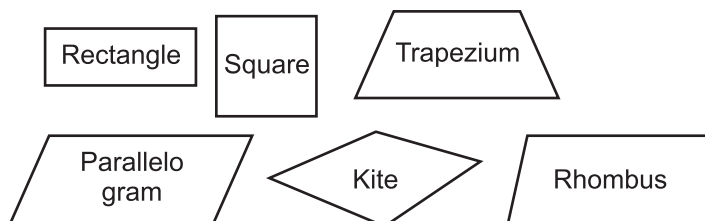
### For Q-No. 8 - 12

The ages (in years) of the workers of a factory is given below :

Age (in years)	10 -19	20 - 29	30 - 39	40 - 49	50 - 59	60 and more
Number of Workers	5	42	33	15	10	5

A worker is chosen at random. The probability of the age of the chosen worker being

8. 40 years or more is :
- (a)  $\frac{3}{11}$  (b)  $\frac{3}{22}$   
(c)  $\frac{1}{11}$  (d)  $\frac{1}{22}$
9. in between 30 - 39 is :
- (a)  $\frac{3}{11}$  (b)  $\frac{3}{10}$   
(c)  $\frac{11}{3}$  (d)  $\frac{10}{3}$
10. 39 years or less is :
- (a)  $\frac{3}{11}$  (b)  $\frac{5}{11}$   
(c)  $\frac{6}{11}$  (d)  $\frac{8}{11}$
11. The probability of 'number of workers' being a multiple of 5 is.
- (a)  $\frac{1}{3}$  (b)  $\frac{3}{2}$   
(c)  $\frac{2}{3}$  (d)  $\frac{4}{3}$
12. The probability of 'number of workers' being greater than 10 is :
- (a)  $\frac{2}{3}$  (b)  $\frac{1}{2}$   
(c)  $\frac{3}{2}$  (d)  $\frac{1}{3}$
13. The probability of the diameter of a circle being the longest chord of the circle is :
- (a) 1 (b) 0  
(c)  $\frac{1}{2}$  (d) cannot be determined
14. A coin is tossed 200 times. If head appears 120 times then the probability of having a tail is :
- (a)  $\frac{3}{5}$  (b)  $\frac{5}{3}$   
(c)  $\frac{2}{5}$  (d)  $\frac{5}{2}$
15. The probability of choosing a quadrilateral out of the given quadrilaterals having only its opposite sides equal is :



- (a)  $\frac{1}{6}$  (b)  $\frac{1}{3}$   
(c)  $\frac{2}{3}$  (d)  $\frac{1}{2}$



16. The probability of falling friday on the 8th day of June is.  
 (a)  $1/7$  (b)  $1/30$   
 (c)  $1/8$  (d)  $2/8$
17. A letter is selected at random from English alphabets. The probability of it being a roman number is  
 (a)  $5/26$  (b)  $3/13$   
 (c)  $7/26$  (d)  $4/13$

For Q. No. 18-20

18. There are 150 steel utensils, 20 alluminium utensils and 80 glass utensils in a kitchen. A utensil is chose at random. Find the probabilityn that the selected utensil is :  
 (a)  $3/5$  (b)  $2/15$   
 (c)  $1$  (d)  $0$
19. not of steel :  
 (a)  $3/5$  (b)  $2/5$   
 (c)  $5/3$  (d)  $5/2$
20. is of metal :  
 (a)  $17/25$  (b)  $25/17$   
 (c)  $3/5$  (d)  $2/25$

**Fill in the blanks :**

21. The probability of happening of an event can never be more than \_\_\_\_.
22. The probability of an impossible event is \_\_\_\_\_.
23. On tossing a coin, the possible outcomes are \_\_\_\_\_ and \_\_\_\_\_.
24. Getting a 9on throwing a dice is \_\_\_\_\_ event.
25. The sum of the probabilities of all the trials of an event is \_\_\_\_\_.

**State True or False**

26. The probability of choosing a white square on the chess board is 50%
27. While calculating the probability, numerator is always greater than denominator.
28. The probability of an event can be  $\sqrt{4}$ .
29. If the probability of an event is 1. then the event is possible.
30. If the probability of happening of an event is 0.42 then the probability of non-happening of that event is 0.58

Match the following :

31. Probability of possible event (i) 1
32. Probability of choosing 'P' from the word APPLE (ii) 0

33. Probability of an impossible event (iii) 3
34. Not the probability of an event (iv)  $\frac{2}{5}$
35. What is the sum of the probabilities of happening of an event & not happening of the event?
36. What could be the probability of happening of an event E?
37. If the probability of an event to occur is 55%, then what is the probability of non occurrence of that event.
38. What is sum of the probabilities of all the possible events of a random experiment?
39. What is the probability of coming a prime number on throwing of a die?
40. A coin is tossed once, what is the probability of getting a tail?
41. A die is tossed once, what is the probability of getting an even number?
42. A bag contains 2 red, 3 green & 1 white ball, what is the probability that the ball picked up is black.
43. In the word MATHEMATICS, what is the probability of choosing a vowel?
44. During an interview for estate manager 15 candidates appeared. Out of which 8 were retired army man, 4 were retired principals & 3 others from different departments. What is the probability of selecting a retired army man for this post?
45. A bag contains slips with numbers between 3 & 32. What is the probability that a slip chosen contains multiples of 4?

### PART-B

46. 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%
47. 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.
48. 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.
49. At a traffic light on 28th April, out of 310 vehicles which crossed the light, 200 were cars, 60 were two wheelers & 50 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.
50. 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

51. 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 for chapter-1, Number system. What is the probability that the student chosen
- Prepares project on chapter 1
  - Prepares project on chapter 2
52. 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.
53. 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
- its birth month is November
  - The month contains 31 days.

### PART-C

54. 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
- HB level less than 10.
  - HB level greater than or equal to 12 but less than 16.
55. 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

56. 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?
57. 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.
58. 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

59. Out of quadrilaterals - Square, rectangle, rhombus, parallelogram and trapezium, a quadrilateral is chosen at random. Find the probability that the quadrilateral chosen has.
- All the angles right angles.
  - both the diagonals bisect each other.
  - Diagonals are perpendicular to each other.
  - Only one of the diagonal bisect the other.
60. 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.
- 9 at one's place.
  - multiple of 4
  - perfect square

61. 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.

- at least ₹ 701 daily
  - at most ₹ 900 daily
  - at most ₹ 1300 daily
62. 
$$\text{BMI} = \frac{\text{Mass in Kg.}}{(\text{height in metres})^2}$$

The following table shows the BMI of different categories.

S.No.	Category	BMI (kg/m <sup>2</sup> )
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 chosen is overweight.

63. Read the lines carefully

Horse is horse, of course, of course.

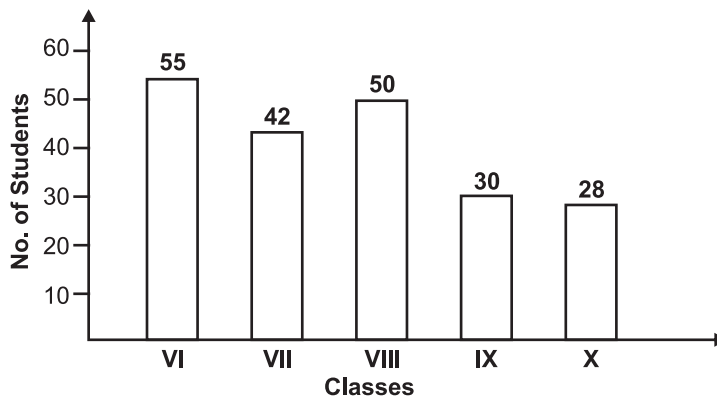
And no one can talk to horse of course.

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.

64. 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

- Deputed for sitting
- a student of class X.
- member of welcome committee.

65. 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. A plant is chosen at random. Find the probability that the chosen plant is

- (i) On the longest side.
- (ii) Sun flower plants.
66. 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.
67. 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**

1. (b) Less than 0
2. (d) 5
3. (c)  $\frac{1}{6}$
4. (a)  $\frac{4}{13}$
5. (d) 0.37
6. (b) 1
7. (c)  $\frac{1}{6}$
8. (a)  $\frac{3}{11}$
9. (b)  $\frac{3}{10}$
10. (d)  $\frac{8}{11}$
11. (c)  $\frac{2}{3}$
12. (b)  $\frac{1}{2}$
13. (a) 1
14. (c)  $\frac{2}{5}$
15. (b)  $\frac{1}{3}$
16. (a)  $\frac{1}{7}$
17. (c)  $\frac{7}{26}$
18. (d) 0
19. (b)  $\frac{2}{5}$
20. (a)  $\frac{17}{25}$
21. 1
22. 0
23. Head, Tail
24. Impossible
25. 1
26. True
27. False
28. False
29. True
30. True
31. (ii) 0
32. (iv)  $\frac{2}{5}$

33. (i) 1  
34. (iii) 3  
35. 1  
36.  $0 \leq P(E) \leq 1$   
37. 45%  
38. 1  
39.  $\frac{1}{2}$   
40.  $\frac{1}{2}$   
41.  $\frac{1}{2}$   
42. 0  
43.  $\frac{4}{11}$   
44.  $\frac{8}{15}$   
45.  $\frac{7}{28} = \frac{1}{4}$   
46. (i)  $\frac{5}{12}$                       (ii)  $\frac{1}{24}$   
47. (i)  $\frac{11}{43}$                       (ii)  $\frac{7}{43}$   
48. (i)  $\frac{11}{24}$                       (ii)  $\frac{1}{8}$   
49. (i)  $\frac{39}{40}$                       (ii)  $\frac{23}{310}$   
50. (i)  $\frac{13}{20}$                       (ii)  $\frac{1}{5}$   
51. (i)  $\frac{26}{51}$                       (ii)  $\frac{25}{51}$   
52.  $\frac{5}{7}$   
53. (i)  $\frac{1}{10}$                       (ii)  $\frac{7}{12}$   
54. (i)  $\frac{2}{7}$                       (ii)  $\frac{22}{35}$

55. (i)  $\frac{4}{7}$                       (ii)  $\frac{3}{7}$
56. (i)  $\frac{17}{50}$                       (ii)  $\frac{7}{20}$
57. (i)  $\frac{99}{200}$                       (ii)  $\frac{2}{25}$                       (iii)  $\frac{6}{25}$
58. (i)  $\frac{7}{15}$                       (ii)  $\frac{2}{15}$
59. (i)  $\frac{2}{5}$                       (ii)  $\frac{4}{5}$                       (iii)  $\frac{3}{5}$                       (iv)  $\frac{1}{5}$
60. (i)  $\frac{32}{323}$                       (ii)  $\frac{80}{323}$                       (iii)  $\frac{17}{323}$
61. (i)  $\frac{18}{25}$                       (ii)  $\frac{91}{200}$                       (iii) 1
62.  $\frac{1}{3}$
63. (i)  $\frac{1}{7}$                       (ii) Horse
64. (i)  $\frac{92}{205}$                       (ii)  $\frac{28}{205}$                       (iii)  $\frac{11}{41}$
65. (i)  $\frac{9}{20}$                       (ii)  $\frac{23}{60}$
66. (i)  $\frac{41}{500}$                       (ii)  $\frac{1}{8}$                       (iii)  $\frac{729}{1000}$
67. (i)  $\frac{236}{682}$                       (ii)  $\frac{138}{682}$

## 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**  
**MATHEMATICS**

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**Time: 3 Hrs.**

**M.M. 80**

**General Instruction:**

1. All questions are compulsory.
2. The paper consists of 40 questions divided into four sections A, B, C and D. Section A comprises of 20 questions of 1 marks each. Section B comprises of 6 question of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 question of 4 marks each.
3. There is no over all choice in this question paper. All though internal choices has been provided in some question.

**SECTION - A**

1.  $\sqrt[4]{\sqrt[3]{2^2}}$
- |                       |             |
|-----------------------|-------------|
| a) $2^{-\frac{1}{6}}$ | b) $2^{-6}$ |
| c) $2^{\frac{1}{6}}$  | d) $2^6$    |

or

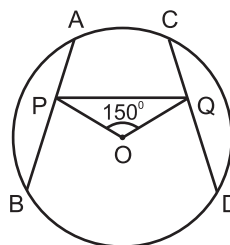
$$(625)^{0.16} \times (625)^{0.09} = ?$$

- |        |           |
|--------|-----------|
| a) 5   | b) 25     |
| c) 125 | d) 625.25 |
2. If  $\frac{x}{y} + \frac{y}{x} = -1$  ( $x, y \neq 0$ ). the value of  $x^3 - y^3$  is
- |       |                  |
|-------|------------------|
| a) -1 | b) 1             |
| c) 0  | d) $\frac{1}{2}$ |
3. If  $a + b + c = 0$  then  $\frac{a^2}{bc} + \frac{b^2}{ca} + \frac{c^2}{ab} = ?$
- |       |      |
|-------|------|
| a) 1  | b) 0 |
| c) -1 | d) 3 |

4. The values of  $249^2 - 248^2$  is
- |          |        |
|----------|--------|
| a) $1^2$ | b) 477 |
| c) 487   | d) 497 |
5. If  $(2, 0)$  is a solution of the linear equation  $2x + 3y = K$ , then the value of  $K$  is
- |      |      |
|------|------|
| a) 4 | b) 6 |
| c) 5 | d) 2 |
6. How many linear equations in  $x$  and  $y$  can be satisfied by  $x = 1$  and  $y = 2$ ?
- |                    |          |
|--------------------|----------|
| a) Only One        | b) Two   |
| c) Infinitely many | d) Three |
7. The point whose ordinate is 4 and which lies on  $y$ -axis is
- |             |             |
|-------------|-------------|
| a) $(4, 0)$ | b) $(0, 4)$ |
| c) $(1, 4)$ | d) $(4, 2)$ |
- or
- If  $P(-1, 1)$ ,  $Q(3, -4)$ ,  $R(1, -1)$ ,  $S(-2, -3)$  and  $T(-4, 4)$  are plotted on the graph paper, then the points in the fourth quadrant are
- |            |            |
|------------|------------|
| a) P and T | b) Q and R |
| c) Only S  | d) P and R |
8. The angles of a triangle are in the ratio  $2 : 4 : 3$ . The smallest angle of the triangle is
- |               |               |
|---------------|---------------|
| a) $60^\circ$ | b) $40^\circ$ |
| c) $80^\circ$ | d) $20^\circ$ |
9. Two sides of a triangle are of length 5cm and 1.5cm. The length of the third side of the triangle cannot be.
- |          |          |
|----------|----------|
| a) 3.4cm | b) 3.6cm |
| c) 3.8cm | d) 4.1cm |

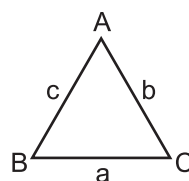
10. The figure obtained by joining the mid point of the sides of a rhombus, taken in order is
- a) a rhombus    b) a rectangle  
 c) a square    d) any Parallelogram

11. In Fig. AB and CD are two equal chords of a circle with centre O. OP and OQ are perpendiculars on chords AB and CD respectively. If  $\angle POQ = 150^\circ$ , then  $\angle APQ$  is equal to



- a)  $30^\circ$     b)  $75^\circ$   
 c)  $15^\circ$     d)  $60^\circ$

12. By the Heron's formula, the area of  $\triangle ABC$  is given by  $\Delta =$  \_\_\_\_\_ sq. unit.



13. The sides of a triangle are 56cm, 60cm, and 52cm long. Then the area of the triangle is
- a)  $1322\text{cm}^2$     b)  $1311\text{cm}^2$   
 c)  $1344\text{cm}^2$     d)  $1392\text{cm}^2$

14. The sides of a triangle are in the ratio 5:12:13 and its perimeter is 150cm. The area of the triangle is
- a)  $375\text{cm}^2$     b)  $750\text{cm}^2$   
 c)  $250\text{cm}^2$     d)  $500\text{cm}^2$

15. The total surface area of a cone whose radius is  $\frac{r}{2}$  and short height  $2l$  is
- a)  $2\pi r(l + r)$     b)  $\pi r(l + \frac{r}{4})$   
 c)  $\pi r(l + r)$     d)  $2\pi r l$

16. The radius of a hemispherical balloon increases from 6cm to 12cm as air is being pumped into it. the ratios of the surface areas of the

balloon in the two cases is

- a) 1 : 4    b) 1 : 3  
c) 2 : 3    d) 2 : 1

17. The class mark of the class 90 – 120 is :

- a) 90    b) 105  
c) 115    d) 120

18. The mean of five number is 30. If one number is excluded their mean becomes 28. The excluded number is :

- a) 28    b) 30  
c) 35    d) 38

19. A coin is tossed 60 times and the tail appears 35 times. What is the probability of getting a head ?

- a)  $\frac{7}{12}$     b)  $\frac{12}{7}$   
c)  $\frac{5}{12}$     d)  $\frac{12}{5}$

20. Fill in the blanks :

If E be an event, then  $P(E) + P(\text{not } E) = \underline{\hspace{2cm}}$

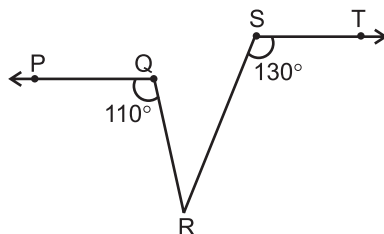
### SECTION - B

21. If the point (3, 4) lies on the graph of  $3y = ax + 7$ , then find the value of  $a$ .

or

Find four different solutions of  $2x + y = 6$ .

22. If  $PQ \parallel ST$ ,  $\angle PQR = 110^\circ$  and  $\angle RST = 130^\circ$ , find  $\angle QRS$





23. Find the area of the trapezium whose parallel sides are 14cm and 10cm and whose height is 6cm.
24. The perimeter of an isosceles triangle is 32cm. The ratio of the equal side to its base is 3:2. Find the area of the triangle.
25. The diameter of a roller is 84cm and its length is 120cm. It takes 500 complete revolutions to move once over to level a playground. Find the area of the playground in  $m^2$ .
26. A die was rolled 100 times and the number of times 6 appeared was noted. If the probability of getting a 6 be  $\frac{2}{5}$ , how many times did 6 come up ?

or

1500 families with 2 children each, were selected randomly and the following data were recorded.

Number of girls in a family	2	1	0
Number of families	102	675	723

out of these families, one family is selected at random. What is the probability that the selected family has.

- i) 2 girls                                      ii) 1 girl

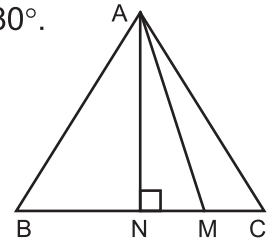
### SECTION - C

27. If  $a = 2 + \sqrt{3}$ , then find the value of  $a - \frac{1}{a}$ .
28. Factorise :  $a(a-1) - b(b-1)$
- or
- If  $P = 2 - a$ , prove that  $a^2 + 6ap + p^3 - 8 = 0$
29. The taxi fare in a city as follows : for the first kilometre, the fare is ₹ 25 and for the subsequent distance it is ₹ 14 per km. Taking the distance covered as  $x$  km and total fare as ₹  $y$ , write the linear equation for this information and draw its graph.
30. Three vertices of a rectangle are  $(3, 2)$ ,  $(-4, 2)$  and  $(-4, 5)$ , plot these points on a graph paper and the coordinates of the fourth vertex.

31. Prove that the sum of three angles of a triangle is  $180^\circ$ .

or

In a  $\triangle ABC$ ,  $\angle B > \angle C$  if  $AM$  is the bisector of  $\angle ABC$  and  $AN \perp BC$ . Prove that  $\angle MAN = \frac{1}{2}(\angle B - \angle C)$



32. The measure of angles of a quadrilateral are  $(x+20)^\circ$ ,  $(x-20)^\circ$ ,  $(2x+5)^\circ$  &  $(2x-5)^\circ$ . Find the value of  $x$ .

or

$E$  is the mid point of the median  $AD$  of  $\triangle ABC$  and  $BE$  is produced to meet  $AC$  at  $F$ . Show that  $AF = \frac{1}{3} AC$ .

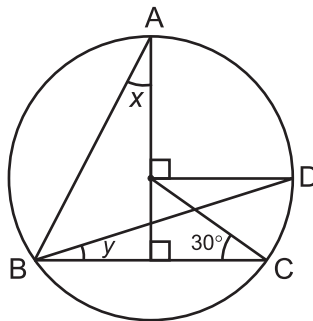
33. Prove that parallelogram on the same base and between the same parallels are equal in area.

or

$ABCD$  is a trapezium in which  $AB \parallel DC$ ,  $DC = 30\text{cm}$  and  $AB = 50\text{cm}$ . If  $x$  and  $y$  are, respectively, the mid points of  $AD$  and  $BC$  prove that

$$\text{ar}(\triangle DCYX) = \frac{7}{9} \text{ar}(\triangle XYBA)$$

34. In figure,  $O$  is the centre of the circle.  $\angle BCO = 30^\circ$ . Find  $x$  and  $y$ .



### SECTION - D

35. Show that :

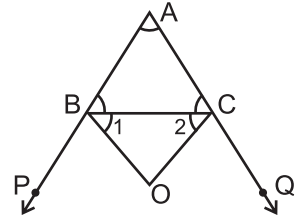
$$\frac{1}{(3 - \sqrt{8})} - \frac{1}{(\sqrt{8} - \sqrt{7})} + \frac{1}{(\sqrt{7} - \sqrt{6})} - \frac{1}{(\sqrt{6} - \sqrt{5})} + \frac{1}{(\sqrt{7} - 6)} = 5$$

36. Factorise the expression

$$8x^3 + 27y^3 + 36x^2y + 54xy^2$$

37. In a  $\triangle ABC$ .

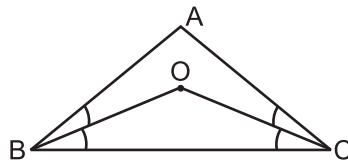
- i) The sides AB and AC are produced to P and Q respectively. If the bisectors of  $\angle PBC$  and  $\angle QCB$  intersect at a point O.



Prove that  $\angle BOC = 90^\circ - \frac{1}{2}\angle A$

- ii) The bisectors of  $\angle B$  and  $\angle C$  intersect each other at a point O.

Prove that  $\angle BOC = 90^\circ + \frac{1}{2}\angle A$



or

If the bisector of an angle of a triangle also bisect the opposite side. Prove that the triangle is isosceles.

38. Construct a triangle XYZ in which  $\angle Y = 30^\circ$ ,  $\angle Z = 90^\circ$  and  $XY + YZ + ZX = 11\text{cm}$ . Write steps of construction also.

39. The radius of a sphere is increased by 10%. Prove that the volume will be increased by 33.1% approximately.

or

The ratio of the curved surface area and the total surface area of a circular cylinder is 1:2 and the total surface area is  $616\text{cm}^2$ . Find its volume

40. The mean marks (out of 100) of boys and girls in an examination are 70 and 73 respectively. If the mean marks of all the students in the examination is 71. Find the ratio of the number of boys to the number of girls.

or

The mean of 100 items was found to be 64. Later on it was discovered that two items misread as 26 and 9 instead of 36 and 90 respectively. Find the correct mean.

**SOLUTION**  
**PRACTICE QUESTION PAPER - I**

1. c)  $2^{\frac{1}{6}}$  or a) 5
2. c) 0
3. d) 3
4. d) 497
5. a) 4
6. c) Infinitely many
7. b) (0, 4) or b) Q and R
8. b)  $40^\circ$
9. a) 3.4cm
10. b) a rectangle
11. b)  $75^\circ$
12.  $\Delta = \sqrt{s(s-a)(s-b)(s-c)}$
13. c)  $13\ 4\ 4\text{cm}^2$
14. b)  $750\text{cm}^2$
15. b)  $\pi r ( l + \frac{r}{4} )$
16. a) 1 : 4
17. b0 105
18. d) 38
19. c)  $\frac{5}{12}$
20.  $P(E) + P(\text{Not } E) = 1$  [ $P(E) + P(\bar{E}) = 1$ ]
21.  $a = \frac{5}{3}$  or  $y = 6 - 2x$  Four solutions are
 

$(x = 1 \Rightarrow y = 4)$	$(x = 3 \Rightarrow y = 0)$
$(x = 2 \Rightarrow y = 2)$	$(x = 4 \Rightarrow y = -2)$

x	1	2	3	4
y	4	2	0	-2

other solutions  
may be possible
22.  $\angle QRS = 60^\circ$
23.  $72\text{cm}^2$

24.  $32\sqrt{2} \text{ cm}^2$

25.  $1584 \text{ m}^2$

26. 40 times      or      i)  $\frac{102}{1500} = 0.068$       ii)  $\frac{675}{1500} = 0.45$

27.  $\boxed{a - \frac{1}{a} = 2\sqrt{3}}$        $\therefore a = 2 + \sqrt{3}$

$\therefore \frac{1}{a} = 2 - \sqrt{3}$

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

28.  $a(a-1) - b(b-1) = a^2 - a - b^2 + b = (a^2 - b^2) - (a - b) = (a - b)(a + b) - (a - b)$   
 $= (a - b)(a + b - 1)$

Hence  $a(a - b) - b(b - 1) = (a - b)(a + b - 1)$

or

$P = 2 - a \Rightarrow a + p + (-2) = 0$

$\Rightarrow a^3 + p^3 + (-2)^3 = 3 \times a \times p \times (-2)$

$\Rightarrow a^3 + p^3 - 8 = -6ap$

$\Rightarrow a^3 + 6ap + p^3 - 8 = 0$

29.  $Y = 25 + 14(x - 1) \Rightarrow y = 25 + 14x - 14 \Rightarrow \boxed{y = 14x + 9}$

Take any two points such as  $(x = 0 \Rightarrow y = 9)$  and  $(x = -1 \Rightarrow y = -5)$

on the graph paper take distance along x-axis and fare (in ₹) along y-axis.

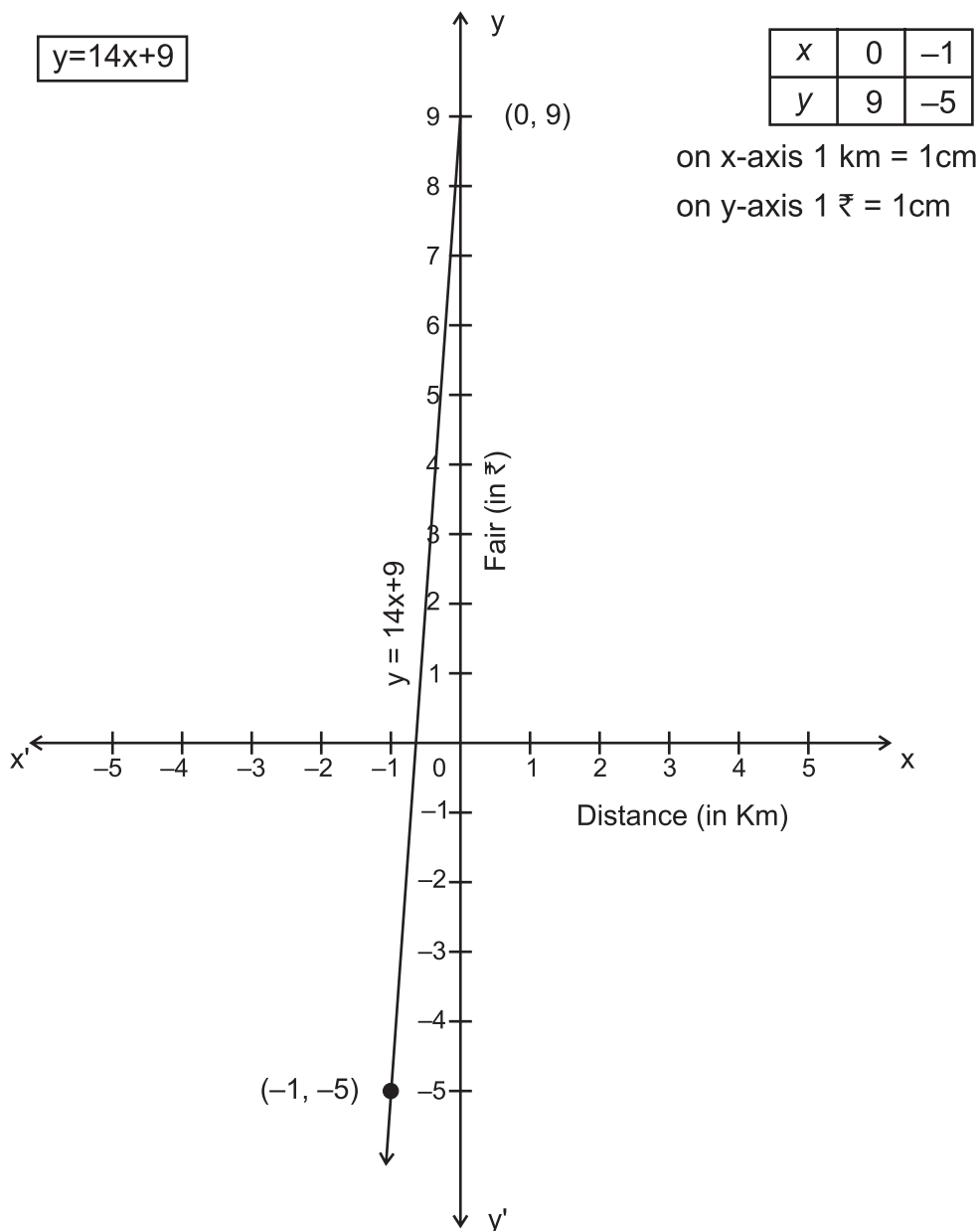
Now, plot the points A(0, 9) and B(-1, -5) on

the graph paper

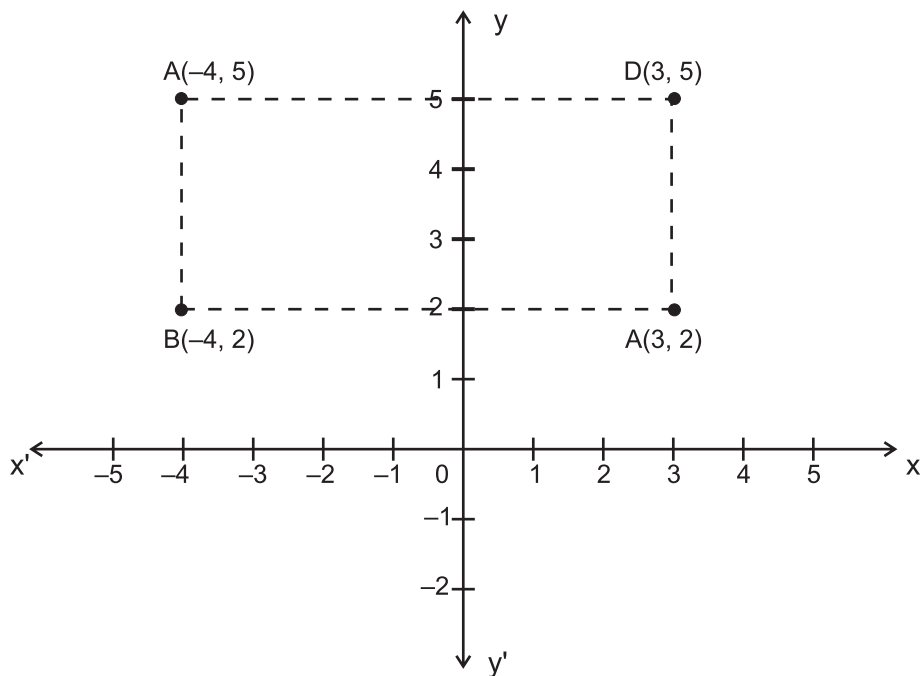
x	0	-1
y	9	-5

Join AB and produce it on both side to obtain the required graph.

$$y=14x+9$$



30. Plot the three vertices of the rectangle as  $A(3, 2)$ ,  $B(-4, 2)$ ,  $C(-4, 5)$ . To find the coordinate of the fourth vertex  $D$ . Since  $ABCD$  is a rectangle. The opposite sides of a rectangle are equal. So the abscissa of  $D$  should be equal to abscissa of  $A$ . i.e. 3 and the ordinate of  $D$  should be equal to ordinate of  $C$ . i.e. 5. So the coordinates of  $D$  are  $(3, 5)$ .



31. Prove that the sum of the three angles of a triangle is  $180^\circ$ .

or

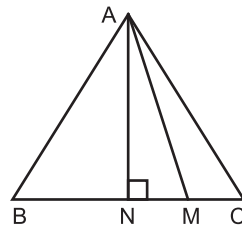
In a  $\triangle ABC$ ,  $\angle B > \angle C$ , If  $AM$  is the bisector of  $\angle BAC$  and  $AN \perp BC$ .

Prove that  $\angle MAN = \frac{1}{2} (\angle B - \angle C)$

Given :-  $\triangle ABC$ , in which  $\angle B > \angle C$ ,  $AN \perp BC$

and  $AM$  is the bisector of  $\angle A$

To prove :  $\angle MAN = \frac{1}{2} (\angle B - \angle C)$



Proof : Since  $AM$  is the bisector of  $\angle A \Rightarrow \angle MAB = \frac{1}{2} \angle A$  \_\_\_\_\_ (i)

In the right angle  $\triangle ANB$

$\angle B + \angle NAB = 90^\circ \Rightarrow \angle NAB = 90^\circ - \angle B$  \_\_\_\_\_ (ii)

$$\begin{aligned} \therefore \angle MAN &= \angle MAB - \angle NAB = \frac{1}{2} \angle A - (90^\circ - \angle B) \\ &= \frac{1}{2} \angle A - \frac{1}{2} (\angle A + \angle B + \angle C) + \angle B \quad [\because \frac{1}{2} (\angle A + \angle B + \angle C) = 90^\circ] \end{aligned}$$

$$= \frac{1}{2} (\angle B - \angle C)$$

Hence  $\angle MAN = \frac{1}{2} (\angle B - \angle C)$

32. We know that  $(x+20)^\circ + (x-20)^\circ + (2x+5)^\circ + (2x-5)^\circ = 360^\circ$

$$= 6x = 360^\circ$$

$$x = \frac{360^\circ}{6}$$

$$x = 60$$

**or**

Draw  $DP \parallel EF$

In  $\triangle ADP$ , E is the mid point of AD and  $EF \parallel DP$

$\Rightarrow$  F is the mid point of AP

(By converse of mid point theorem)

in  $\triangle BFC$ , D is the mid point of BC and  $DP \parallel BF$

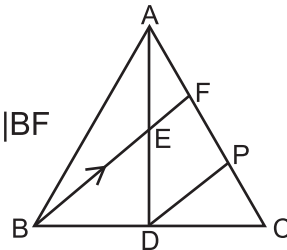
$\therefore$  P is the mid point of FC

Then  $AF = FP = PC$

$$AF + FP + PC = AC$$

$$AF + AF + AF = AC \Rightarrow 3AF = AC \Rightarrow AF = \frac{1}{3} AC$$

Hence  $AF = \frac{1}{3} AC$



33. Given :- Two  $\parallel$  gms ABCD and ABEF on the same base AB and between the same parallel lines AB and FC.

To prove : ar ( $\parallel$  gm ABCD) = ar ( $\parallel$  gm ABEF)

Proof : In  $\triangle ADF$  and  $\triangle BCE$

$$AD = BC \quad (\text{opposite sides of } \parallel \text{ gm})$$

$$AF = BE \quad (\text{opposite sides of } \parallel \text{ gm})$$

$$\angle DAF = \angle CBE \quad (\because AD \parallel BC \text{ and } AF \parallel BE)$$

angle between AD and AF = angle between BC and BE

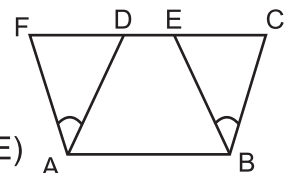
$$\therefore \triangle ADF \cong \triangle BCE \text{ (SAS Criteria)}$$

$$\therefore \text{ar} (\triangle ADF) = \text{ar} (\triangle BCE) \quad (i)$$

$$\begin{aligned} \therefore \text{ar} (\parallel \text{ gm ABCD}) &= \text{ar} (\square ABED) + \text{ar} (\triangle BCE) \\ &= \text{ar} (\square ABED) + \text{ar} (\triangle ADF) \text{ using (i)} \end{aligned}$$

$$= \text{ar} (\parallel \text{ gm ABEF})$$

$$\text{Hence} \quad = \text{ar} (\parallel \text{ gm ABCD}) = \text{ar} (\parallel \text{ gm ABEF})$$





or

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

Let  $d$  be distance between  $AB$  and  $XY$

then  $D$  is the distance between  $XY$  and  $DC$ .

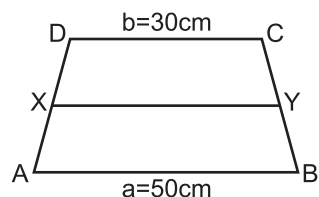
$$\text{ar (trap. ABXY)} = \frac{1}{2} \left( a + \frac{a+b}{2} \right) d = \frac{(3a+b)d}{4}$$

$$\text{ar (trap XYCD)} = \frac{1}{2} \left( \frac{a+b}{2} + b \right) d = \frac{(a+3b)d}{4}$$

$$\frac{\text{ar(trap xy)}}{\text{ar(trap XYBA)}} = \frac{\text{ar(DCYX)}}{\text{ar(XYBA)}} = \frac{\frac{(3a+b)d}{4}}{\frac{(a+3b)d}{4}}$$

$$\frac{\text{ar(DCYX)}}{\text{ar(XYBA)}} = \frac{a+3b}{3a+b} = \frac{50+3 \times 30}{3 \times 50+30} = \frac{50+90}{150+30} = \frac{140}{180} = \frac{7}{9}$$

$$\therefore \text{ar (DCYX)} = \frac{7}{9} \text{ar (XYBA)}$$



34. In  $\triangle OEC$

$$\angle EOC = 180^\circ - (90^\circ + 30^\circ) = 180^\circ - 120^\circ = 60^\circ$$

$$\therefore \angle COD = 90^\circ - 60^\circ = 30^\circ$$

$$\angle CBD = \frac{1}{2} \angle COD = \frac{1}{2} \times 30^\circ = 15^\circ$$

$$\Rightarrow y = 15^\circ \quad [ \because \angle CBD = y ]$$

$$\text{Again } \angle ABD = \frac{1}{2} \angle AOD = \frac{1}{2} \times 90^\circ = 45^\circ$$

$$\text{and } \angle ABC = \angle ABD + y = 45^\circ + 15^\circ = 60^\circ = \angle ABE$$

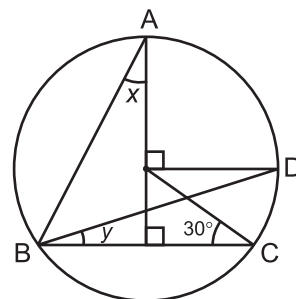
In  $\triangle ABE$

$$\angle BAE = 180^\circ - (90^\circ + \angle ABE) = 180^\circ - (90^\circ + 60^\circ)$$

$$x = \angle BAE = 180^\circ - 150^\circ = 30^\circ$$

$$\Rightarrow x = 30^\circ$$

$$\text{Hence } x = 30^\circ \text{ and } y = 15^\circ$$



35. on Rationalising

$$\frac{1}{3-\sqrt{8}} = \frac{1}{(3-\sqrt{6})} \times \frac{(3+\sqrt{8})}{(3+\sqrt{8})} = \frac{3+\sqrt{8}}{(3)^2-(\sqrt{8})^2} = \frac{3+\sqrt{8}}{9-8} = \frac{3+\sqrt{8}}{1} = 3+\sqrt{8}$$

Similarly

$$\frac{1}{\sqrt{8}-\sqrt{7}} = \sqrt{8}-\sqrt{7}, \quad \frac{1}{\sqrt{7}-\sqrt{6}} = \sqrt{7}+\sqrt{6}, \quad \frac{1}{\sqrt{6}-\sqrt{5}} = \sqrt{6}+\sqrt{5}, \quad \frac{1}{\sqrt{5}-2} = \sqrt{5}+2$$

L.H.S.

$$\begin{aligned} & \frac{1}{(3-\sqrt{8})} - \frac{1}{(\sqrt{8}-\sqrt{7})} + \frac{1}{(\sqrt{7}-\sqrt{6})} - \frac{1}{(\sqrt{6}-\sqrt{5})} + \frac{1}{(\sqrt{5}-2)} \\ & (3-\sqrt{8}) - (\sqrt{8}-\sqrt{7}) + (\sqrt{7}-\sqrt{6}) - (\sqrt{6}-\sqrt{5}) + (\sqrt{5}+2) \\ & 3-\sqrt{8} - \sqrt{8}-\sqrt{7} + \sqrt{7}-\sqrt{6} - \sqrt{6}-\sqrt{5} + \sqrt{5}+2 \\ & 3+2 \\ & 5 \\ & = \text{R.H.S} \end{aligned}$$

36.  $8x^3 + 27y^3 + 36x^2y + 54xy^2$

$$= (2x)^3 + (3y)^3 + 18xy(2x+3y)$$

$$[\because a^3+b^3+3ab(a+b)=(a+b)^3]$$

$$= (2x)^3 + (3y)^3 + 3(2x)(3y)(2x+3y)$$

$$= (2x+3y)^3 = (2x+3y)(2x+3y)(2x+3y)$$

37. i)  $\angle B + \angle CBP = 180^\circ$  (Liner Pair)

$$\Rightarrow = \frac{1}{2}\angle B + \frac{1}{2}\angle CBP = 90^\circ$$

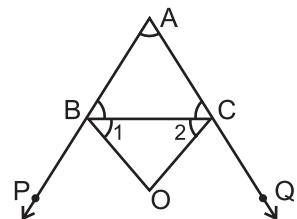
$$= \frac{1}{2}\angle B + \angle 1 = 90^\circ$$

$$= \angle 1 = 90^\circ - \frac{1}{2}\angle B$$

Again  $\angle C + \angle BCQ = 180^\circ$

$$= \frac{1}{2}\angle C + \frac{1}{2}\angle BCQ = 90^\circ$$

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



$$\Rightarrow \angle 2 = 90^\circ - \frac{1}{2} \angle C \quad \text{_____ (ii)}$$

In  $\triangle BOC$   $\angle 1 + \angle 2 + \angle BOC = 180^\circ$  (Angle sum property of  $\triangle$ 's)

$$\angle BOC = 180^\circ - (\angle 1 + \angle 2) = 180^\circ - (90^\circ - \frac{1}{2} \angle B + 90^\circ - \frac{1}{2} \angle C)$$

$$\angle BOC = \frac{1}{2}(\angle B + \angle C) = \frac{1}{2}(\angle A + \angle B + \angle C) - \frac{1}{2} \angle A$$

$$= \frac{1}{2} \times 180^\circ - \frac{1}{2} \angle A \quad [ \because \angle A + \angle B + \angle C = 180^\circ ]$$

$$\angle BOC = 90^\circ - \frac{1}{2} \angle A$$

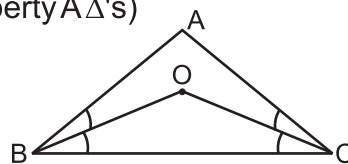
ii) In  $\triangle ABC$

$\angle A + \angle B + \angle C = 180^\circ$  (Angle sum property  $\triangle$ 's)

$$\Rightarrow \frac{1}{2} \angle A + \frac{1}{2} \angle B + \frac{1}{2} \angle C = 90^\circ$$

$$\Rightarrow \frac{1}{2} \angle A + \angle 1 + \angle 2 = 90^\circ$$

$$\Rightarrow \angle 1 + \angle 2 = (90^\circ - \frac{1}{2} \angle A) \quad \text{_____ (i)}$$



In  $\triangle BOC$

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

$$(90^\circ - \frac{1}{2} \angle A) + \angle BOC = 180^\circ$$

Using equation (i)

$$\angle BOC = 90^\circ + \frac{1}{2} \angle A$$

or

Given :- A point D on side BC of a  $\triangle ABC$  such that

$$\angle BAD = \angle CAD$$

and  $AD = CD$

To prove :-  $AB = AC$

Construction :- Produce AD to a point E such that

$AD = DE$  and Join EC

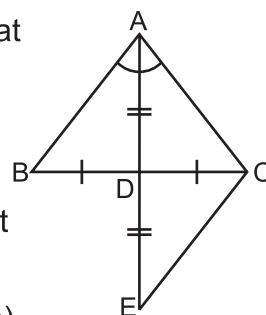
Proof : In  $\triangle ABD$  and  $\triangle ECD$

$BD = CD$  (Given)

$AD = ED$  (By construction)

$\angle ADB = \angle EDC$  (V.O.A.)

$\Rightarrow \triangle ABD \cong \triangle ECD$  (SAS)



$$\left. \begin{array}{l} \text{So, } AB = EC \\ \text{and } \angle BAD = \angle CED \end{array} \right\} \text{(CPT) } \underline{\hspace{2cm}} \text{ (i)}$$

$$\text{Also } \angle BAD = \angle CAD \text{ (Given) } \underline{\hspace{2cm}} \text{ (ii)}$$

From (i) and (ii)

$$\angle CAD = \angle CED$$

$$\Rightarrow AC = EC \text{ [side opposite to equal angles] } \underline{\hspace{2cm}} \text{ (iii)}$$

From (i) and (iii)

$$\left. \begin{array}{l} AB = EC \\ AC = EC \end{array} \right\} \Rightarrow AB = AC$$

Hence  $\triangle ABC$  is isosceles.

39. The volume of the sphere =  $\frac{4}{3} \pi r^3$

$$10\% \text{ increase in radius} = 10\% r$$

$$\text{Increase radius} = r + \frac{1}{10} r = \frac{11}{10} r$$

the volume of the sphere now becomes

$$= \frac{4}{3} \pi \left( \frac{11}{10} r \right)^3 = \frac{4}{3} \pi \times \frac{1331}{1000} r^3$$

$$= \frac{4}{3} \pi \times 1.331 r^3$$

$$= \frac{4}{3} \pi \times 1.331 r^3 - \frac{4}{3} \pi r^3 = \frac{4}{3} \pi r^3 (1.331 - 1)$$

$$= \frac{4}{3} \pi r^3 \times 0.331$$

$$\% \text{ increase in volume} = \frac{\frac{4}{3} \pi r^3 \times 0.331}{\frac{4}{3} \pi r^3} \times 100\% = 33.1\%$$

or

$$\frac{\text{C.S.A.}}{\text{T.S.A.}} = \frac{2\pi rh}{2\pi r(h+r)} = \frac{1}{2}$$

$$\Rightarrow \frac{h}{h+r} = \frac{1}{2}$$

$$\Rightarrow h + r = 2h \Rightarrow h = r$$

$$\text{T.S.A.} = 2\pi r(h+r) = 616 = 2\pi r(r+r) = 616$$

$$= 2\pi r \times 2r = 616 \Rightarrow 4\pi r^2 = 616$$

$$= 4 \times \frac{22}{7} \times r^2 = 616 \times \frac{7}{88} \Rightarrow r = 7 = h$$

$$\text{Volume of cylinder} = \pi r^2 h = \frac{22}{7} \times 7 \times 7 \times 7 = 1078 \text{ cm}^3$$

$$\text{Volume of cylinder} = 1078 \text{ cm}^3$$

40. Let number of boys = x, number of girls = y

Total marks obtained by boys = 70x

Total marks obtained by girls = 73y

Total marks obtained by both = 71(x+y)

$$\therefore 70x + 73y = 71(x+y)$$

$$\Rightarrow 73y - 71y = 71x - 70x$$

$$\Rightarrow 2y = x \Rightarrow \frac{x}{y} = \frac{2}{1} \Rightarrow x:y = 2:1$$

or

Mean of item = 64

Total items = 100

Num. of items = 64 × 100 = 6400

Correct new sum of items = 6400 - (26+9) + (36+90)

= 6400 - 35 + 126

$\therefore$  Correct new sums of items = 6400+91=6491

$$\therefore \text{Correct mean} = \frac{6491}{100} = 64.91$$

**PRACTICES QUESTION PAPER - 2**  
**CLASS-IX**  
**MATHEMATICS**

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**Time: 3 Hrs.**

**M.M. 80**

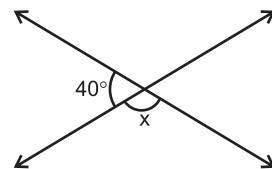
**General Instruction:**

1. All questions are compulsory.
2. The question paper consists of 40 questions and it is divided into four section A, B, C and D.
3. Section A comprises of 20 question carrying 1 mark each.
4. Section B comprises of 6 question carrying 2 mark each.
5. Section C comprises of 8 question carrying 3 mark each.
6. Section D comprises of 6 question carrying 4 mark each.
7. There is no overall choice in the paper. However an internal choice has been provided into 2 question of 2 marks, 4 questions of 3 marks and 3 questions of 4 marks. You have to attempt only one of the alternatives in all such questions.
8. Use of calculator is not permitted.

**PART – A**

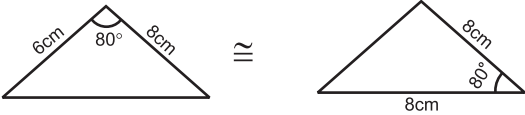
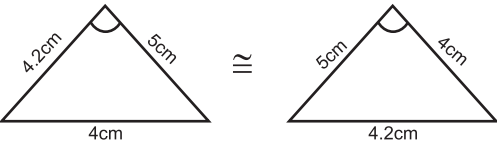
1. Which of the following is the formula for the volume of the sphere ?
  - a)  $\frac{1}{3}\pi r^3$
  - b)  $\frac{2}{3}\pi r^3$
  - c)  $\pi r^3$
  - d)  $\frac{4}{3}\pi r^3$
  
2. If  $x=0$  and  $y=k$  are the solutions of the equation  $5x-3y=3$ , the value of K is :
  - a)  $\frac{3}{2}$
  - b) 0
  - c) -1
  - d)  $-\frac{2}{3}$
  
3. The class mark of the interval 100 – 120 is :
  - a) 100
  - b) 110
  - c) 120
  - d) 20

4. How many triangles are possible having angles  $60^\circ$ ,  $90^\circ$  and  $30^\circ$  ?
- a) only one                      b) None  
c) Infinite                      d) only 3
5. Which of the following is true if  $\triangle PQR \cong \triangle SET$  ?
- a)  $PQ = SE$                       b)  $QR = ST$   
c)  $\angle P = \angle T$                       d)  $PR = SE$
6. Which of the following is a rational number ?
- a) 0.123456....                      b)  $\sqrt{23}$   
c)  $\sqrt{36}$                       d)  $2\sqrt{3}$
7. The base and height of a parallelogram are 10cm and 6cm respectively. The area of parallelogram is :
- a)  $30\text{cm}^2$                       b)  $60\text{cm}^2$   
c)  $16\text{cm}^2$                       d)  $8\text{cm}^2$
8. The probability of getting a factor of 6 on throwing a dice is :
- a)  $\frac{2}{3}$                       b)  $\frac{1}{3}$   
c)  $\frac{1}{6}$                       d)  $\frac{3}{2}$
9. The angle of the semicircle is :
- a)  $120^\circ$                       b)  $60^\circ$   
c)  $180^\circ$                       d)  $90^\circ$
10. Which quadrant has both ordinate and abscissa negative ?
- a) I                      b) II  
c) III                      d) IV
11. Find the value of C if in a triangle  $S=13$ ,  $a=8$ , and  $b=7$ .
12. Find the value of x from the following figure.



13. Find the decimal expansion of  $\frac{31}{16}$ .
14. If  $(x-1)$  is a factor of the polynomial  $2x^2 - 2a$  then find the value of  $a$ .
15. If the median of 6, 4, 7, 13 and  $p$  is 8 then find the value of  $p$ .

Match the following

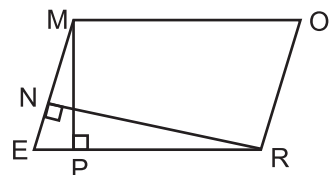
16.  i) 9
17. Distance of point  $(4, 9)$  from x-axis ii)  $25^\circ$
18.  iii)  $115^\circ$
19. Mode of data 4, 9, 5, 4, 9, 5, 4, 5, 9, 5 iv) SAS Congruency
20. Supplementary angle of  $65^\circ$  v) 5

### PART B

21. Find any two solutions of the equation  $4x + 3y = 12$ .
22. If each side of triangle is doubled then find the ratio of area of new triangle thus formed and the given triangle.

or

In the figure, MORE is a parallelogram and  $RN \perp ME$  and  $MP \perp ER$ . if  $MO = 16\text{cm}$ ,  $MP = 8\text{cm}$  and  $RN = 10\text{cm}$  then find the value of  $ME$ .



23. The volume of a right circular cone is  $9856\text{cm}^3$ . If the radius of the base is 14 cm then find the height of the cone. (Use  $\pi = 22/7$ )
24. Solve :  $(625)^{0.06} \times (625)^{0.19}$



25. Factorize :  $(p-q)^3 + (q-r)^3 + (r-p)^3$

or

If  $p(x) = x+5$  then find the value of  $p(x) + p(-x)$

26. The side of cube is 8cm. Find the lateral surface area of the cube.

### PART – C

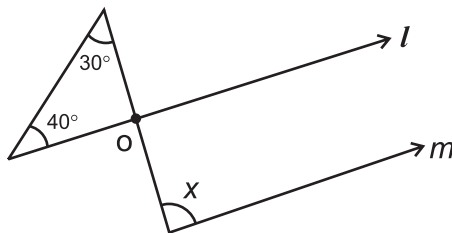
27. A dice is thrown 80 times. If the probability of having an even number is  $\frac{7}{10}$  then how many times an odd number appears on dice ?

28. The cost of four chairs and five tables is ₹ 3200. Write a linear equation in two variables for this statement and find out its two solutions.

or

Solve for  $x$  :  $(5x+1)(x+3) - 8 = 5(x+1)(x+2)$

29. In the given figure if  $l \parallel m$  then find the value of  $x$ .



30. The sides of a triangle are in the ration 11:19:24 and its perimeter is 540cm. Find the area of the triangle.

or

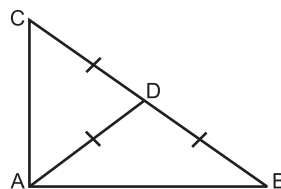
The side of a triangle shaped sheet are 5cm, 12cm and 13cm. Find the cost of painting on the sheet at the rate of ₹ 30per  $\text{cm}^2$ .

31. Divide the polynomial  $9x^3 - 3x^2 + 15x - 3$  by  $(3x - 1)$  and find its quotient and remainder.

32. Prove that the angle opposite to the equal sides of an equilateral triangle are equal.

or

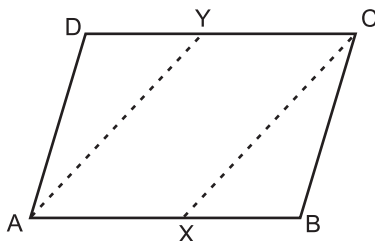
In the given figure,  $AD = BD = CD$ . Find  $\angle BAC$ .



33. In a rhombus ABCD,  $\angle ABC = 72^\circ$ . Find  $\angle ACD$

or

In the figure ABCD is a parallelogram x and y are mid-point of sides AB and DC. Prove that AXCY is a parallelogram.

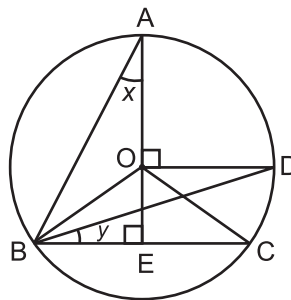


### PART – D

35. 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.

or

In the given figure, O is the centre of the circle and  $\angle BCO = 30^\circ$ . Find the value of x and y.



36. Draw the frequency polygon for the following distribution.

Marks	No. of Students
0-10	7
10-20	10
20-30	6
30-40	8
40-50	12
50-60	3
60-70	2
70-80	2

or

Find the mean, median and mode for the following distribution.

75, 62, 88, 55, 90, 95, 85, 59, 72, 78, 90, 95, 90, 95, 80, 71, 44, 57, 68, 90.

37. Construct a triangle having perimeter 6.4 cm and its basic angle are  $60^\circ$  and  $45^\circ$ .
38. The inner diameter of a cylindrical wooden pipe is 24cm and its outer diameter is 28cm - The length of this pipe is 35cm. Find the mass of the pipe if  $1\text{cm}^3$  of wood has a mass of 0.6 gram.
39. Simplify :  $\frac{(361)^3 + (139)^3}{(361)^2 - (361 \times 139) + (139)^2}$

or

Express  $0.\overline{245}$  in the form  $\frac{p}{q}$ .

40. If  $(x+a)$  is a factor of the polynomials  $(x^2+px+q)$  and  $(x^2+mx+n)$  then prove that

$$a = \frac{n - q}{m - p}$$

**SOLUTION**  
**PRACTICE QUESTION PAPER - 2**

- |   |   |
|---|---|
| <p>1. d) <math>\frac{4}{3}\pi r^3</math></p> <p>2. c) <math>-1</math></p> <p>3. b) 110</p> <p>4. c) Infinite</p> <p>5. a) PQ = SE</p> <p>6. c) <math>\sqrt{36}</math></p> <p>7. b) <math>60\text{cm}^2</math></p> <p>8. a) <math>\frac{2}{3}</math></p> <p>9. d) <math>90^\circ</math></p> <p>10. c) III</p> <p>11. C = 11</p> <p>12. <math>x = 140^\circ</math></p> <p>13. 1.9375</p> <p>14. <math>a = 1</math></p> <p>15. <math>p = 10</math></p> <p>16. iv) SAS</p> <p>17. i) 9</p> <p>18. vi) SSS</p> <p>19. v) 5</p> <p>20. iii) <math>115^\circ</math></p> <p>21. Any two solutions</p> <p>22. 4 : 1 or ME=12.8cm</p> <p>23. <math>h = 48\text{cm}</math></p> <p>24. 5</p> <p>25. <math>3(p-q)(q-r)(r-p)</math> or 5</p> <p>26. <math>256\text{cm}^3</math></p> <p>27. 24 times</p> | <p>28. No. of chair = x<br/>No. of table = y<br/><math>4x + 5y = 3200</math><br/>Any two solution<br/>or<br/><math>x = 15</math></p> <p>29. <math>x = 70^\circ</math></p> <p>30. <math>7200\sqrt{2}\text{ cm}^2</math><br/>or<br/>Area = <math>30\text{cm}^2</math><br/>Cost = ₹ 900</p> <p>31. Quotient = <math>3x^2+5</math><br/>Remainder = 2</p> <p>32. <math>\angle BAC = 90^\circ</math></p> <p>33. Non-collinear</p> <p>34. <math>\angle ACD = 54^\circ</math></p> <p>35. <math>x = 30^\circ</math><br/><math>y = 15^\circ</math></p> <p>36. Means = 76.95<br/>Median = 79<br/>Mode = 90</p> <p>38. 3432gm<br/>3.432 kg</p> <p>39. 500<br/>or<br/><math>\frac{245}{999}</math></p> |
|---|---|

**PRACTICES QUESTION PAPER - 3**  
**CLASS-IX**  
**MATHEMATICS**

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**Time: 3 Hrs.**

**M.M. 80**

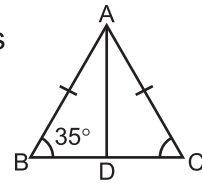
**General Instruction:**

1. All questions are compulsory.
2. The paper consists of 40 questions divided into four sections A, B, C and D. Section A comprises of 20 questions of 1 marks each. Section B comprises of 6 question of 2 marks each. Section C comprises of 8 questions of 3 marks each. Section D comprises of 6 question of 4 marks each.
3. There is no over all choice in this question paper. All though internal choices has been provided in some question.

**SECTION - A**

1. A national number  $\frac{5}{7}$  is equivalent to
  - a)  $\frac{15}{17}$
  - b)  $\frac{25}{27}$
  - c)  $\frac{10}{14}$
  - d)  $\frac{10}{27}$
2. The zero of the polynomial  $p(x) = 2x+5$  is
  - a) 2
  - b)  $\frac{2}{5}$
  - c) 5
  - d)  $-\frac{5}{2}$
3. The polynomial of type  $ax^2+bx+c$ , when  $a=0$ 
  - a) Linear
  - b) Quadratic
  - c) Cubic
  - d) Biquadratic
4. Through which of the following point, the graph of  $y = -x$  passes?
  - a) (1, 1)
  - b) (0, 1)
  - c) (-1, 1)
  - d) (0, 0)

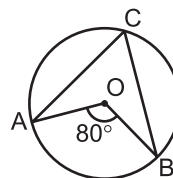
5. Graph of which question is parallel to  $x$ -axis ?
- a)  $y = x + 1$                       b)  $y = 2$   
 c)  $x = 3$                                 d)  $x = 2y$
6. What is the measure of an angle whose measure is  $32^\circ$  less than its supplement ?
- a)  $148^\circ$                                 b)  $60^\circ$   
 c)  $74^\circ$                                       d)  $55^\circ$
7. If  $\angle P$  and  $100^\circ$  form a linear pair. What is the measure of  $\angle P$ .
- a)  $80^\circ$                                       b)  $180^\circ$   
 c)  $120^\circ$                                     d)  $75^\circ$
8. In the given figure AD is the median then  $\angle BAD$  is
- a)  $70^\circ$                                       b)  $55^\circ$   
 c)  $110^\circ$                                     d)  $35^\circ$



9. In two triangles ABC and DEF,  $AB = DE$ ,  $BC = DF$  and  $AC = EF$  then
- a)  $\triangle ABC \cong \triangle DEF$             b)  $\triangle ABC \cong \triangle FED$   
 c)  $\triangle ABC \cong \triangle EDE$             d) None of these
10. If  $P(E) = 0.37$  then  $P(\text{Not } E)$  will be
- a) 0.37                                        b) 0.74  
 c) 0.57                                        d) 0.63
11. The radius of hemisphere is " $r$ " what is its total surface area.
- a)  $\frac{2}{3}\pi r^3$                                       b)  $3\pi r^2$   
 c)  $2\pi r^2$                                         d)  $\frac{4}{3}\pi r^2$
12. The sides of a triangle are in the ration  $3 : 4 : 5$ . If its perimeter is 36cm. Then what is its area ?
- a)  $72\text{cm}^2$                                       b)  $67\text{cm}^2$   
 c)  $32\text{cm}^2$                                       d)  $54\text{cm}^2$
13. The mean of 5 numbers is 30. If one number is excluded their mean becomes 28. What is excluded number.
- a) 38    b) 35  
 c) 32    d) 36

14. In the given figure if O is the centre of a circle, then measure of  $\angle ACB$  is

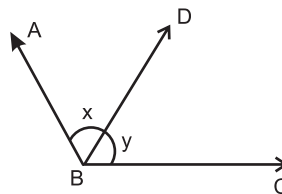
- a)  $80^\circ$                       b)  $40^\circ$   
c)  $160^\circ$                      d)  $35^\circ$



15. In  $\triangle ABC$ ,  $AB = AC$  and  $\angle B = 65^\circ$  then  $\angle C$  is equal to

- a)  $130^\circ$                       b)  $32^\circ$   
c)  $70^\circ$                         d)  $65^\circ$

16. For what value of  $x+y$  in given figure ABC be a line? justify your answer.



17. How many linear equations in  $x$  and  $y$  can be satisfied by  $x=1$  and  $y=2$ ?

18. Fill in the blank

An arc is a \_\_\_\_\_ when its ends are the ends of a diameter.

19. Write the class size of 0–4, 5–9, 10–14

\* Write the class limits in 10.4, 11.4, 12.4

20. Two parallelograms are on same base and between same parallels. The ratio of their areas is 1:1 (True/False)

or

A median of a triangle divides it into two triangles of equal area (True/False)

### SECTION - B

21. Find the value of the polynomial  $5x-4x^2+3$  at

- a)  $x = 0$                               b)  $x = 2$

22. Write any two solutions of the equation  $\pi x + y = 9$ .

23. If the base of a parallelogram is 8cm and its altitude is 5cm. then find its area?

24. Write the co-efficient of  $x^2$  in each of the following

- i)  $2 - x^2 + x$                       ii)  $\sqrt{2}x - 1$

or

Find the product with out multiplying directly  $107 \times 93$

25. The total surface area of a cube is  $150\text{cm}^2$ . Find the peri meter of any one of its faces ?
26. Find the ratio of total surface area of a sphere and a hemisphere of same radius ?

or

Find the curved surface area of a cone whose height is 12cm and base radius is 5cm ?

### SECTION – C

27. Two coins are tossed simultaneously 500 times and we get
- |           |   |           |
|-----------|---|-----------|
| two heads | = | 105 times |
| one heads | = | 275 times |
| No heads  | = | 120 times |

Find the probability of each of these events ?

28. Give the geometric representation of  $2x+9=0$  as an equation.
- i) In one variable                      ii) in two variables
29. Construct a triangle ABC in which  $BC=8\text{cm}$   $\angle B=45^\circ$  and  $AB-AC=3.5\text{cm}$ .
30. 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.

31. Draw the graph of following linear equation in two variables  $x+y=4$

or

If  $x=3k-2$  and  $y=2k$  is a solution of equation  $4x-7y+12=0$  then find the value of K.

32. 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.

or

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.



33. Simplify the given expression  $(5 + \sqrt{7})(2 + \sqrt{5})$
34. The sides of a triangle shaped sheet are 5cm, 12cm and 13cm. Find the cost of painting on the sheet at the rate of ₹ 30 per  $\text{cm}^2$  ?

### SECTION-D

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

Activity	Sports	Meditation	Yoga	Wacking
No. of Girls	40	35	100	120

Draw the bar graph for the given date.

or

If  $x+y+z=0$  show that

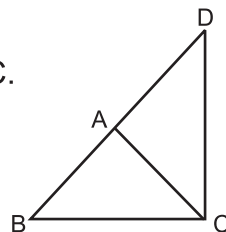
$$x^3 + y^3 + z^3 = 3xyz$$

37. Rationalise the denominator  $\frac{5}{\sqrt{3} - \sqrt{5}}$

or

Express 0.3178 is the form of  $\frac{p}{q}$  where p and q are \_\_\_\_\_ and  $q \neq 0$ .

38.  $\triangle ABC$  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.

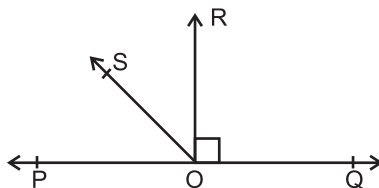


or

Prove that

In a right angle triangle, the hypotenuse is the longest side.

- 39.



In the given figure POQ is a straight line .  $RO \perp PQ$ . SO is a ray from O then prove that  $\angle ROS = \frac{1}{2} (\angle QOS - \angle POS)$

40. 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 the godown.

or

The value of right circular cone is  $9856\text{ cm}^3$ . If the diameter of base is  $20\text{cm}$ . Find

- i) Slant height
- ii) Height of the cone.
- iii) Curved surface area of the cone.

**SOLUTION**  
**PRACTICE QUESTION PAPER - 3**

- |  |  |
|--|--|
| <p>1. c) 10/14</p> <p>2. d) <math>-5/2</math></p> <p>3. a) linear</p> <p>4. c) <math>(-1, 1)</math></p> <p>5. b) <math>y = 2</math></p> <p>6. c) <math>74^\circ</math></p> <p>7. a) <math>80^\circ</math></p> <p>8. b) <math>55^\circ</math></p> <p>9. c) <math>\triangle ABC \cong \triangle EDF</math></p> <p>10. d) 0.63</p> <p>11. b) <math>3\pi r^2</math></p> <p>12. d) <math>54\text{cm}^2</math></p> <p>13. a) 38</p> <p>14. b) <math>40^\circ</math></p> <p>15. d) <math>65^\circ</math></p> <p>16. <math>x + y = 180^\circ</math></p> <p>17. Infinitely many</p> <p>18. Semi circle</p> <p>19. 5 or 9.9, 10.9, 11.9</p> <p>20. True or False</p> <p>21. i) 3                      ii) <math>-3</math></p> <p>22. Any two solutions</p> <p>23. <math>40\text{cm}^2</math></p> <p>24. <math>-1, 0</math>      or</p> <p style="padding-left: 20px;"><math>9951[\text{using}(100+7)\times(100-7)]</math></p> <p>25. 20 cm</p> | <p>26. 4:3 or <math>204.28\text{cm}^2</math></p> <p>27. i) <math>P(2 \text{ head}) = 21/100</math><br/>ii) <math>P(\text{one head}) = 11/20</math><br/>iii) <math>P(\text{no head}) = 6/25</math></p> <p>28. Correct representation,<br/><math>x = -9/2</math></p> <p>29. Correct construction</p> <p>30. Correct proof      or<br/>Correct proof</p> <p>31. Correct graph for<br/><math>x+y=4</math> or <math>k=2</math></p> <p>32. correct proof</p> <p>33. <math>10 + 5\sqrt{5} + 2\sqrt{7} + \sqrt{35}</math></p> <p>34. ₹ 900</p> <p>35. Correct draw of bar graph</p> <p>36. <math>0 \times [x^2+y^2+z^2-xy-yz-zx] = 0</math></p> <p>37. <math>-5/2(\sqrt{3}+\sqrt{5})</math> or<br/><math>3175/9990</math></p> <p>38. Correct proof</p> <p>39. Correct proof</p> <p>40. 16000<br/>or<br/>i) 50cm<br/>ii) 48cm<br/>iii) <math>2200\text{cm}^2</math></p> |
|--|--|

