

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

**SUPPORT MATERIAL**  
**(2017-2018)**

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

Under the Guidance of

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## **SUBJECTWISE SUPPORT MATERIAL**

### **PREFACE**

It is a matter of great pleasure for me to present the Support Material for various subjects prepared for the students of classes IX to XII by a team of dedicated and sincere teachers and subject experts from the Directorate of Education.

The subject wise Support Material is designed to enhance the academic performance of the students and improve their understanding of the subject. It is hoped that this comprehensive study material will be put to good use by both the students and the teachers in order to achieve academic excellence.

I commend the efforts of the team of respective subject teachers and their group leaders who worked sincerely and tirelessly under the able guidance of the officers of the Directorate of Education to complete this remarkable work in time.

*Punya Salila*  
(Punya S. Srivastava)

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प्रिय विद्यार्थियों,

इस पुस्तक के माध्यम से आपके साथ सीधे संवाद का अवसर मिल रहा है। और अपने विद्यार्थियों के साथ जुड़ने के इस अवसर का मैं पूरा लाभ उठाना चाहती हूँ।

दिल्ली में आपके विद्यालय जैसे कोई १०३० राजकीय विद्यालय हैं, जिनका संचालन 'शिक्षा निदेशालय' करता है। शिक्षा निदेशालय का मुख्यालय पुराना सचिवालय (ओल्ड सेक्रेटेरिएट), दिल्ली-५४ में स्थित है।

इस निदेशालय में सभी अधिकारी दिन रात कार्य करते हैं ताकि हमारे स्कूल और अच्छे बन सकें; हमारे शिक्षक आपको नए-नए व बेहतर तरीकों से पढ़ा सकें; परीक्षा में हमारे सभी विद्यार्थी और अच्छे अंक ला सकें तथा उनका भविष्य सुनिश्चित हो।

इसी क्रम में पिछले कुछ वर्षों से शिक्षा निदेशालय ने कक्षा नववीं से बारहवीं तक के अपने विद्यार्थियों के लिए विभिन्न विषयों में 'सहायक सामग्री' उपलब्ध करवाना प्रारंभ किया है।

प्यारे बच्चों, आपके हाथ में यह जो पुस्तक है, इसे कई उत्कृष्ट अध्यापकों ने मिलकर विशेष रूप से आप ही के लिए तैयार किया है। इसे तैयार करवाने में काफी मेहनत और धन खर्च हुआ है। इसलिए अपनी मुख्य पाठ्यपुस्तक के साथ-साथ यदि आप इस सहायक सामग्री का भी अच्छे से अभ्यास करेंगे तो परीक्षा में आपकी सफलता तो सुनिश्चित होगी ही, आपको बाजार में बिकने वाली महंगी सहायक पुस्तकें भी खरीदने की जरूरत नहीं पड़ेगी। और हाँ, इस पुस्तक को हर साल हम CBSE के पाठ्यक्रम के अनुसार संवादित और परिमार्जित भी करते हैं ताकि छात्र छात्राओं की परीक्षा-तैयारी अध्ययन रहे।

अंततः, एक बात और। अपने विद्यार्थी काल के जिस पड़ाव से आप आज गुजर रहे हैं, यह आपके शेष जीवन की नींव के निर्माण का समय है। मुझे आप पर पूरा विश्वास है कि आप इस समय का सदुपयोग करेंगे, खूब अध्ययन करेंगे तथा अपने एवं अपने देश के लिए एक सार्थक भविष्य की नींव डालेंगे।

मेरी ढ़ेरी शुभकामनाएं।

*सौम्या गुप्ता*

आपकी  
सौम्या गुप्ता

**Dr. Sunita S. Kaushik**  
Addl. Director of Edn. (School)/Exam



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D. O. No. FD/ADDL DE/Sch/38

Dated. 14/09/2017

**SUBJECTWISE SUPPORT MATERIAL**

**FOREWORD**

I take pride in presenting latest Support Material for the students of classes IX to XII developed and prepared by a team of subject experts and dedicated teachers from different schools of the Directorate of Education.

The Support Material, over the years, has proved to be a blessing for the students of our schools who are unable to purchase quality subject material from the market unlike their public school counterparts. It gives them a fair chance to do well in the public exams. The comprehensive support material presents the material contained in the prescribed texts in a lucid and comprehensible manner.

While the teachers are expected to give ample practice to the students to enhance their academic performance, the students are also expected to utilize the material to the maximum so that they have a better understanding of the concepts of each subject.

I express my sincere appreciation to all team leaders and their respective teams for their valuable contribution to this commendable task.

  
**Dr. Sunita S. Kaushik**  
Addl D.E. (School & Exam)



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

**SUPPORT MATERIAL**  
**(2017-2018)**

**MATHEMATICS**  
**Class : IX**  
**(English Medium)**

**NOT FOR SALE**

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**PUBLISHED BY : DELHI BUREAU OF TEXTBOOKS**



# MATHEMATICS

## Class (IX)

### TEAM MEMBERS

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- |    |                       |   |
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## **COURSE STRUCTURE**

### **MATHEMATICS (IX) (Code No. 041)**

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

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

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

#### **Objectives**

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

- consolidate the Mathematical knowledge and skills acquired at the upper primary stage;
- acquire knowledge and understanding, particularly by way of motivation and visualization, of basic concepts, terms, principles and symbols and underlying processes and skills;
- develop mastery of basic algebraic skills;

- develop drawing skills;
- feel the flow of reason while proving a result or solving a problem;
- apply the knowledge and skills acquired to solve problems and wherever possible, by more than one method;
- to develop ability to think, analyze and articulate logically;
- to develop awareness of the need for national integration, protection of environment, observance of small family norms, removal of social barriers, elimination of gender biases;
- to develop necessary skills to work with modern technological devices and mathematical softwares.
- to develop interest in mathematics as a problem-solving tool in various fields for its beautiful structures and patterns, etc.
- to develop reverence and respect towards great Mathematicians for their contributions to the field of Mathematics;
- to develop interest in the subject by participating in related competitions;
- to acquaint students with different aspects of Mathematics used in daily life;
- to develop an interest in students to study Mathematics as a discipline.

#### **COURSE STRUCTURE CLASS -IX**

<b>Units</b>	<b>Unit Name</b>	<b>Marks</b>
I	NUMBER SYSTEMS	08
II	ALGEBRA	17
III	COORDINATE GEOMETRY	04
IV	GEOMETRY	28
V	MENSURATION	13
VI	STATISTICS & PROBABILITY	10
	Total	80

#### **UNIT I: NUMBER SYSTEMS**

##### **1. REAL NUMBERS**

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

terminating recurring decimals on the number line through successive magnification. Rational numbers as recurring/terminating decimals. Operations on real numbers.

2. Examples of non-recurring/non-terminating decimals. Existence of non-rational numbers (irrational numbers) such as  $\sqrt{2}$ ,  $\sqrt{3}$  and their representation on the number line. Explaining that every real number is represented by a unique point on the number line and conversely, viz. every point on the number line represents a unique real number.
3. Definition of  $n^{\text{th}}$  root of a real number.
4. Existence of  $\sqrt{x}$  for a given positive real number  $x$  and its representation on the number line with geometric proof.
5. Rationalization (with precise meaning) of real numbers of the type  $\frac{1}{a+b\sqrt{x}}$  and  $\frac{1}{\sqrt{x}+\sqrt{y}}$  (and their combinations) where  $x$  and  $y$  are natural number and  $a$  and  $b$  are integers.
6. Recall of laws of exponents with integral powers. Rational exponents with positive real bases (to be done by particular cases, allowing learner to arrive at the general laws.)

## UNIT II: ALGEBRA

### 1. POLYNOMIALS

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

Recall of algebraic expressions and identities. Verification of identities:

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

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

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

$x^3+y^3+z^3-3xyz=(x+y+z)(x^2+y^2+z^2-xy-yz-zx)$  and their use in factorization of polynomials.

## 2. LINEAR EQUATIONS IN TWO VARIABLES

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

Focus on linear equations of the type  $ax+by+c=0$ . Prove that a linear equation in two variables has infinitely many solutions and justify their being written as ordered pairs of real numbers, plotting them and showing that they lie on a line. Graph of linear equations in two variables. Examples, problems from real life, including problems on Ratio and Proportion and with algebraic and graphical solutions being done simultaneously.

### UNIT III: COORDINATE GEOMETRY

#### COORDINATE GEOMETRY

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

### UNIT IV: GEOMETRY

## 1. INTRODUCTION TO EUCLID'S GEOMETRY

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

(Axiom) 1. Given two distinct points, there exists one and only one line through them.

(Theorem) 2. (Prove) Two distinct lines cannot have more than one point in common.

## 2. LINES AND ANGLES

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

1. (Motivate) Two triangles are congruent if any two sides and the included angle of one triangle is equal to any two sides and the included angle of the other triangle (SAS Congruence).
2. (Prove) Two triangles are congruent if any two angles and the included side of one triangle is equal to any two angles and the included side of the other triangle (ASA Congruence).
3. (Motivate) Two triangles are congruent if the three sides of one triangle are equal to three sides of the other triangle (SSS Congruence).
4. (Motivate) Two right triangles are congruent if the hypotenuse and a side of one triangle are equal (respectively) to the hypotenuse and a side of the other triangle. (RHS Congruence)
5. (Prove) The angles opposite to equal sides of a triangle are equal.
6. (Motivate) The sides opposite to equal angles of a triangle are equal.
7. (Motivate) Triangle inequalities and relation between 'angle and facing side' inequalities in triangles.

### 4. QUADRILATERALS

1. (Prove) The diagonal divides a parallelogram into two congruent triangles.
2. (Motivate) In a parallelogram opposite sides are equal, and conversely.
3. (Motivate) In a parallelogram opposite angles are equal, and conversely.
4. (Motivate) A quadrilateral is a parallelogram if 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

Review concept of area, recall area of a rectangle.

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

## 6. CIRCLES

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

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

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

7. CONSTRUCTIONS

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

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

2. SURFACE AREAS AND VOLUMES

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

**UNIT VI: STATISTICS & PROBABILITY**

1. STATISTICS

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

2. PROBABILITY

History, Repeated experiments and observed frequency approach to probability.

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

## QUESTIONS PAPER DESIGN 2017-18 CLASS-IX

**Mathematics (Code No. 041)**

**Time : 3 hrs**

**Marks: 80**

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

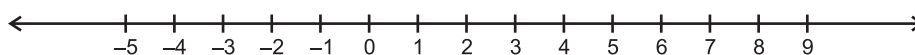
Note: One of the LA will be to assess the values inherent in the texts.

### INTERNAL ASSESSMENT

- |   |                 |
|---|-----------------|
| • Periodical Test   | <b>20 Marks</b> |
| • Note Book Submission  | 10 Marks        |
| • Lab Practical (Lab activities to be done from the prescribed books) | 05 Marks        |
|   | 05 Marks        |



**CHAPTER-1**  
**NUMBER SYSTEMS**  
KEY POINTS



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

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

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

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

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

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

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

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

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

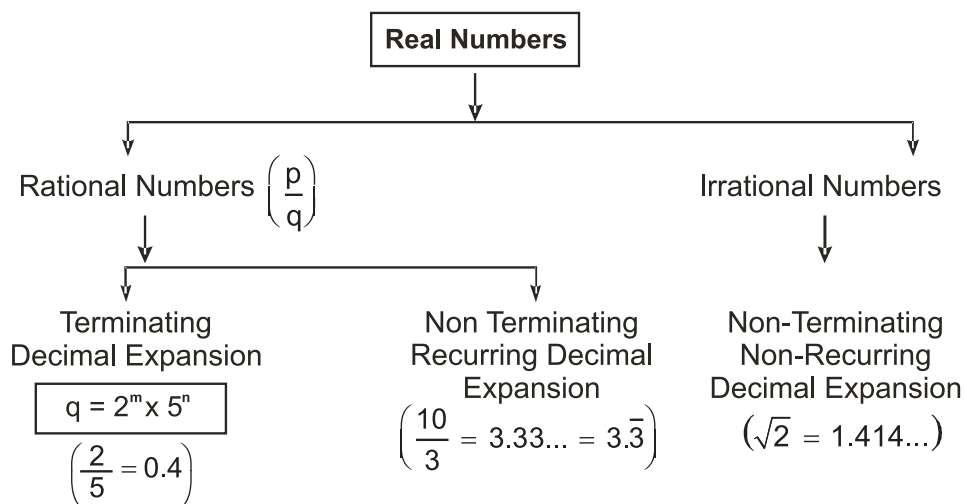
$$1) \quad \sqrt{a} \cdot \sqrt{b} = \sqrt{ab}$$

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

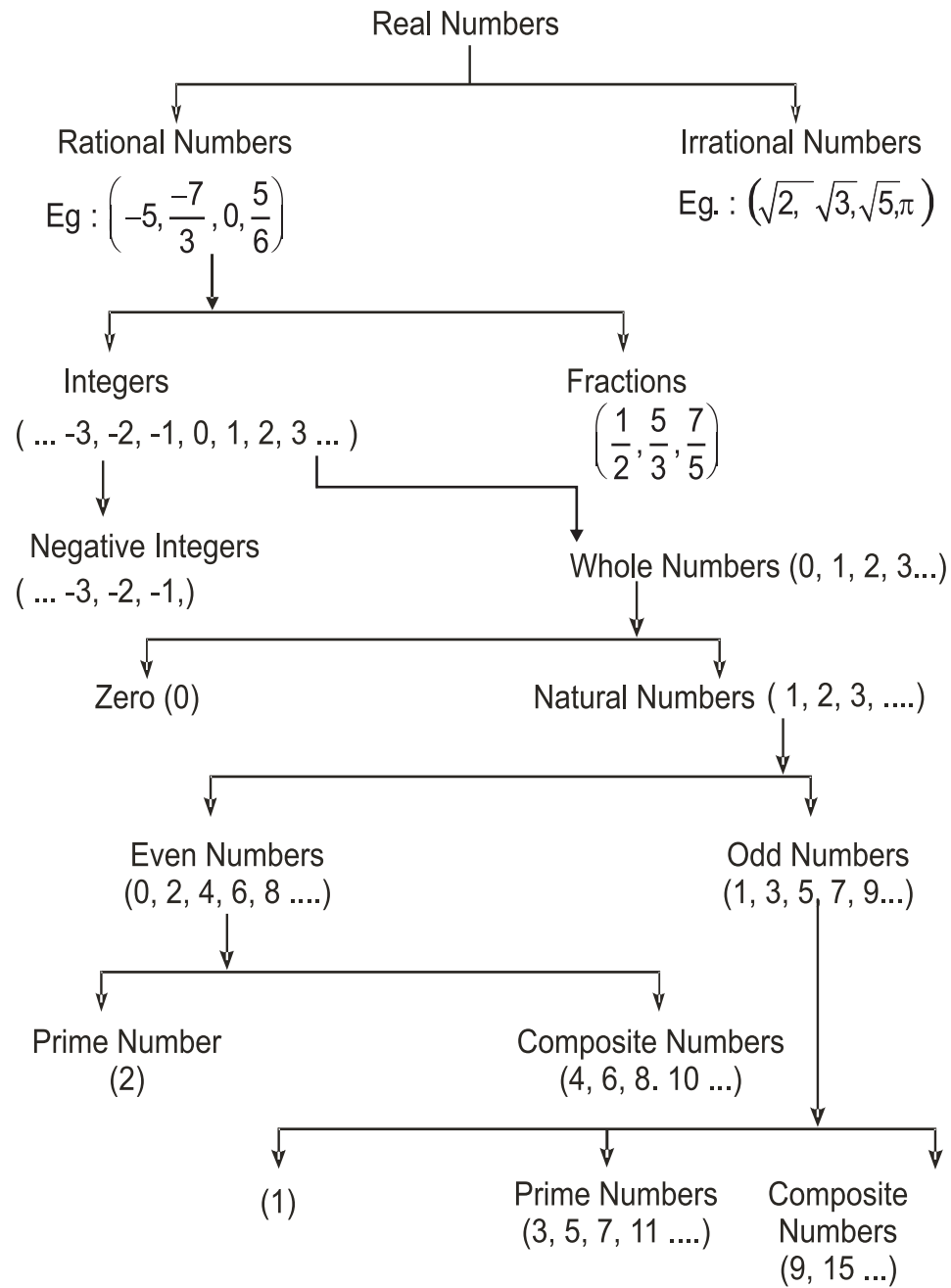
$$3) \quad (\sqrt{a} + \sqrt{b})(\sqrt{a} - \sqrt{b}) = a - b$$

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

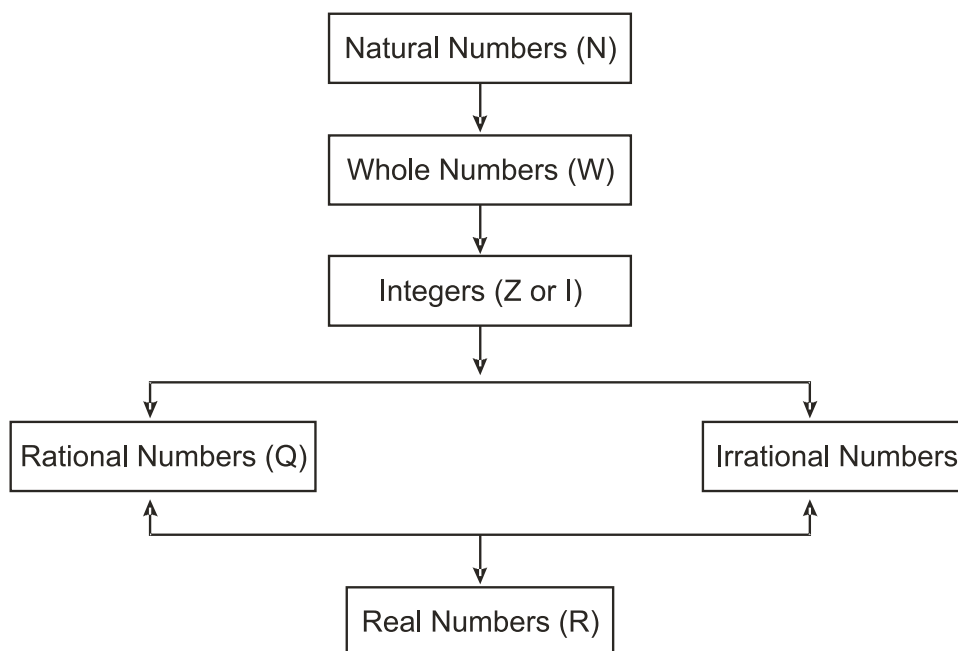
$$5) \quad (a + \sqrt{b})(a - \sqrt{b}) = a^2 - b$$



- Types of Numbers :



- Sequence of various types of Numbers :



### Part (A)

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

### Part (B)

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

20. If  $2^{5x} \div 2^x = \sqrt[5]{32}$ . Then find the value of x.
21. Evaluate  $a^{x-y} \cdot a^{y-z} \cdot a^{z-x}$ .
22. Simplify  $12^{\frac{2}{5}} \cdot 5^{\frac{2}{5}}$ .
23. Which of the following rational numbers will have a terminating decimal expansion or a non-terminating repeating (recurring) decimal expansion ?
- (i)  $\frac{135}{50}$       (ii)  $\frac{4}{11}$       (iii)  $\frac{8}{7}$       (iv)  $6\frac{3}{8}$
- (v)  $\frac{55}{9}$       (vi)  $\frac{5^2 \times 3^3}{2 \times 5^3 \times 27}$       (vii)  $\frac{51}{60}$ .
24. Classify the following numbers as terminating decimal or non-terminating recurring decimal or non-terminating non-recurring decimal :
- (i) 0.1666...      (ii) 0.250.....      (iii) 1.01001000100001....
- (iv) 0.27696      (v) 2.142857142857....      (vi)  $0.\overline{3}$
- (vii) 0.2359872785...      (viii) 0.48484884848....      (ix) 2.502500250002.....
- (x)  $4.\overline{123456789}$

Also classify these given numbers as Rational and Irrational numbers.

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

- (iv) 0.437                      (v) 3.651

27. Do as directed :

- (i) Add:  $\sqrt{125} + 2\sqrt{27}$  and  $-5\sqrt{5} - \sqrt{3}$   
 (ii) Add:  $\sqrt{7} - \sqrt{11}$  and  $\sqrt{5} - \sqrt{11} + \sqrt{13}$   
 (iii) Multiply:  $2\sqrt{2}$  by  $5\sqrt{2}$ .  
 (iv) Multiply:  $(-3 + \sqrt{5})$  by 3.  
 (v) Divide:  $7\sqrt{5}$  by  $-14\sqrt{125}$   
 (vi) Divide:  $2\sqrt{216} - 3\sqrt{27}$  by 3.

**Part (C)**

28. Simplify :

- (i)  $(2\sqrt{2} + 3\sqrt{3})(2\sqrt{2} - 3\sqrt{3})$                       (ii)  $(2\sqrt{8} - 3\sqrt{2})^2$   
 (iii)  $(\sqrt{7} + \sqrt{6})^2$                       (iv)  $(6 - \sqrt{2})(2 + \sqrt{3})$

29. Evaluate :

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

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

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

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

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

**Part (D)**

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

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

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

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

38. If  $xyz = 1$ , then simplify

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

39. Find the value of  $x$  if

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

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

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

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

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

43. Show that :

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

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

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

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

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

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

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

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

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

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

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

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



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

47. If  $a = 1 + \sqrt{7}$ , find the value of  $\frac{-6}{9}$

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

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

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

51. Find the value of

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

# CHAPTER-1

## NUMBER SYSTEMS

### ANSWERS

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

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

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

$$36. \quad a=0, b=2$$

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

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

$$40. \quad 4$$

$$41. \quad 1$$

$$42. \quad 1$$

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

$$45. \quad 8\sqrt{3} - 14\sqrt{2}$$

$$46. \quad (i) \quad 18$$

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

$$(iii) \quad 322$$

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

$$(v) \quad 5778$$

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

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

$$(viii) \quad 4$$

$$(ix) \quad 103682$$

$$(x) \quad 33385282$$

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

$$47. \quad 1-\sqrt{7}$$

$$48. \quad 98$$

$$49. \quad \frac{635}{1998}$$

$$50. \quad 28.28$$

$$51. \quad 214$$

## CHAPTER-2

# POLYNOMIALS

### KEY POINTS

- A Polynomial  $p(x)$  in one variable  $x$  is an algebraic expression in  $x$  of the form  $p(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$ , where  $a_0, a_1, a_2, \dots, a_n$  are real numbers and  $a_n \neq 0$  are called coefficients and  $n$  is a whole numbers.
- The highest power of variable  $x$  in a polynomial  $p(x)$  is called the degree of the polynomial.
- $a_0, a_1, a_2, \dots, a_n$  are respectively the coefficients of  $x^0, x, x^2, \dots, x^n$ , and  $n$  is called the degree of the polynomial. Each of  $a_n x^n, a_{n-1} x^{n-1}, \dots, a_0$  with  $a_n \neq 0$ , is called a term of the polynomial  $p(x)$
- A polynomial having one term is called monomial, having two terms called binomial and having three terms called trinomial.
- A polynomial of degree one is called linear polynomial, having degree two is called quadratic polynomial and of degree three is called cubic polynomial.
- 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.
- 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.
- 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.
- 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)  $(x+a)(x+b) = x^2 + (a+b)x + ab$

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

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

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

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

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

$$\begin{aligned} x) \quad x^3 + y^3 + z^3 - 3xyz &= (x+y+z)(x^2 + y^2 + z^2 - xy - yz - zx) \\ &= \frac{1}{2}(x+y+z)\{(x-y)^2 + (y-z)^2 + (z-x)^2\} \end{aligned}$$

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

### Part-A

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

### Part – B

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

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

### Part – C

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



### Part – D

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

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

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

45. Simplify :

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

46. Factorise :

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

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

**CHAPTER-2**  
**POLYNOMIALS**

**ANSWERS**

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

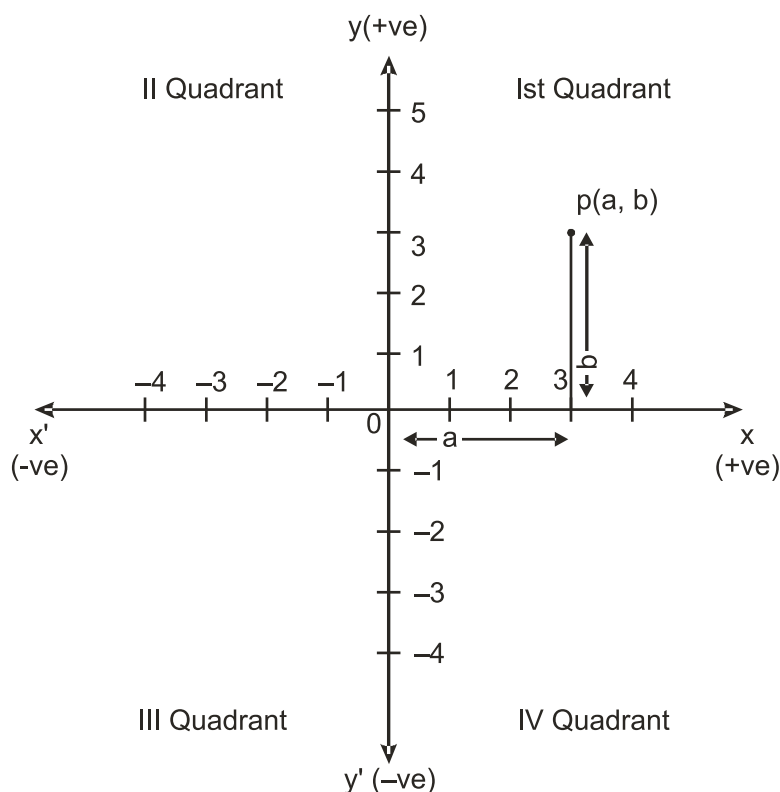
41. (i)  $(x + 2\sqrt{5}), (x + 3\sqrt{5})$  (ii)  $(4x + 1), (6x - 8)$
42. (a)  $3x^2 - 19x + 20$   
(b) Social responsibility, Empathy, etc.
43. (i)  $(3x + 2)$   
(ii) Scientific attitude, Dutiful, Environment awareness, Social values
44. 3 45.  $(a+b)(b+c)(c+a)$
46.  $3(2a-b-c)(2b-c-a)(2c-a-b)$  47.  $a=5, (x-1)(2x+1)(2x-7)$

# 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  $P(a, b)$  figure above.

$a$  is the length of perpendicular of  $P(a, b)$  from y-axis and is called abscissa of  $P$ .

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

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

where  $a$  and  $b$  are such that —

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

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

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

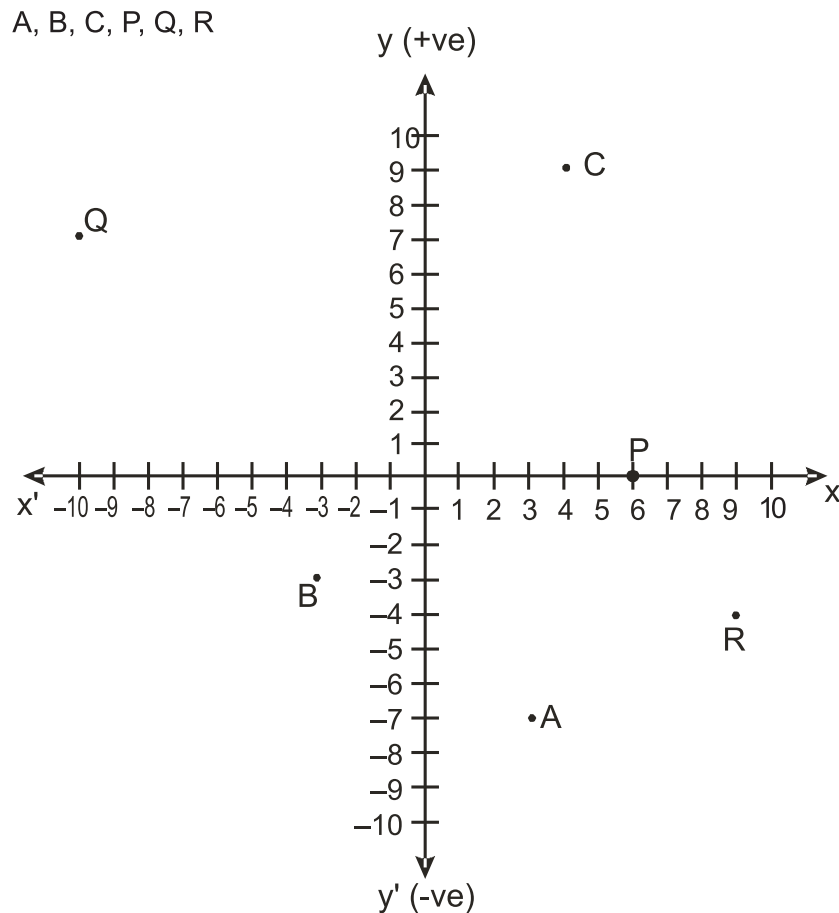
### Part-A

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

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

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

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



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

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

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



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

**Part – B**

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

**Part – C**

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

31. Draw a quadrilateral with vertices A (4, 3), B(−4, 3), C(−4, −3) and D(4, −3). Draw its diagonals and write the coordinates of the point where the diagonals cut each other?

**Part – D**

32. A rectangular field is of length 10 units & breadth 8 units. One of its vertex lie on the origin. The longer side is along x-axis and one of its vertices lie in first quadrant. Find all the vertices.
33. Plot the points B (5, 3), E(5, 1), S (0, 1) and T(0, 3) and answer the following :
- (i) Join the points and name the figure obtained.
  - (ii) Find the area of figure.
  - (iii) Which mathematical concept has been used in this problem.
34. Plot the points A (1, 1), B (0, −2), C (2, −1), D (4, 0) and E (0, −3). Identify the points which are collinear. Name the intersecting lines. In which quadrant the point of intersection lies ?
35. P (1, 1) is a point in the interior of the figure. containing the points Q (3, 3), R (−1, 3), S (−1, −1) & T (3, −1) Check whether the points Q, R, S, T lie on a rectangle which is not square or a circle.

**CHAPTER-3**  
**COORDINATE GEOMETRY**

**ANSWERS**

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

## CHAPTER-4

# LINEAR EQUATIONS IN TWO VARIABLES

### KEY POINTS

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

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

3. Linear equation in one variable has a unique solution

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

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

Graph :

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

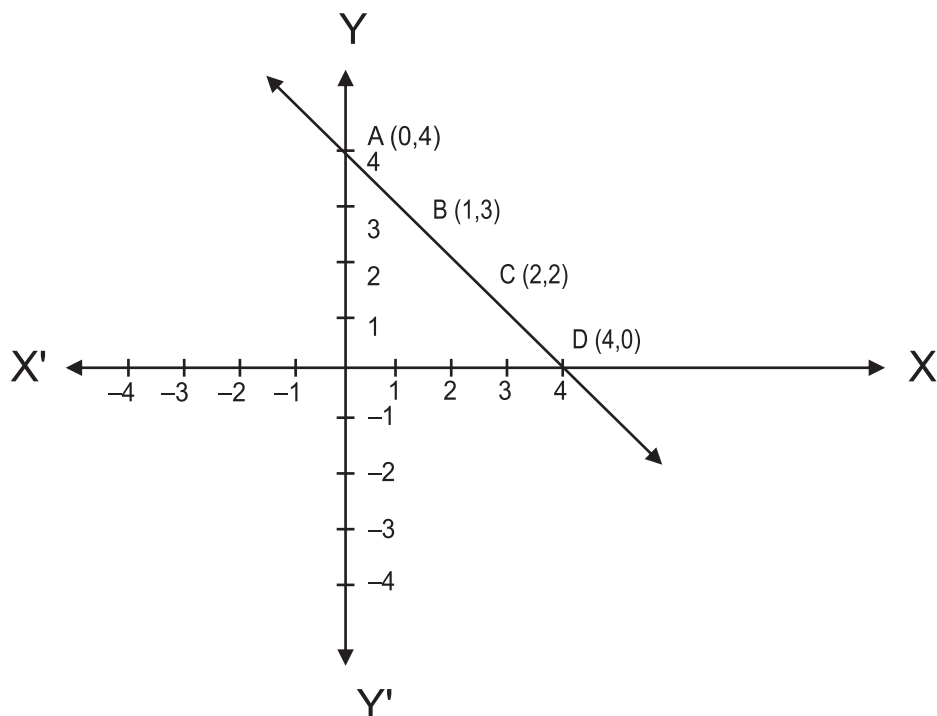
Example :  $x + y = 4$

Solution of equation

$x+y=4$  are

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

and many more



### Part – A

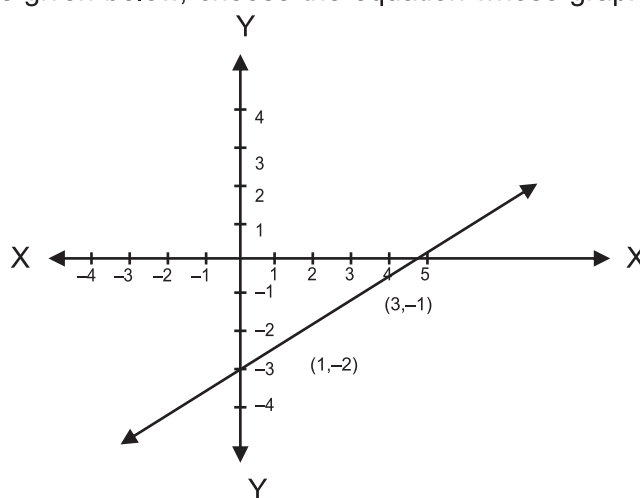
1. The graph of the linear equation  $4x=6$  is parallel to which axis?
2. Point  $(a,0)$  lie on which axis?
3. Write the equation of x axis.
4. Write a linear equation of two variables for  $x=5$ ,  $y=-2$ .
5. Find the value of K, if  $x=-1$  is a solution of equation  $Kx-2y=0$ .
6. Write the linear equation which is parallel to x-axis and is at a distance of 2 units from the origin in upward direction.
7. How many solutions are there for equation  $y=5x+2$ .
8. Express the equation  $5y=9$  as linear equation in two variables.
9. If the graph of equation  $2x+Ky=10$  K intersects x axis at point  $(5,0)$  find the value of K.

10. 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  $c$ .
11. Express  $x$  in terms of  $y$  for the equation  $3x + 4y = 7$
12. Express  $y$  in the terms of  $x$ .  
 $3y + 5x = 9$

### Part – B

13. Examine whether the point  $(5, 2)$  lie on the graph of equation  $2x + 3y = 16$ ?
14. Find any two solutions of equation  
 $2x + y = x + 5$ .
15. Find the value of  $P$  if  $x = 2$ ,  $y = 3$  is a solution of equations.  $5x + 3py = 4a$
16. Write the equations of two lines passing through  $(3, 10)$ .
17. Write the coordinates of the point where the graph of the equation  $5x + 2y = 10$  intersect both the axes.
18. If the points  $A(3, 5)$  and  $B(1, 4)$  lies on the graph of line  $ax + by = 7$ . Find the value of  $a$ .
19. 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.
20. Draw the graph of equation  $x + y = 5$ .
21. From the choices given below, choose the equation whose graph is given in figure –

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



22. Write the statement in linear equation in two variables showing relationship between Fahrenheit and Celsius.

**Part – C**

23. 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.
24. Find the value of 'a' if (1, -1) is the solution of the equation  $2x + ay = 5$ . Find the other two solutions of the equation.
25. 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.
26. Find two solutions of the equation  $4x + 5y=28$ . Check whether (-2, 10) is the solution of the given equations.
27. Give the geometrical representation of  $5x+7=0$  as equation.
- (i) in one variable
  - (ii) in two variables
28. The length of the rectangular park is 10m more than its breadth. Perimeter of the park is 180m. Find out the dimensions of park using linear equations in two variables.
29. Draw the graph for the linear equations  
 $3x - 4y = 12$ . If  $x = 8$  Find the value of y with the help of graph.
30. Find the different solutions of  $3m - 8n = 27$ .
31.  $F = (9/5)C + 32$ .
- (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?
32. If  $x = 3k - 2$ ,  $Y=2k$  is a solution of equation  $4x - 7y + 12 = 0$ , then find the value of K.

**Part – D**

33. 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?
34. Solve for x

$$\frac{3x-5}{3} + \frac{4(x+2)}{5} = \frac{25x+7}{15}$$

35. A man went to the Bank with ₹ 1000. He asked the cashier to give him ₹ 5 and ₹ 10 notes only in return. Write the linear equation in two variables. If no. of ₹ 10 Notes are 25, then find the no. of ₹ 5 Notes? Also represent it graphically?
36. 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?
37. The age of father is 3 years more than three times the age of his son. Three years hence, father's age will be ten years more than twice the age of the son. Assuming father's age as  $x$  and son's age as  $y$  form two linear equations.
38. The force exerted to pull a cart is directly proportional to the acceleration produced in the body, write a linear equation in two variables to represent the statement by taking constant mass equal to 3kg. Read from the graph the force (in Newton) required when the acceleration produced is  $5\text{m/sec}^2$ .
39. 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. What values of both the students are depicted here?
40. Sarika distributes chocolates on the occasion of children's Day. She gives 5 chocolates to each child and 20 chocolates to adults. If no. of child is represented by ' $x$ ' and total distributed chocolates as ' $y$ '.
  - (i) Write it in form of linear equation in two variables.
  - (ii) If she distributed 145 chocolates in total, find out no. of children?
  - (iii) Which values are depicted here?
41. Priyanka and Arti decided to donate ₹ 1600 for the earthquake victims in Gujrat considering Priyanka's share as ' $x$ ' and Arti share as ' $y$ '.
  - (a) Form a liner equation in two variables.
  - (b) If Priyanka donates thrice the amount donated by Arti, than find out the amount donated by both.
  - (c) What values of both the children are depicted here?
42. In a Residential society, Rain water is stored in underground water tank. If the water stored at the rate of 30 cubic cm per second. If water store in ' $x$ ' seconds and ' $y$ ' cubic cm.



- (i) Write this statement in linear equation in two variables.
  - (ii) Write this equation in the form of  

$$ax + by + c = 0$$
  - (iii) What value of the society members shows in Rain water storage?
43. 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 Rs. 200.
- (a) Form the linear equation in two variables.
  - (b) If no. of girls are 8, find out no. of boys.
  - (c) What values of Riya & her friends are depicted here?
44. Find the value of  $\left(\frac{x+y}{z}\right)$  If  $x^2 + y^2 + z^2 - 4x - 8y - 6z + 29 = 0$
45. (i) If  $56^2 - 51^2 = 5P$ , then find the value of P.
- (ii) Find the value of  $(625)^{0.16} \times (625)^{0.09}$
46. A pharmacist needs to strengthen a 10% alcohol solution to one of 20% alcohol. How much pure alcohol should be added to 400ml of 10% solution?
47. A and B together can do a piece of work in 10 days, but A alone can do it in 15 days. How many days would B alone take to do the same piece of work.
48. If a scootrist drives at the rate of 24 Km. per hour, he reaches his destination 5 minutes late, and if he drives at the rate of 30 Km. per hour, he reaches his destination 4 minutes earlier. Find how far is his destination.
49. A man is five times as old as his son. After 2 years the man will be four times as old as his son. Find their present ages.
50. The numerator of a fraction is 3 less than denominator. If numerator is added to the denominator, then the fraction becomes  $\frac{2}{7}$ . Find the fraction.

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

**ANSWERS**

1. Paralled to y-axis
2. x-axis
3.  $y = 0$
4.  $2x - y = 12$  (or any other possible solution)
5.  $k = -2$
6.  $y = 2$
7. Infinitely many solutions
8.  $0.x + 5.y = 9$
9.  $K = 1$
10.  $\sqrt{2}x - 5y - 4 = 0$   
Where  $a = \sqrt{2}$ ,  $b = -5$ ,  $c = -4$
11.  $x = \frac{7 - 4y}{3}$
12.  $y = \frac{9 - 5x}{3}$
13. Yes
14.  $(1, 4)(0, 5)$  (or any other two possible solutions)
15.  $P = \frac{4a - 10}{9}$
16.  $3x - y + 1 = 0$  (or any other possible solution)  
 $12x + 7y = 106$
17.  $(0, 5)$  and  $(2, 0)$
18.  $a = -1$

19.  $3x - y = 21$
20.  $x - 2y = 5$
22.  $f = \frac{(9)}{5}c + 32$
23.  $a = -4$   $b = 4$
24.  $a = -3$  (other two solutions may be  $x = 4, y = 1$  and  $x = 1, y = -1$  and any other possible solutions.
25.  $(3, 0), (0, 2)$
26.  $(2, 4), (7, 0)$  (No)
28. 50m, 40m
29.  $y = 3$
30.  $(1, -3), (9, 0)$  and  $(-7, -6)$  (or any other possible solutions)
31.  $95^\circ \text{F}, 86^\circ \text{F}$
32.  $K = 2$
33. No
34.  $x = 4$
35. 150
36.  $a = 8, b = -3, c = 0$  infinite solutions  
Two solutions may be  $x = 3, y = 8$  and  $x = 6, y = 16$  (Any other solutions may possible)
37.  $x = 3y + 3$   
 $x = 2y + 13$

38.  $y = 3x$  ( $y = \text{force}$ ,  $x = \text{acceleration}$ ),  $F = 15 \text{ N}$
39.  $x + y = 25$ , Sharing, Self awareness (Any other values)
40. (i)  $5x + 20 = y$   
 (ii) 25  
 (iii) Happiness, Sharing, Harmony
41. (a)  $x + y = 1600$   
 (b) Priyanka ₹ = 1200, Arti ₹ = 400  
 (c) Helpfulness, caring, social responsibility, sensitivity
42. (i)  $y = 30x$   
 (ii)  $30x - y + 0 = 0$   
 (iii) Environment Security, Co-operation
43. (a)  $150x + 200y = 3600$   
 (b) Boys = 12  
 (c) Co-operation, sincerity, helpfulness
44.  $\frac{x + y}{z} = 2$  ( $x=2$ ,  $y=4$  and  $z=3$ )
45. (i) 107  
 (ii) 5
46. 50 ml
47. 30 days
48. 18km far
49. Son's age = 6 years  
 Man's age = 30 years
50.  $\frac{2}{5}$

## CHAPTER-5

# INTRODUCTION TO EUCLID'S GEOMETRY

### KEY POINTS

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

### SOME OF EUCLID'S AXIOMS

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

### EUCLID'S POSTULATES AND DEFINITIONS

- **Postulates 1** : A straight line may be drawn from any one point to any other points.
- **Postulate 2** : A terminated line can be produced in definitely.
- **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.

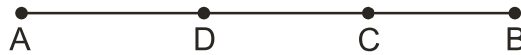
### **DEFINITIONS**

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

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.

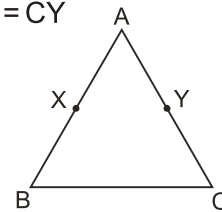


6. How many lines can pass through a single point?
7. State Euclid's first postulate.
8. Write Euclid's fifth postulate.
9. If  $a + b = 15$  and  $a + b + c = 15 + c$   
which axiom of Euclid does the statement illustrate?
10. If A, B and C are three points on a line and B is between A and C then prove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

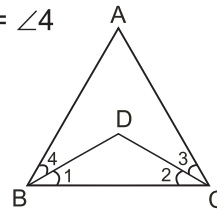


### Part – B

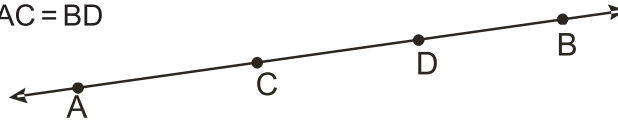
11. If  $x + y = 10$  and  $x = z$  then show that  $z + y = 10$
12. In given figure  $AX = AY$ ,  $AB = AC$  Show that  $BX = CY$   
Show that :  $BX = CY$



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  $AC = BD$



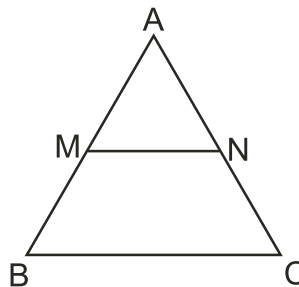
15. Solve the equation  $x - 10 = 15$ , State which axiom do you use here.  
16. If a point C lies between two points A and B such that  $AC = BC$  then prove that

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

17. In the given figure

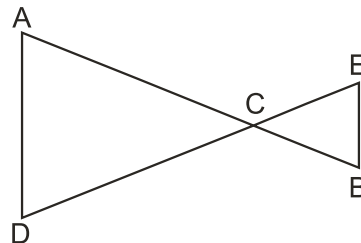
$$AM = \frac{1}{2} AB$$

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



show that  $AB = AC$

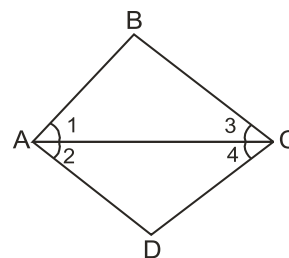
18. In the given figure  $AC = DC$ ,  $CB = CE$   
then show that  $AB = DE$



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.

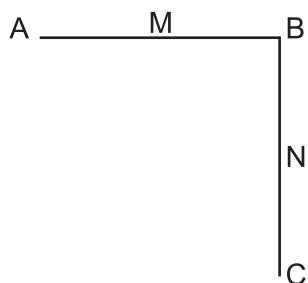
#### Part – C

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

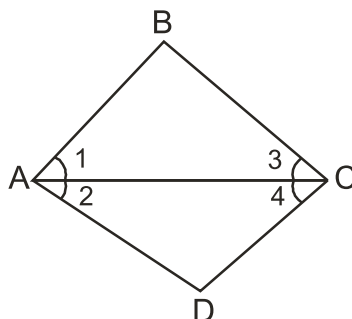




22. In the give figure  $AB = BC$ , M is the mid point AB and N is the mid point of BC. Show that  $AM = NC$



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



24. An equilateral triangle is a polygen made up of three line segment 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.
- what values are depicted in the question
- which mathematical concept have been covered in this question?

26. Monika and Vasu have the same weight if they each gain weight by 2kg. How will their new weights be compared?

- what values are depicted in this question?
- What mathematical concept have been covered in this question?

**CHAPTER-5**  
**INTRODUCTION TO EUCLID'S GEOMETRY**

**ANSWERS**

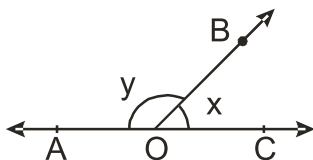
- |  |                  |             |
|--|------------------|-------------|
| 1. Two                                   | 2. Theorem       | 3. Only One |
| 4. Axiom                                 | 5. Equal         | 6. Infinite |
| 9. Second axiom                          | 15. Second Axiom |   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

## CHAPTER-6

# LINES AND ANGLES

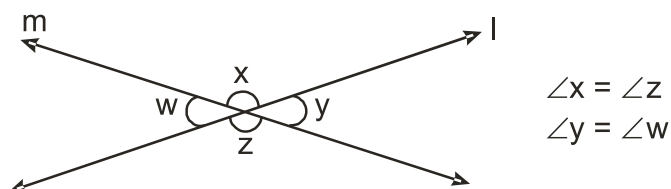
### KEY POINTS

- Line is a collection of points which has only length neither breadth nor thickness.
- **Line Segment** : A part of portion of a line with two end points.
- **Ray** : A part of a line with one end point.
- **Collinear points** : Three or more points lying on the same line.
- **Angle** : An angle is formed when two rays originate from the same end point. The rays making an angle are called the arms and the end point is the vertex.
- **Acute angle** : An angle measure between  $0^\circ$  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  $180^\circ$
- **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.



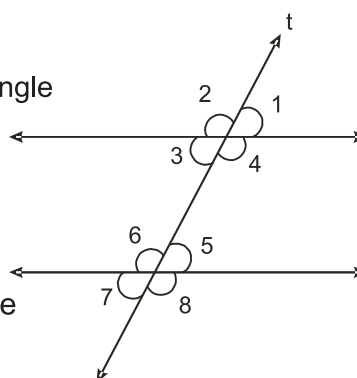
- **Intersecting line** : Two lines are said to be intersecting when the perpendicular distance between the two lines is not same every where. They meet at one point.
- **Non Intersecting lines** : Two lines are said to be non-intersecting lines when the perpendicular distance between them is same every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

(a)  $\left. \begin{array}{l} \angle 1 = \angle 3 \\ \angle 2 = \angle 4 \\ \angle 5 = \angle 7 \\ \angle 6 = \angle 8 \end{array} \right\} \text{Vertically opposite angle}$

(b)  $\left. \begin{array}{l} \angle 1 = \angle 5 \\ \angle 2 = \angle 6 \\ \angle 3 = \angle 7 \\ \angle 4 = \angle 8 \end{array} \right\} \text{Corresponding angle}$

(c)  $\left. \begin{array}{l} \angle 3 = \angle 5 \\ \angle 4 = \angle 6 \end{array} \right\} \text{Alternate Interior angle}$

(d)  $\left. \begin{array}{l} \angle 3 + \angle 6 = 180^\circ \\ \angle 4 + \angle 5 = 180^\circ \end{array} \right\} \text{Angles on the same sides of a transversal are supplementary.}$

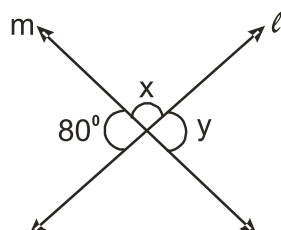


$\angle 3, \angle 6$  and  $\angle 4, \angle 5$  are called co-interior angles or allied angles or consecutive interior angles.

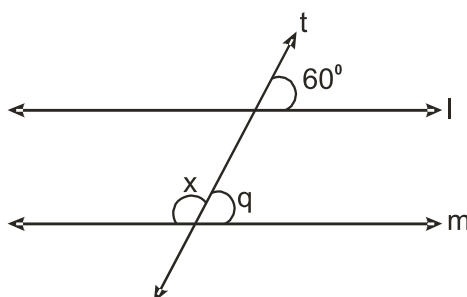
- Sum of all interior angles of a triangle is  $180^\circ$ .

### Part – A

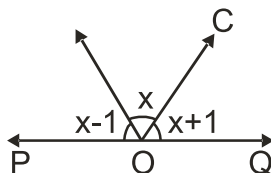
1. From the figure find  $x$  and  $y$



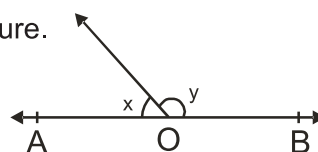
2. If an angle is equal to its complement find the angle.  
 3. In the adjoining figure if  $l \parallel m$  and  $t$  is transversal, find the value of  $x$ .



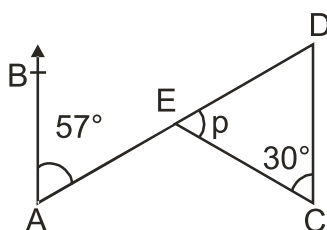
4. In the figure POQ is a straight line. The three adjacent angles are consecutive numbers. What are the measure of these angles.



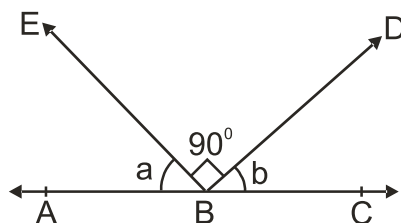
5. Twice of  $x$  is  $30^\circ$  less than  $y$  find  $x$  &  $y$  from figure.



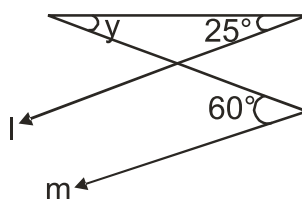
6. In the adjoining figure if  $AB \parallel CD$  what is the value of  $p$ .



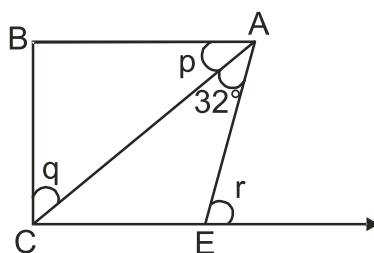
7. In the adjoining figure find that value of  $a + b$  if  $\angle DBE = 90^\circ$



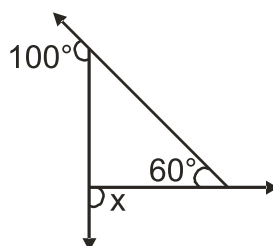
8. In the figure  $l \parallel m$  find  $\angle y$



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

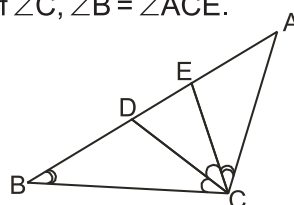


10. What is  $x$  in the figure?

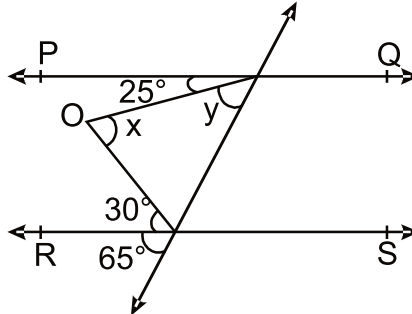


11. One of the angle of a pair of supplementary angles is  $2^3$  more than its supplement find the angles.
12. In the figure  $CD$  is the angle bisector of  $\angle C$ ,  $\angle B = \angle ACE$ .

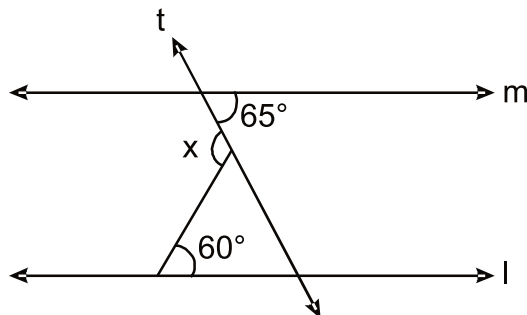
Prove that  $\angle ADC = \angle ACD$



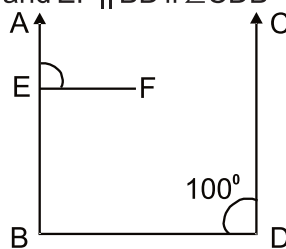
13. In the adjoining figure  $PQ \parallel RS$  find  $x$  and  $y$ .



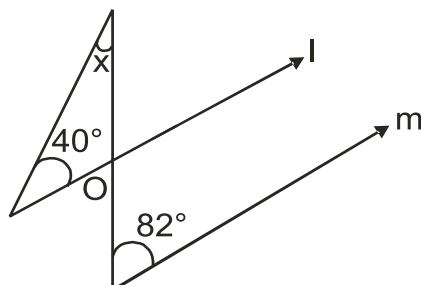
14. By contributing money, 5 friends bought pizza. They want to divide it equally among themselves. But one of them was given double piece, as he was very hungry. Find the angle of the piece of pizza each one received.
15.  $BO$  and  $CO$  are external bisector of  $\angle B$  and  $\angle C$  of a  $\triangle ABC$  Intersecting at  $O$ . If  $\angle A = 60^\circ$   $\angle ABC = 70^\circ$ , find  $\angle BOC$ .
16. In the above question 15, if Internal bisector of  $\angle B$  and  $\angle C$  intersect at  $P$ . Prove that  $\angle PBO = 90^\circ$  and  $\angle BOC + \angle BPC = 180^\circ$
17. In the given figure if  $l \parallel m$  and ' $t$ ' is the transversal find  $x$ .



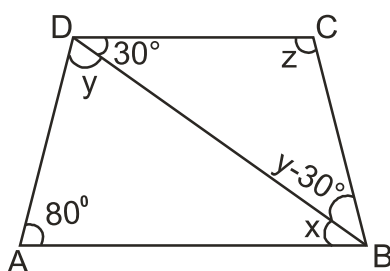
18. An exterior angle of a triangle is  $103^\circ$  and two of its interior opposite angles are equal, find the angles.
19. Prove that vertically opposite angles are equal.
20. In the figure  $AB \parallel CD$  and  $EF \parallel BD$  if  $\angle CDB = 100^\circ$ , find  $\angle AEF$



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

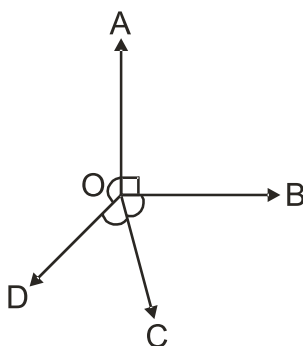


22. The angles of a triangle are  $(x - 40^\circ)$ ,  $(x - 20^\circ)$ ,  $(\frac{x}{2} - 10^\circ)$ .  
Find the value of  $x$  and then find the angles of the triangle.
23. In the given figure if  $AB \parallel DC$  and  $\angle BDC = 30^\circ$   $\angle BAD = 80^\circ$  find  $\angle x$ ,  $\angle y$ ,  $\angle z$ .



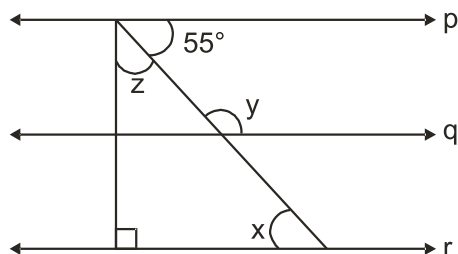
### Part – C

24. In the figure O is the location of the mother dairy from where the milk is to be supplied to the four booths A, B, C & D. If the angle between booth B & C, C & D and D & A are in the ratio 2 : 1 : 3, find the angles.

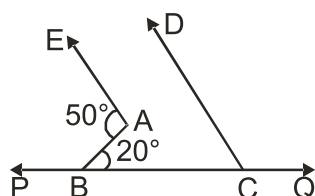




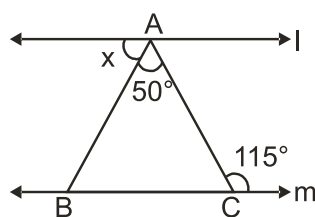
25. If  $p \parallel q \parallel r$ , find  $x, y, z$  from given figure.



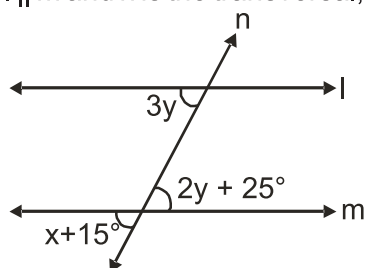
26. In the given figure find  $\angle DCB$  if  $AE \parallel CD$ .



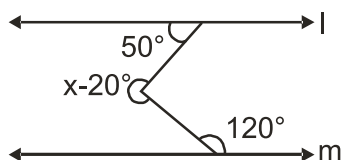
27. In the given figure  $l \parallel m$  find  $x$ .



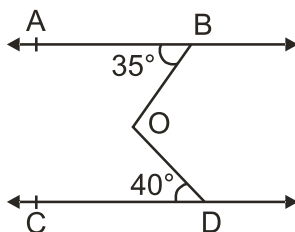
28. In the given figure  $l \parallel m$  and  $n$  is the transversal, find  $x$ .



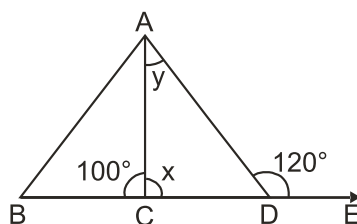
29. For what value of  $x$ ,  $l \parallel m$ .



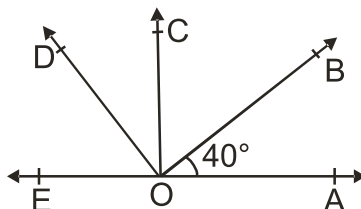
30. From the figure find reflex angle  $\angle BOD$  if  $AB \parallel CD$ .



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



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



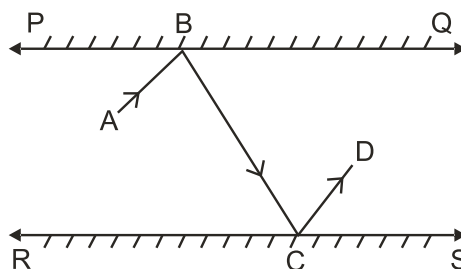
35. Prove that the bisectors of the angles of a linear pair are at right angle.
36. If two complementary angles are such that two times the measure of one is equal to three times the measure of the other. Find the measure of larger angle.
37. Prove that the sum of all exterior angles of a triangle is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

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

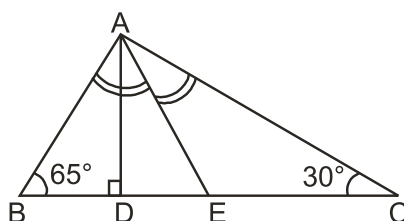
### Part – D

39. 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.
40. 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.

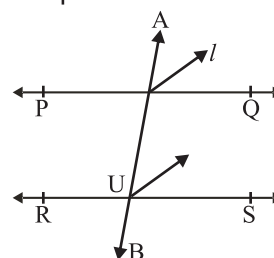
Prove that  $AB \parallel CD$ .



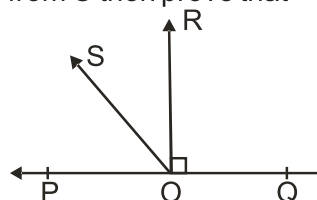
41. In the figure AE is the bisector of  $\angle A$ ,  $AD \perp BC$ . Find  $\angle EAD$ .



42. Prove that quadrilateral formed by the intersection of bisectors of interior angles made by a transversal on two parallel lines is a rectangle.
43. In the given figure  $l \parallel m$  where  $l$  and  $m$  are the bisectors of corresponding angles  $\angle ATQ$ ,  $\angle TUS$ . Prove that  $PQ \parallel RS$ .

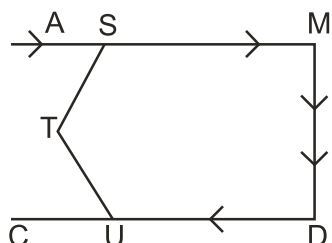


44. POQ is a straight line  $RO \perp PQ$ , SO is a ray from O then prove that  $\angle ROS = \frac{1}{2}(\angle QOS - \angle POS)$



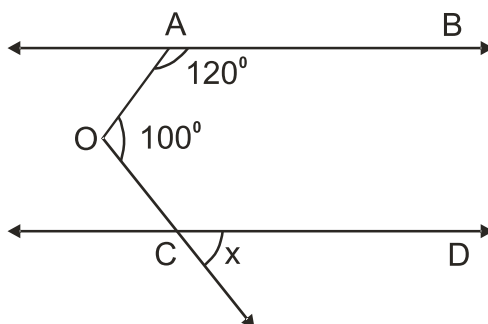
45. A route for going from place A to place C is shown in the adjoining figure. To avoid traffic on the highway AM, a road is cut through S via T

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



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

- If  $AB \parallel CD$  find  $x$
- What value is depicted by the teacher in this activity.



**CHAPTER-6**  
**LINES & ANGLES**

**ANSWERS**

- |   |   |  |
|---|---|--|
| 1. $x = 100^\circ, y = 80^\circ$            | 2. $45^\circ$                                   | 3. $120^\circ$                                 |
| 4. $59^\circ, 60^\circ, 61^\circ$           | 5. $50^\circ, 130^\circ$                        | 6. $93^\circ$                                  |
| 7. $a + b = 90^\circ$                       | 8. $35^\circ$                                   | 9. $33^\circ, 57^\circ, 65^\circ$              |
| 10. $140^\circ$                             | 11. $86^\circ, 94^\circ$                        | 13. $40^\circ, 55^\circ$                       |
| 14. $60^\circ \times 4, 120^\circ \times 1$ | 17. $125^\circ$                                 | 18. $51\frac{1}{2}^\circ, 51\frac{1}{2}^\circ$ |
| 20. $80^\circ$                              | 21. $42^\circ$                                  |  |
| 22. $x = 100, 60^\circ, 80^\circ, 40^\circ$ | 23. $x = 30^\circ, y = 70^\circ, z = 110^\circ$ |  |
| 26. $30^\circ$                              | 27. $65^\circ$                                  | 28. $60^\circ$                                 |
| 30. $285^\circ$                             | 33. $80^\circ, 40^\circ$                        | 34. $45^\circ, 40^\circ$                       |
| 36. $54^\circ$                              | 41. $17.5^\circ$                                |  |

## CHAPTER-7

# TRIANGLES

### KEY POINTS

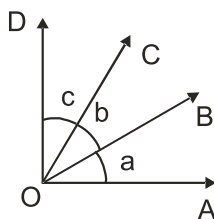
- Two figures having the same shape and size are called congruent figures.
- Two plane figures are congruent, if each one when superimposed on the other, covers the other exactly.
- Two line segments are congruent, if they are of equal lengths.
- Two angles of equal measures are congruent.
- Two circles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

side of the other triangle.

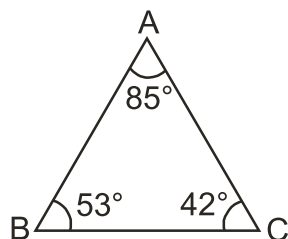
- Angles opposite to equal sides of a triangle are equal.
- Sides opposite to equal angles of a triangle are equal.
- In a triangle, angle opposite to the longer side is larger (greater).
- In a triangle, side opposite to the larger (greater) angle is longer.
- Sum of any two sides of a triangle is greater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

### Part – A

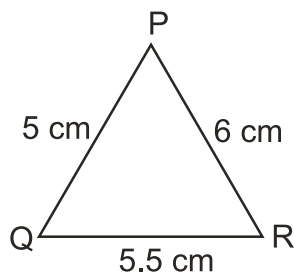
- Which of the following is not a congruence criterion for triangles?  
(a) SSS (b) RHS  
(c) AAA (d) SAS
- If  $AB \cong CD$  then  
(a)  $AB < CD$  (b)  $AB + CD = 0$   
(c)  $AB = CD$  (d)  $AB > CD$
- If  $\triangle ABC \cong \triangle DEF$  then  
(i)  $AB =$  \_\_\_\_\_ (ii)  $BC =$  \_\_\_\_\_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



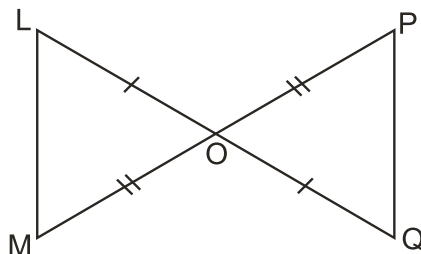
6. If  $\triangle PQR \cong \triangle DEF$  then  $Q \longleftrightarrow$  \_\_\_\_\_
7. Which is the longest side of the triangles given in the figure?



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



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

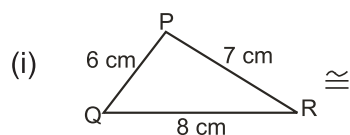


10. Two squares are congruent if they have \_\_\_\_\_.

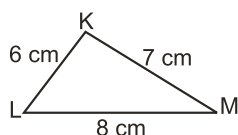
### Part – B

11. Match the columns :

#### Column A



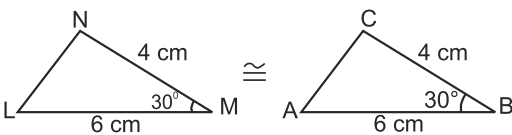
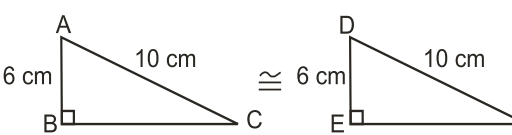
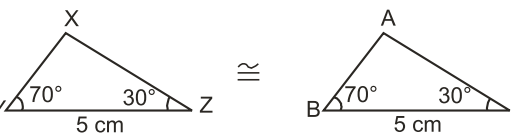
$\cong$



#### Column B

(a) SAS congruence


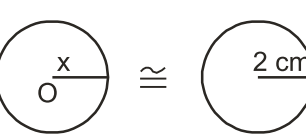
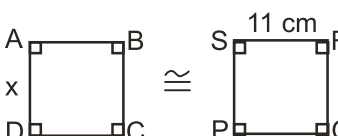
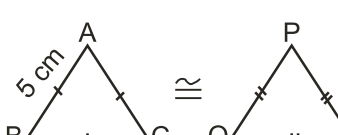
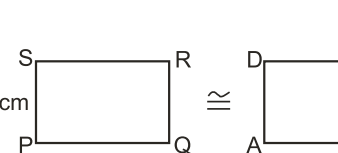


- (ii)  (b) SSS congruence
- (iii)  (c) ASA congruence
- (iv)  (d) RHS congruence

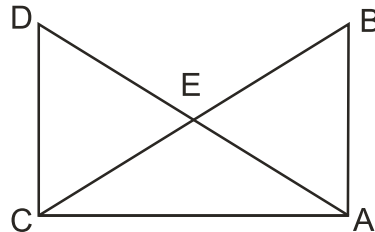
12. Match the columns :

**Column A**

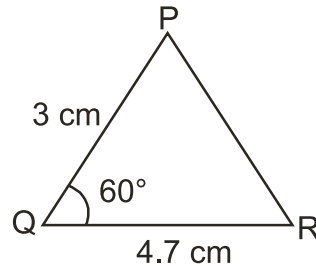
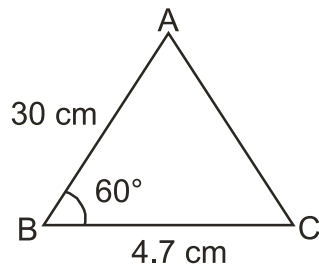
**Column B**

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

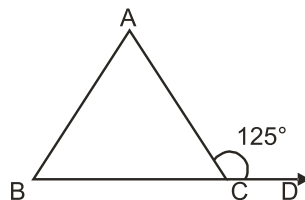
13. In the given figure. If  $AB = CD$ ,  $AD = BC$  then prove that  $\triangle ADC \cong \triangle CBA$



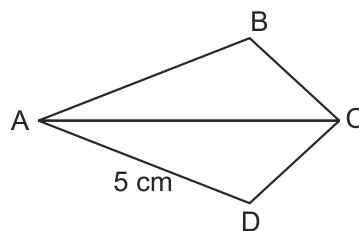
14. If  $\triangle ABC$  is an isosceles triangle such that  $AB = AC$ , then prove that altitude  $AD$  from  $A$  on  $BC$  bisects it.
15. Which criteria of congruence of triangles is satisfied in the given figure.



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



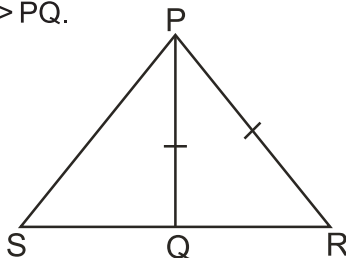
18. In  $\triangle ABC$ , if  $\angle A = 55^\circ$ ,  $\angle B = 75^\circ$  then find out the smallest and longest side of the triangle.
19. In the given figure,  $AC$  bisects  $\angle A$  and  $\angle C$ . If  $AD = 5$  cm find  $AB$ .



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

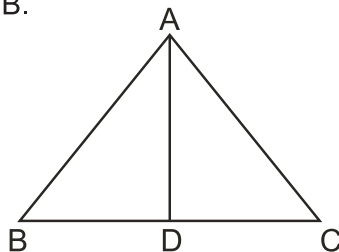
**Part – C**

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

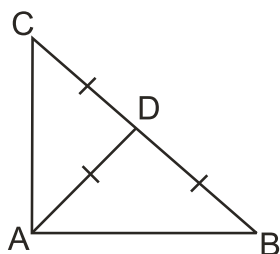


22. ABC is a triangle and D is the mid-point of BC. The perpendicular from D to AB and AC are equal. Prove that triangle is isosceles.
23. Prove that angles opposite to the equal sides of an isosceles triangle are equal.
24. In the given figure,  $AC > AB$  and AD bisects  $\angle BAC$ .

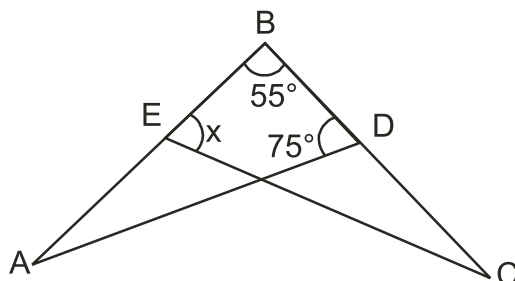
Prove that  $\angle ADC > \angle ADB$ .



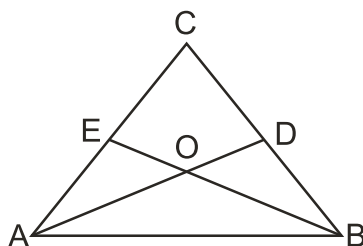
25. S is any point in the interior of a  $\triangle PQR$ . Prove that  $SQ + SR < PQ + PR$ .
26. In the given figure, if  $AD = BD = CD$ . Find  $\angle BAC$ .



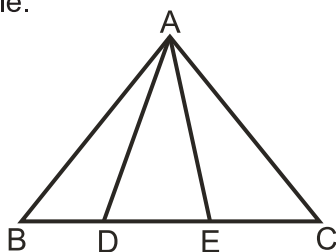
27. In the given figure, if  $AB = BC$  and  $\angle A = \angle C$  then find the value of  $x$ .



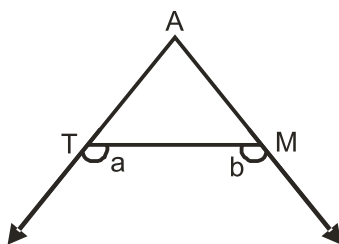
28. In the given figure,  $\angle ABC = \angle BAC$ ,  $D$  and  $E$  are points on  $BC$  and  $AC$  respectively such that  $DB = AE$ . If  $AD$  and  $BE$  intersect at  $O$  then prove that  $OA = OB$ .



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

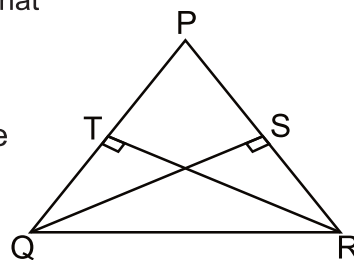


30. In  $\triangle DEF$ ,  $\angle E = 2\angle F$ .  $DM$  is the angle bisector of  $\angle EDF$  that intersects  $EF$  at  $M$ . If  $DM = MF$ , then prove that  $\angle EDF = 72^\circ$ .
31. Prove that the angles of an equilateral triangle are  $60^\circ$  each.
32. In the given figure,  $\angle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

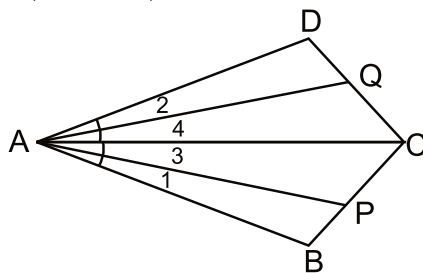


### Part – D

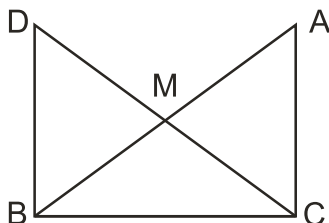
33. AF, BD and CE altitudes of  $\triangle ABC$  are equal. Prove that  $\triangle ABC$  is an equilateral triangle.
34. Prove that two triangles are congruent if two angles and the included side of one triangle are equal to the two angles and the included side of the other triangle.
35. O is any point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



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



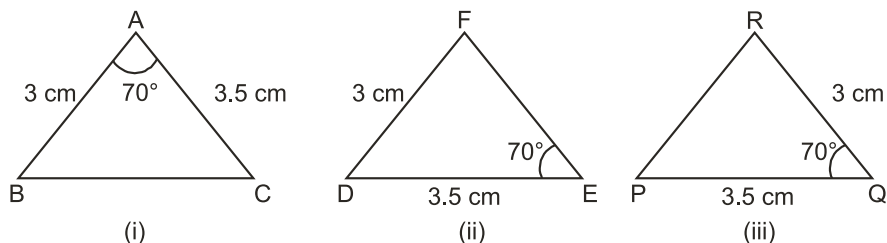
40. In the given figure, ABC is a right angled triangle, right angled at C, M is the mid-point of hypotenuse AB. C is joined to M and produced to a point D such that DM = CM. D is joined to B. Prove that  $CM = \frac{1}{2} AB$



41. Ram has a land in the shape of a square PQRS. Its diagonals PR and QS intersect at O. Show that  $\triangle POQ \cong \triangle QOR \cong \triangle ROS \cong \triangle SOP$

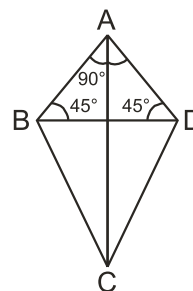
Ram donates two triangular parts of land for opening a hospital and a school. Which values are exhibited by Ram?

42. Vandana wishes to literate the poor children of the nearby slum area. She makes flash cards for them as shown in the given figure.



- (a) Which two flash cards are congruent?  
 (b) Which criteria of congruency is satisfied here?  
 (c) Which values are depicted by Vandana?
43. Pravesh with his friends made kites for orphanage children for Independence day celebration. He pasted orange strip on the longest side of  $\triangle ABD$ .

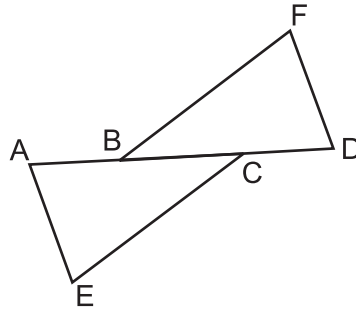
- (a) Which is the longest side of  $\triangle ABD$  of Kite?  
 (b) What values are exhibited by Pravesh and his friends by performing such activity?



44. 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)
2. (c)
3. (i) DE (ii) EF (iii) FD
- (iv)  $\angle B$  (v)  $\angle BAC$  (vi)  $\angle EFD$
4. 12 cm
5.  $\angle BOD$
6. E
7. BC
8.  $\angle Q$
9.  $\triangle LOM \cong \triangle QOP$
10. same side length
11. (i) (b) (ii) (a) (iii) (d)
- (iv) (c)
12. (i) (c) (ii) (a) (iii) (e)
- (iv) (b) (v) (d)
15. SAS
16.  $\angle Q = \angle R = 35^\circ$
17.  $\angle A = 70^\circ$
18. Smallest side = AB  
Longest side = AC
19. AB = 5 cm
20.  $50^\circ, 50^\circ$
26.  $\angle BAC = 90^\circ$
27.  $75^\circ$
41. Charity, Care for society etc.
42. (a) (i) and (iii)  
(b)  $\triangle ABC \cong \triangle QRP$  (SAS Congruency)  
(c) Social Value etc.
43. (a) BD (b) Social Values etc.

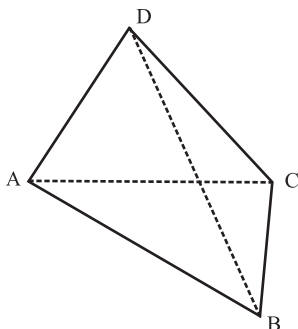


## CHAPTER-8

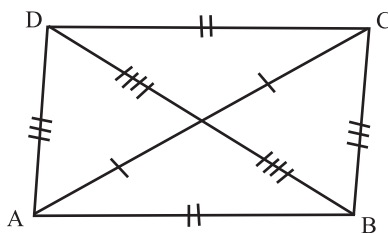
# QUADRILATERALS

### KEY POINTS

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

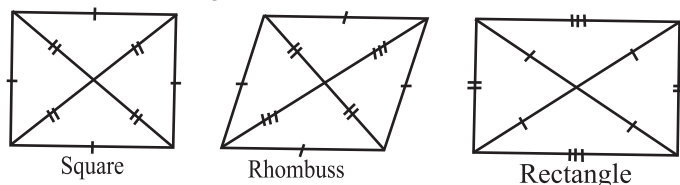


- i) Two pairs of opposite side (no common point)
  - ii) Two pairs of opposite angles  $\angle A$  &  $\angle C$  and  $\angle B$  &  $\angle D$ .
  - iii) Four pairs of adjacent sides AB & BC, BC & CD, CD & AD and AD & AB (one common point)
  - iv) Four pairs of adjacent angles  $\angle A$  &  $\angle B$ ,  $\angle B$  &  $\angle C$ ,  $\angle C$  &  $\angle D$ ,  $\angle D$  &  $\angle A$ .
  - v) Line segment join opposite vertices called diagonal of quadrilateral. 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.

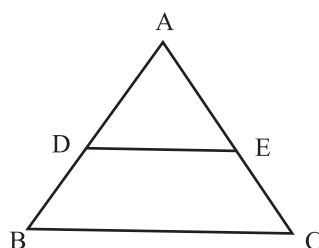


- Opposite sides are equal or
- Opposite angles are equal or
- Diagonals bisect each other or
- One pair of opposite sides is equal and parallel

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



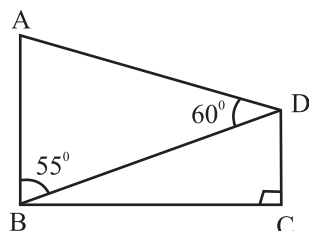
4. Theorem :- A line segment joining the mid points of the two sides of a triangle is parallel to the third side and is half of it. If D & E are mid points then  $DE \parallel BC$  and  $DE = \frac{1}{2} BC$ .



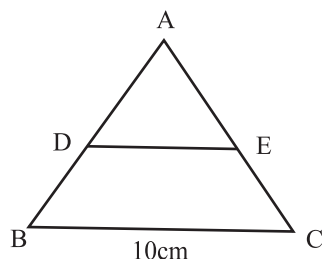
5. Converse of mid point theorem.  
The line drawn through the mid point of one side of a triangle, parallel to another side bisects the third side.

### Part – A

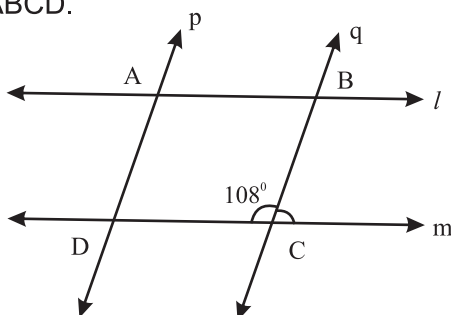
- In a rhombus ABCD, if  $\angle A = 60^\circ$  find  $\angle B$ ,  $\angle C$  &  $\angle D$ .
- The angles of a quadrilateral are in the ratio 1:2:4:5. Find the measure of each angle.
- If in a rhombus LMNP,  $\angle LNM = 40^\circ$  then what is the measure of  $\angle LPM$ ?
- In a parallelogram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



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



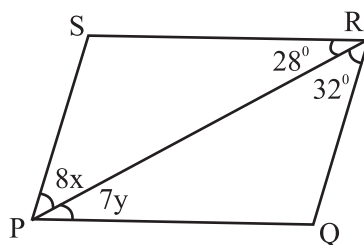
7. PQRS is a rhombus with  $\angle QPS = 50^\circ$ . Find  $\angle RQS$ .
8. The angles of a quadrilateral are in the ratio 2:3:5:8. Find all the angles of the quadrilateral.
9. In the figure line  $l \parallel m$  and  $p \parallel q$ ,  $\angle BCD = 108^\circ$  find all four angles of quadrilateral ABCD.



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

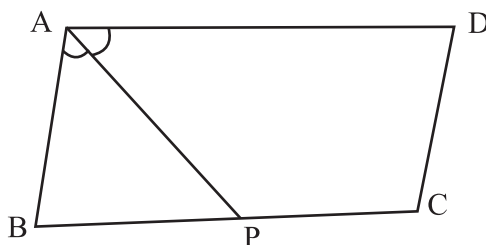
#### Part – B

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



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

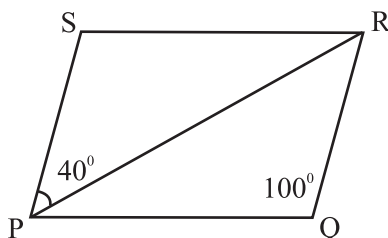
16. In a parallelogram ABCD diagonals AC and BD intersect at O and  $AC = 7.4$  cm. and  $BD = 6.2$  cm. Find the length of AO and BO.
17. Two opposite angles of a parallelogram are  $(5x-3)$  and  $(4x+12)$ . Find the measure of each angle of the parallelogram.
18. Diagonals of a quadrilateral ABCD bisect each other if  $\angle A = 35^\circ$  determine  $\angle B$ .
19. The perimeter of a parallelogram is 30cm. If longer side is 9.5 cm then find the length of shorter side.
20. In a parallelogram ABCD diagonals AC and BD intersect at O and  $AC = 12.6$  cm and  $BD = 9.4$  cm. Find the measures of OC and OD.
21. In the give figure P is the mid point of side BC of a parallelogram ABCD such that  $\angle BAP = \angle DAP$  prove that  $AD = 2CD$ .



22. The angles of a quadrilateral are  $(x+20)$ ,  $(x-20)$ ,  $(2x+5)$ ,  $(2x-5)$ . Find the value of  $x$ .

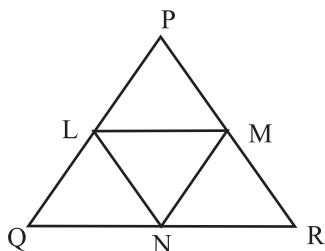
### Part – C

23. ABCD is a rectangle in which diagonal AC bisects  $\angle A$  as well as  $\angle C$ . Show that ABCD is a square.
24. In the adjoining figure if PQRS is a parallelogram and  $\angle PQR = 100$  and  $\angle SPR = 40$ . Find  $\angle PRQ$  and  $\angle SRQ$ .

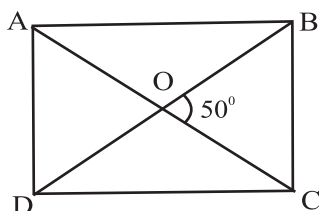


25. Prove that the line segment joining the mid points of two sides of a triangle is parallel to the third side.

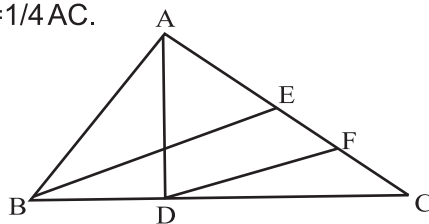
26. In the given figure L, M, and N are mid point of the sides PQ, PR and QR respectively of  $\triangle PQR$ . If  $PQ = 4.4\text{cm}$ ,  $QR = 5.6\text{ cm}$  and  $PR = 4.8\text{cm}$  then find the perimeter of  $\triangle LMN$ .



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



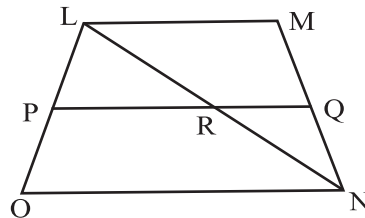
32. In the given figure AD and BE are the medians of  $\triangle ABC$  and  $BE \parallel DE$  prove that  $CF = \frac{1}{4} AC$ .



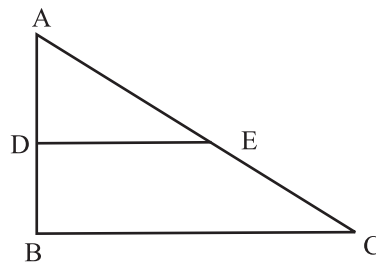
#### Part – D

33. AD is a median of  $\triangle ABC$  and E is the mid point of AD, BE produced meets AC in F. Prove that,  $AF = \frac{1}{3} AC$ .

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



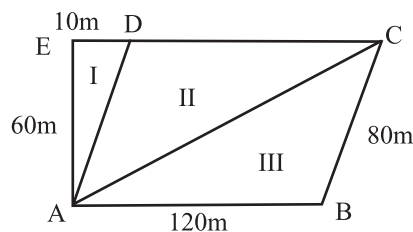
35. In the figure,  $\triangle ABC$  is right angled at B. If  $AB = 9$  cm  $AC = 15$  cm. and D and E are the mid points of AB & AC respectively calculate.
- The length of BC
  - The area of trapezium BCED



36. Show that bisectors of angles of parallelogram form a rectangle.
37. 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 ?
- What values of the farmer are depicted here ?



**CHAPTER-8**  
**QUADRILATERALS**

**ANSWERS**

- |  |                                |
|--|--------------------------------|
| 1. $120^{\circ}, 60^{\circ}, 120^{\circ}$              | 20. 6.3 cm, 4.7 cm             |
| 2. $30^{\circ}, 60^{\circ}, 120^{\circ}, 150^{\circ}$  | 21. 20x units                  |
| 3. $100^{\circ}$                                       | 22. $x = 6$                    |
| 4. Rectangle   | 24. $40^{\circ}, 80^{\circ}$   |
| 5. $115^{\circ}$                                       | 26. 7.4 cm                     |
| 6. 5 cm  | 27. $65^{\circ}$               |
| 7. $65^{\circ}$  | 35. 12 cm, $40.5 \text{ cm}^2$ |
| 8. $40^{\circ}, 60^{\circ}, 100^{\circ}, 160^{\circ}$  |                                |
| 9. $108^{\circ}, 72^{\circ}, 108^{\circ}, 72^{\circ}$  |                                |
| 10. $100^{\circ}, 80^{\circ}, 100^{\circ}, 80^{\circ}$ |                                |
| 13. $70^{\circ}, 110^{\circ}$                          |                                |
| 14. $x = y = 4$  |                                |
| 16. 3.7 cm, 3.1 cm                                     |                                |
| 17. $72^{\circ}, 108^{\circ}, 72^{\circ}, 108^{\circ}$ |                                |
| 18. $35^{\circ}$                                       |                                |
| 19. 5.5 cm   |                                |

## CHAPTER-9

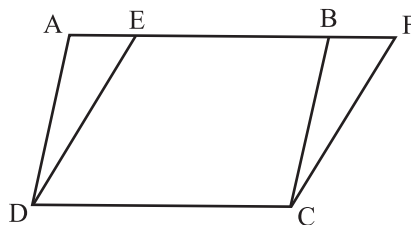
# AREAS OF PARALLELOGRAMS & TRIANGLES

### KEY POINTS

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

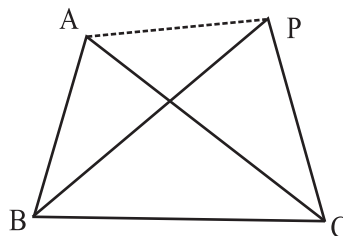
Two parallelograms ABCD and EFCD on the same base DC and between same parallels AF and DC

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



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

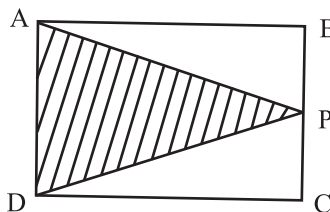
Two triangles ABC and PBC on the same base BC and between same Parallel lines BC and AP in the given figure then  $\text{ar}(\triangle ABC) = \text{ar}(\triangle PBC)$



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

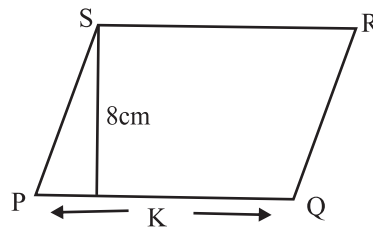
### Part – A

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

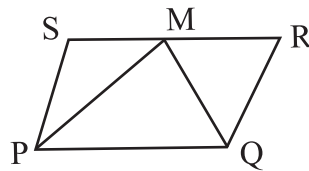




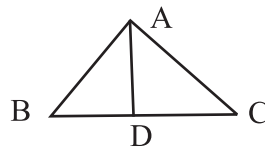
2. If area of Parallelogram PQRS is  $88 \text{ cm}^2$  find K.



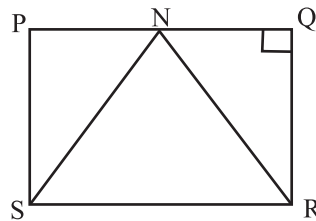
3. PQRS is a Parallelogram and PQM is a triangle. If area of PQM =  $180 \text{ cm}^2$ . Find the area of PQRS.



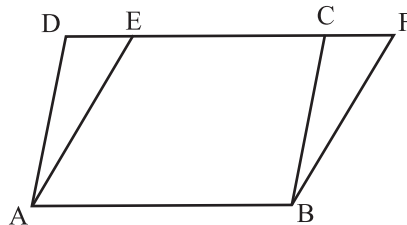
4. In  $\triangle ABC$ , AD is median. If area of  $\triangle ABD = 25 \text{ cm}^2$  find the area of  $\triangle ABC$ .



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



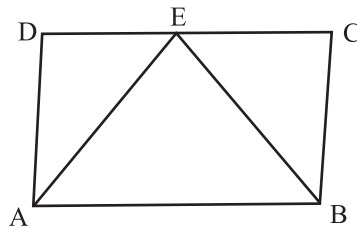
6. In the figure ABCD and ABFE are Parallelograms then find ar ( $\triangle BCE$ ).



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

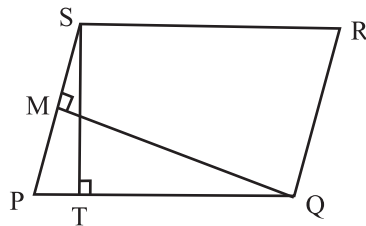
of the parallelogram.

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

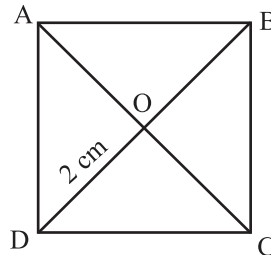


**Part – B**

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

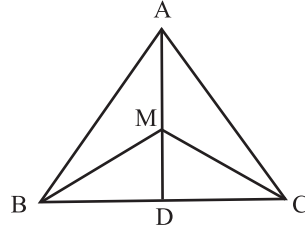


17. In given fig. ABCD is a square whose diagonals are intersecting at O. If OD = 2 cm then find the length of AB.



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

19. M is any point on the median AD of  $\triangle ABC$ . Show that  $\text{ar}(\triangle AMB) = \text{ar}(\triangle AMC)$ .



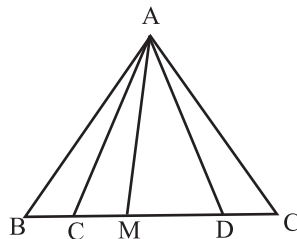
20. If D, E and F are respectively the mid points of sides BC, CA, and AB of  $\triangle ABC$  show that.

i) BDEF is a parallelogram.

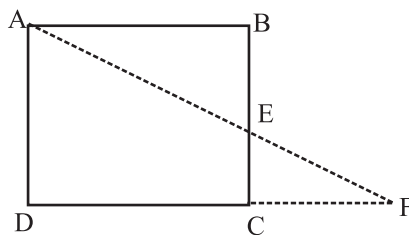
ii)  $\text{ar}(\triangle DEF) = \frac{1}{4} \text{ar}(\triangle ABC)$

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

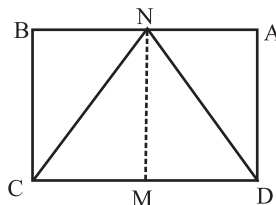
M is the mid point of CD then find the area of  $\triangle AMC$ .



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



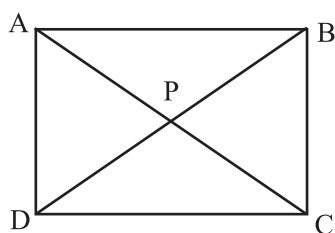
23. In the given figure, the area of parallelogram ABCD is  $40 \text{ cm}^2$ . If MN is a median of  $\triangle CDN$  then find the area of  $\triangle NDM$ .



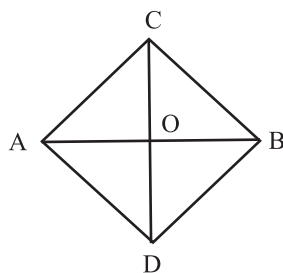
### Part-C

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

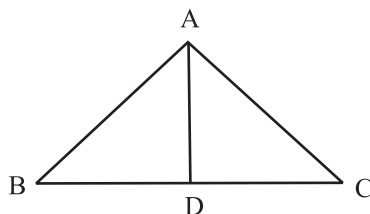
- (i)  $\text{ar}(\triangle APB) + \text{ar}(\triangle PCD) = \frac{1}{2} \text{ar}(\text{ABCD})$
- (ii)  $\text{ar}(\triangle APD) + \text{ar}(\triangle PBC) = \text{ar}(\triangle APB) + \text{ar}(\triangle PCD)$



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

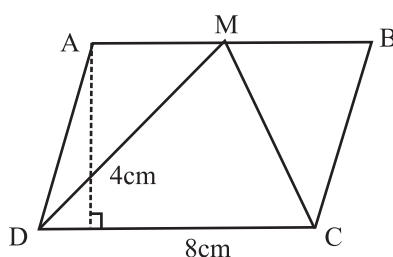


29. In given figure AD is median of  $\triangle ABC$ . Prove that  $\text{ar}(\triangle ABD) = \text{ar}(\triangle ACD)$ .



### Part – D

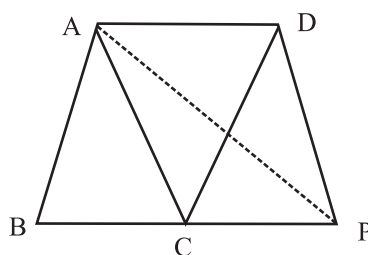
30. Prove that parallelogram on the same base and between same parallels are equal in area.
31. Prove that the two triangles on the same base and between the same parallels are equal in area.
32. If a triangle and parallelogram are on the same base and between the same parallels then prove that the area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



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

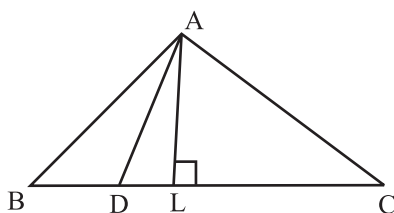
Letter he decided to construct playground of shape  $\triangle ABP$  for children. If AC  $\parallel$  DP then

- (a) Prove that  $\text{ar}(\triangle ABCD) = \text{ar}(\triangle ABP)$
- (b) Which values are depicted here?

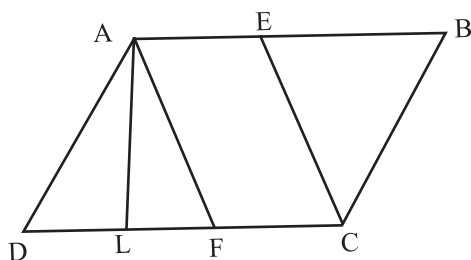


36. A farmer has a square plot of land where he wants to grow five different crops at a time. On half of the area in the middle he want to grow different crops.

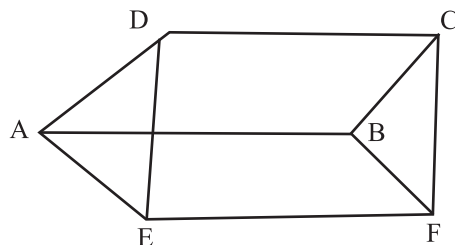
- a) Explain by diagram how he can divide the area to fulfill his purpose.
- b) By using the crop pattern which values are depicted by the farmer.
37. In the adjoining figure, the point D divides the side BC of  $\triangle ABC$  in the ratio  $m:n$ . Prove that  $\text{ar}(\triangle ABD) : \text{ar}(\triangle ADC) = m : n$ .



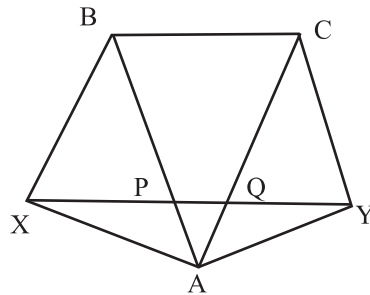
38. ABCD is a parallelogram. E is a point on BA such that  $BE = 2EA$  and F is a point on DC such that  $DF = 2FC$ . Prove that AECF is a parallelogram whose area is one third the area of parallelogram ABCD.



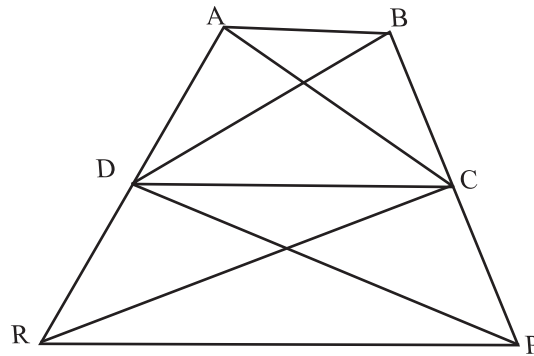
39. In the adjoining figure, two parallelogram ABCD and AEFB are drawn on opposite sides of AB. Prove that  $\text{ar}(\text{Parallelogram ABCD}) + \text{ar}(\text{Parallelogram AEFB}) = \text{ar}(\text{Parallelogram EFCD})$



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



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



CHAPTER-9  
**AREAS OF PARALLELOGRAM & TRIANGLES**

**ANSWERS**

1.  $40 \text{ cm}^2$
2.  $11 \text{ cm}$
3.  $36 \text{ cm}^2$
4.  $50 \text{ cm}^2$
5.  $7 \text{ cm}$
6.  $8 \text{ cm}^2$
7.  $1:1$
8.  $1:2$
9.  $1:4$
10.  $40 \text{ cm}^2$
11.  $1:1$
12.  $15 \text{ cm}^2$
15.  $\frac{11}{2}$  units
16.  $18 \text{ cm}$
17.  $\sqrt{8} \text{ cm}$
21.  $\frac{1}{6} \triangle ABC$
23.  $10 \text{ cm}^2$
32.  $16 \text{ cm}^2$



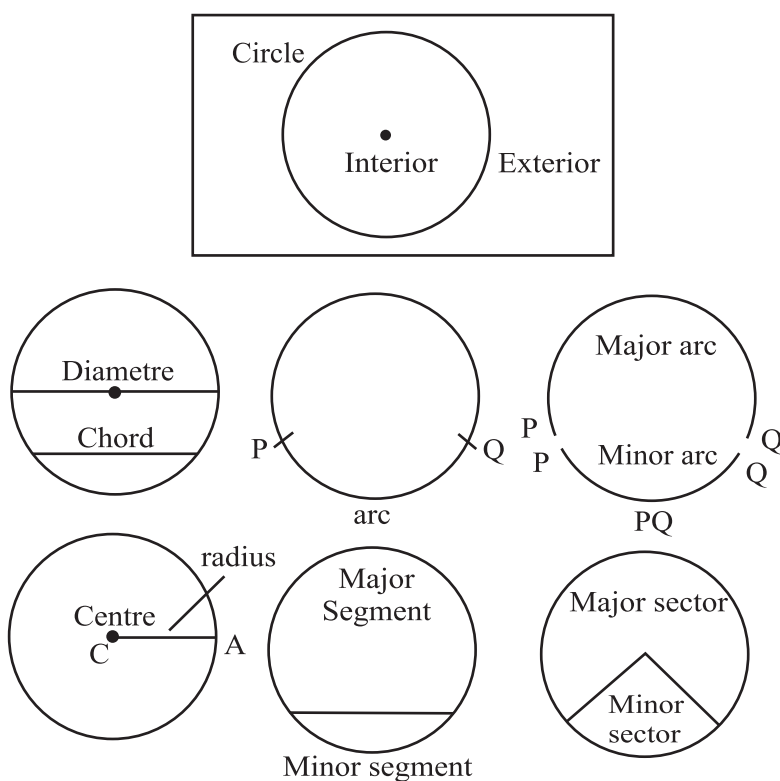
## CHAPTER-10

# CIRCLES

### KEY POINTS

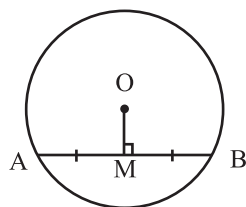
- The collection of those points in a plane which are at a fixed distance from a given fixed point is called a circle. That fixed point is called centre of the circle and that fixed distance is called radius.

Circle and related Terms !

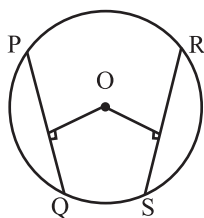


- There is one and only one circle passing through three non-collinear points.
- Equal chords of a circle subtend equal angles at centre.
- If angles subtended by chords at centre are equal then chords are equal.
- The perpendicular from centre to a chord of a circle, bisects the chord.

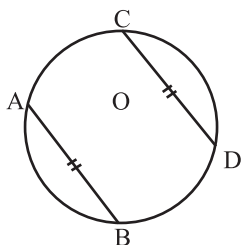
- The line joining the centre of a circle to the mid point of a chord is perpendicular to the chord.



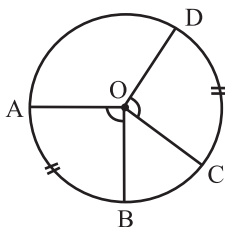
- Equal chords of a circle are equidistant from centre.
- Chords equidistant from centre are equal in length.



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

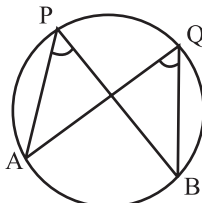


- Congruent arcs (or equal arcs) of a circle subtends equal angle at centre.

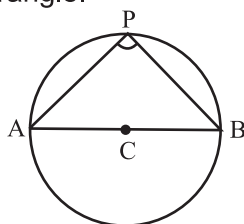


- The angle subtend by an arc at the centre of circle is twice the angle which is subtend at remaining part of the circle.

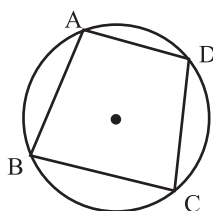
- Any two angles in the same segment of the circle are equal.



- Angle of semi circle is right angle.

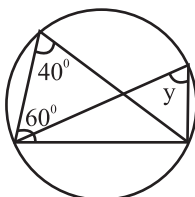


- In a cyclic quadrilateral the sum of opposite angles is  $180^\circ$ .
- If sum of opposite angles of a quadrilateral is  $180^\circ$  then that quadrilateral is cyclic quadrilateral.

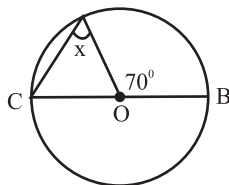


### Part – A

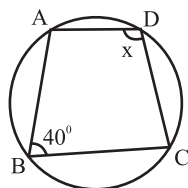
- If the sum of a pair of opposite angles of a quadrilateral is  $180^\circ$ , then quadrilateral is \_\_\_\_\_.
- A round pizza is cut into 4 equal pieces. What does each piece represent?
- AD is a diameter of a circle and AB is a chord if  $AD = 34\text{cm}$ ,  $AB = 30\text{ cm}$  then find the distance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



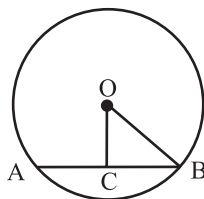
6. Find  $x$



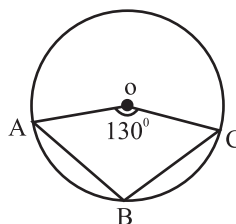
7. Find  $x$



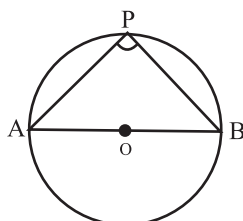
8. Diameter is the \_\_\_\_\_ Chord of a circle.
9. Circle having the same centre and different radii are called \_\_\_\_\_ circles.
10. In given figure OC is perpendicular segment drawn from centre O on chord AB. If  $OB = 5\text{cm}$ , and  $OC = 3\text{cm}$  then find length of AB.



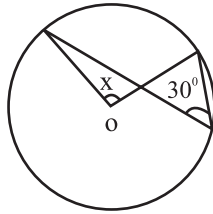
11. In given figure O is centre of circle.  
If  $\angle AOC = 130^\circ$  then find  $\angle ABC$



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

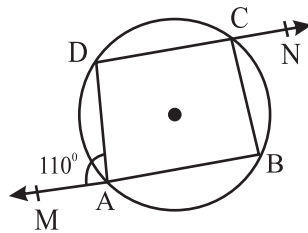


13. Find the value of  $x$  in given figure.

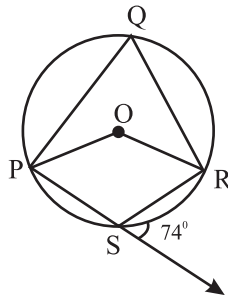


**Part – B**

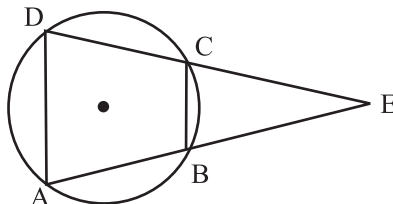
14. Prove that cyclic parallelogram is a rectangle.
15. A chord of a circle is equal to the radius of the circle. Find the angle subtended by the chord at a point on the minor arc and also at a point on the major arc.
16. In the following figure. Find the value of  $\angle BCN$ .



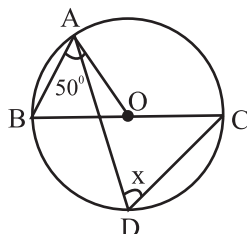
17. In the given figure. Find the value of reflex angle POR.



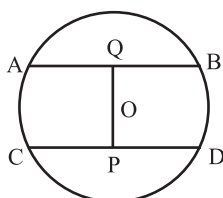
18. In given figure ABCD is a cyclic quadrilateral chords AB and CD are produced to meet E show that  $EA \times EB = EC \times ED$ .



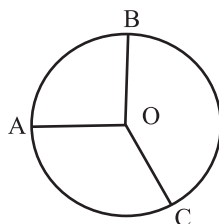
19. Find the value of  $x$  in figure if  $O$  is centre of circle and  $\angle OAB = 50^\circ$ .



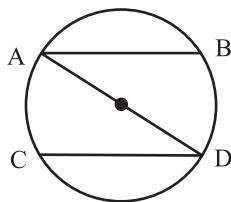
20. In the given figure,  $O$  is centre of the circle with radius 5 cm,  $OP \perp CD$ ,  $OQ \perp AB$ ,  $AB \parallel CD$ ,  $AB = 6$  cm and  $CD = 8$  cm. Determine  $PQ$ .



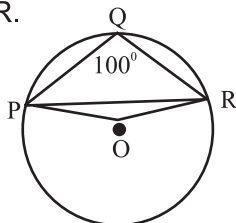
21. In the given figure,  $O$  is the centre of a circle,  $\angle AOB = 90^\circ$ ,  $\angle BOC = 120^\circ$ , what is measure of  $\angle ABC$ .



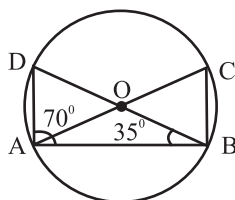
22. In the given figure  $AB$  and  $CD$  are parallel chords if the length of arc  $AC = 14$  cm. What is length of  $BD$ .



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

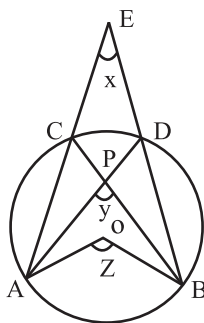


24. In the given figure O is centre of circle, if  $\angle ABD = 35^\circ$  and  $\angle BAD = 70^\circ$  find  $\angle ACB$ .

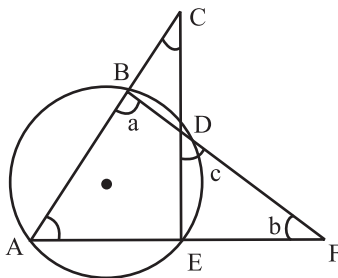


### Part – C

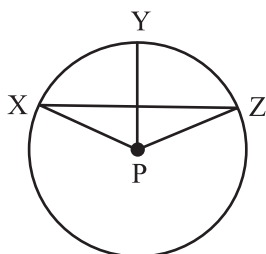
25. In the given figure, O is the centre of a circle prove that  $\angle x + \angle y = \angle z$ .



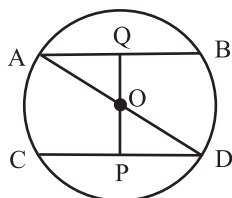
26. If two non parallel sides of a trapezium are equal prove that it is cyclic quadrilateral.
27. In the given figure determine a, b & c if  $\angle BCD = 43^\circ$ ,  $\angle BAF = 62^\circ$ .



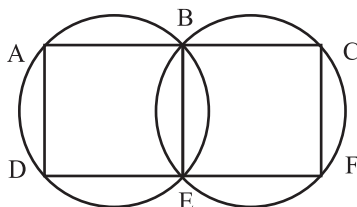
28. In the figure P is the centre prove that  $\angle XPZ = 2(\angle XZP + \angle YXZ)$



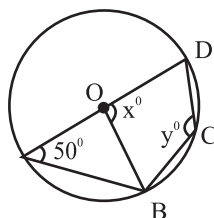
29. In the given figure AD is diameter of the circle whose centre is O and  $AB \parallel CD$  prove that  $AB = CD$ .



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



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



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

#### Part – D

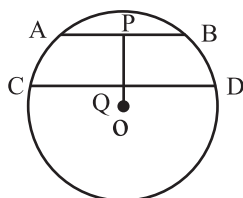
35. Bisector of angle A, B and C of a  $\triangle ABC$  intersect its circum circle at D, E and F respectively, prove that the angles of a triangle DEF are  $90^\circ - \frac{1}{2} A$ ,  $90^\circ - \frac{1}{2} B$ ,  $90^\circ - \frac{1}{2} C$



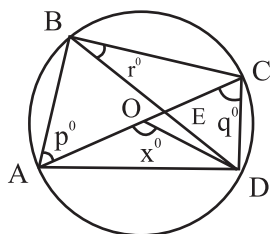
36. Find the sum of the angles in the four segments exterior to a cyclic quadrilateral.
37. Let the vertex of an angle ABC be located outside a circle and let the sides of the angle intersect equal chords AD and CE with the circle. Prove that  $\angle ABC$  is equal to half the difference of the angles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

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

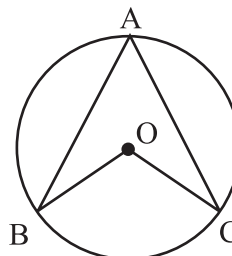
38. In the given figure O is centre of the circle of radius 5 cm,  $OP \perp CD$ ,  $AB \parallel CD$   
 $AB = 6$  cm and  $CD = 8$  cm  
 Determine PQ



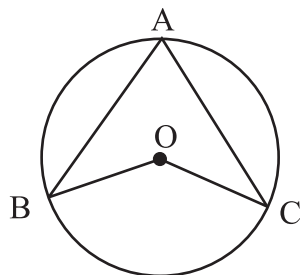
39. In the adjoining figure AC is diameter of a circle with centre O and chord  $BD \perp AC$ , intersecting each other at E. Find out the values of p, q, r in terms of x, if  $\angle AOD = x^\circ$ ,  $\angle BAC = p^\circ$ ,  $\angle ACD = q^\circ$ .



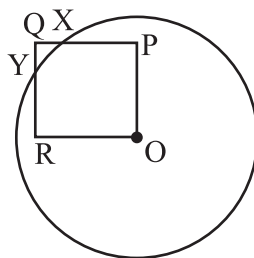
40. During a practical activity in maths lab students were using circular geo board. The angle subtended by an arc at the centre is  $(2a+50^\circ)$ . Pallavi calculated  $\angle BAC$  as  $(a+25^\circ)$ .
- Is her finding correct? Justify it.
  - Find  $\angle BAC$  if  $a = 30^\circ$
  - What will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



41. 3 STD booths situated at A, B and C as shown in the figure are operated by handicapped persons. These three booths are equidistant from each other.

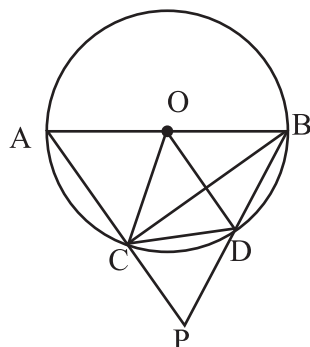


- a) Find  $\angle BOC$ .
  - b) Do you think employment provided to handicapped person is important for the development of a society. Justify your answer.
42. Three friends ordered 3 pizzas of the same sized for them. Just then two more friends joined them. They decided to share 3 pizzas among all of them.
- a) Find the area of the share of pizza each child gets if the radius of each pizza is 7 cm.
  - b) Which values of children are depicted here?
43. Prove that there is one and only one circle passing through three non-collinear points.
44. In the given figure OPQR is a square. A circle drawn with centre O cuts the square in X and Y. Prove that  $QX = QY$ .

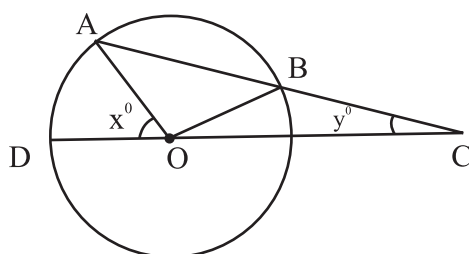


45. Prove that the opposite angles of a cyclic quadrilateral are supplementary.

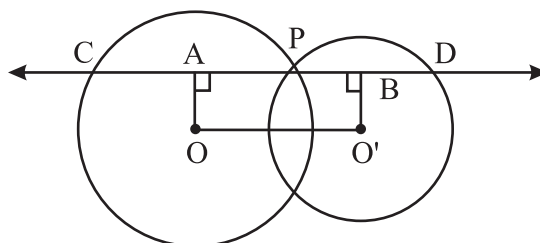
46. In the given figure, AB is a diameter of a circle (o, r) and chord CD = radius oc. If AC and BD when produced meet at P. Prove that  $\angle APB$  is constant.



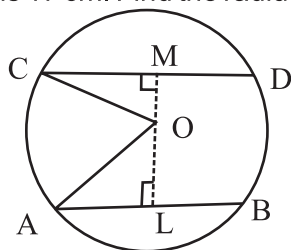
47. Prove that the angle subtended by an arc of a circle at the centre is double the angle subtended by it at any point on the remaining part of the circle.
48. In the given figure, AB is a chord of a circle with centre O and AB is produced to C such that  $BC = OB$ . Also, CO is joined and produced to meet the circle in D. If  $\angle ACD = y^\circ$  and  $\angle AOD = x^\circ$ . Prove that  $x = 3y$ .



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



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



## CHAPTER-10 CIRCLES

### ANSWERS

1. Cyclic quadrilateral
2. Sector
3. 8 cm
4. 10 cm
5.  $y = 40^\circ$
6.  $x = 35^\circ$
7.  $x = 140^\circ$
8. longest
9. concentric
10. 8 cm
11.  $115^\circ$
12.  $90^\circ$
13.  $60^\circ$
15.  $30^\circ, 150^\circ$
16.  $70^\circ$
17.  $212^\circ$
19.  $50^\circ$
20. 7 cm
21.  $75^\circ$
22. 14 cm
23.  $10^\circ$
24.  $75^\circ$
27.  $a = 105^\circ, b = 13^\circ, c = 62^\circ$
32.  $x = 100^\circ, y = 130^\circ$
36.  $540^\circ$
38. 1 cm
39.  $p = 90 - \frac{1}{2}x, q = \frac{1}{2}x, 90 - \frac{1}{2}x$
40. i) yes  
ii)  $55^\circ$   
iii)  $80^\circ$   
iv) Truth, scientific temper
41. a)  $120^\circ$   
b) yes
42. a)  $92.4 \text{ cm}^2$   
b) Co-operation.
50. 13 cm

**CHAPTER-11**  
**CONSTRUCTIONS**  
**KEY POINTS**

- Following types of constructions using a ruler and compass are important.
  1. Construction of angle 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 parallel lines to a given line.
  6. Construction of a triangle given its base, a base angle and the sum of the other two sides.
  7. Construction of a triangle given its base, a base angle, and the difference of the other two sides.
  8. Construction of a triangle given its perimeter and its two base angles.

**Questions**

1. Draw a line segment of 7.2 cm and bisect it. Also measure each part.
2. Draw perpendicular bisector of  $AB = 6.4$  cm.
3. Draw a line segment  $PQ = 8$  cm. Draw a perpendicular at P.
4. Draw a line  $AB = 7.9$  cm and draw perpendiculars at A and B.  
Are these two perpendiculars parallel to each other?
5. Draw an angle  $\angle ABC = 32^\circ$  using protractor. Construction 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
  - a) Construct the triangle taking measurement in cm.
  - b) What values are depicted here?
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
  - a) Construct  $\triangle ABC$  taking measurement in cm.
  - b) What values are represented here?
21. Draw a line  $l$  and take a point P which is not on  $l$ . From point P draw  $m \parallel l$ .

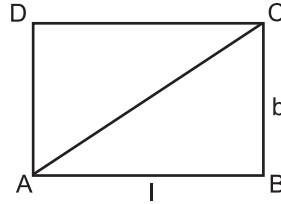
## CHAPTER-12

# HERON'S FORMULA

### KEY POINTS

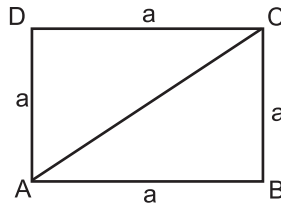
- Rectangle : If length and breadth of a rectangle is 'l' and 'b' respectively then

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



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

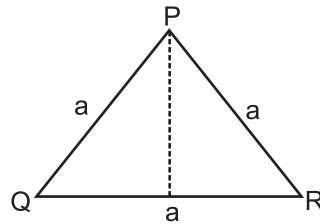
- (i) Perimeter of square =  $4a$
- (ii) Area of square =  $(\text{side})^2 = (a)^2$
- (iii) Area of square =  $\frac{1}{2} \times (\text{diagonal})^2$



- Triangle :

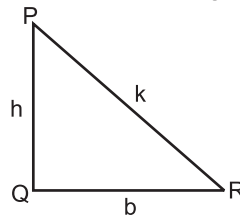
- (A) Equilateral Triangle : In this triangle all three sides are equal. If the length of each side is 'a'

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



- (B) Right Angled Triangle : When an angle is of  $90^\circ$  of a triangle.

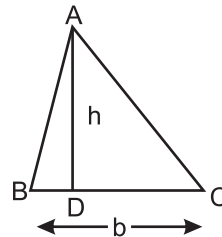
- (i) Hypotenuse  $K = \sqrt{b^2 + h^2}$
- (ii) Perimeter =  $b + h + k$
- (iii) Area =  $\frac{1}{2} \times b \times h$



Area of triangle (General Formula)

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

$$= \frac{1}{2} \times b \times h$$



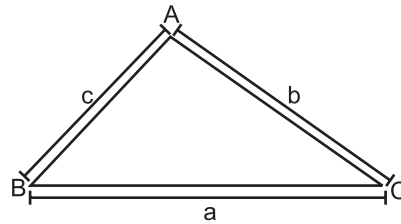


- The sides of triangle are a, b and c

(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.

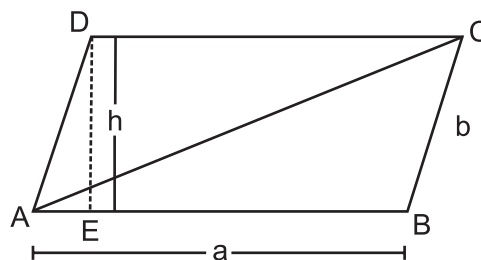
- Area of Parallelogram : If a is the length and b is breadth of a parallelogram and h be the height or perpendicular distance between two parallel sides then.

Area of parallelogram (ABCD)

= Base x Corresponding Height

= AB x DE

=  $a \times h$



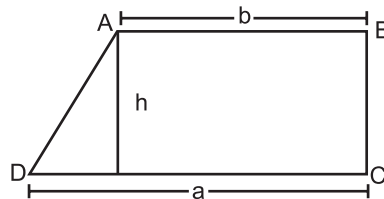
Area of  $\Delta ABC = \frac{1}{2} \times \text{Area of Parallelogram}$

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

Area of trapezium

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

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

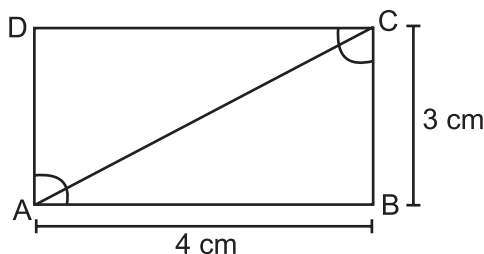


### Part – A

- Find the area of a triangle whose base and altitudes are 8cm and 5cm.
- Find the area of an equilateral triangle whose sides are 4cm each.
- If sum of two sides of a triangle is 17cm and its perimeter is 30cm, then

what is the length of third side.

4. If perimeter of a triangle is 24cm and sides are in the ratio 2 : 1 : 3, then find the longest side?
5. If each sides of a triangle is doubled then how many times the area of triangle increased?
6. If area of a triangle is  $50\text{cm}^2$  and one of its sides is 10cm then find the length of corresponding altitude.
7. The area of an equilateral triangle is  $16\sqrt{3}\text{ cm}^2$  then what will be the length of each side of that triangle?
8. Find the ratio between the area  $\triangle ABC$  and area  $\triangle ACD$  of the given rectangle.

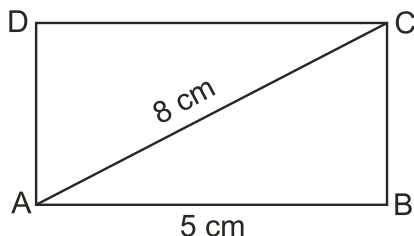


9. A square has each side of 5cm. Find the length of one of its diagonals.
10. If a parallelogram has length is 10cm and 8cm then find the area of a triangle made by its diagonal.
11. If area of a triangle is doubled to its area then what is the percentage increased in the area of triangle?
12. If one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

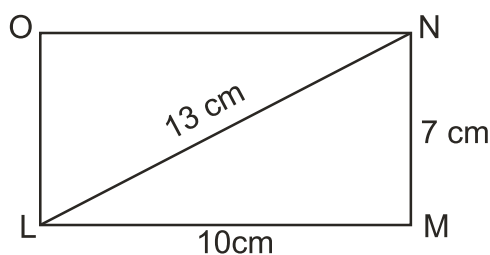
#### Part – B

13. The ratio between the sides of a triangle are 3 : 5 : 7 and its perimeter is 300cm find the sides of triangle.
14. Find the cost of fencing the ground in the form of a triangle with sides 16 m, 12 m and 18 m. The rate of fencing is Rs. 25 per meter.
15. Find the area of isosceles triangle whose non equal side of 12 cm having the corresponding altitude is 7.5 cm.
16. The parallel side of a trapezium is 77m and 60m and its non parallel sides are 26m and 25m. Find the area of trapezium.

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



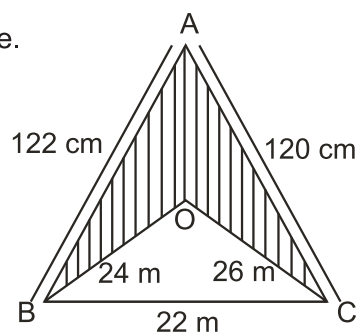
18. If in a triangle  $AB = 15$  cm,  $BC = 14$  cm and  $AC = 13$  cm. Find the area of  $\triangle ABC$  and hence its altitude on  $BC$ .
19. Show that the Area of an equilateral triangle is  $\frac{\sqrt{3}}{4} x^2$ , where side is  $x$ .
20. Two sides of a parallelogram  $LMNO$  are 7 cm and 10 cm one of its diagonal is 13 cm. Find the area of the parallelogram.



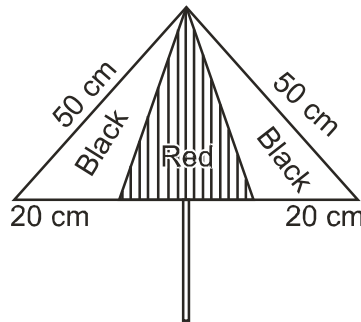
### Part – C

21. 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.
22. Find the area of a triangle whose sides are 1.6m, 1.2m and 2.0m.
23. The cost of leveling a park at the rate of  $2\text{km}^2$  is ₹ 2,700. If the park is in right angled triangular form with one side being 45 km. Find the hypotenuse side.
24. Find the area of shaded region in the figure.

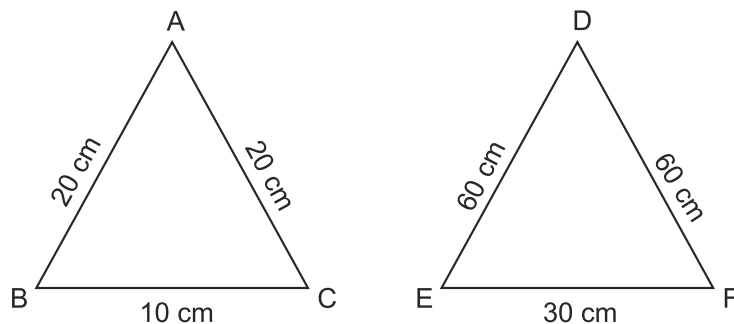
Use  $\sqrt{105} = 10.25$



25. Find the area of rhombus whose perimeter is 100 m and one of whose diagonal is 30 m.
26. The sides of a triangle shaped sheet are 5 cm, 12 cm and 13 cm. Find the cost of painting on the sheet at the rate of ₹ 30 per  $\text{cm}^2$ .
27. An umbrella is made by stitching 6 triangular pieces of cloth of red and black colours each measuring 20 cm, 50 cm and 50 cm. How much cloth of each colour is required for umbrella?



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

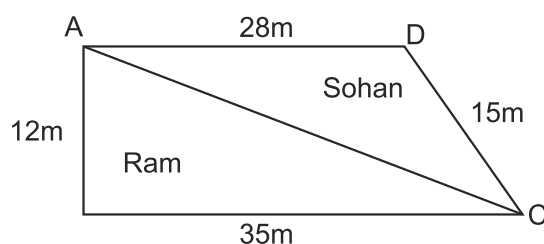


29. If perimeter of a triangle is  $x$  cm and its sides are  $p$ ,  $q$  and  $r$  cm. What will be the area of triangle. Use the Heron's formula.

#### Part – D

30. A Triangular park ABC has sides 120 m, 80m and 50 m. A gardner Dhani Ram has to put a fence all around it and also plant some trees inside the garden to get clean air.
- Find the cost of fencing it at the rate of Rs. 50 per meter. Leaving space 5 cm wide for the gate on one side.
  - Find its area where Dhani Ram may plant the tree.
  - What values of Dhani Ram do you assess here.

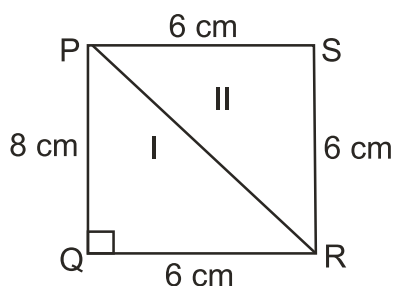
31. A piece of land is in the shape as given in the figure, has been cut along diagonal AC. The two pieces of land has been distributed between Ram and Sohan. Who will get larger piece of land in terms of area?  
[Use  $\sqrt{10} = 3.15$ ]



32. A triangle hoarding of dimension 11m, 6m and 15m is used for commercial activities. The hoarding yield an earning of ₹ 5000 per  $\text{m}^2$  per month.

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

33. A cake is in the form of quadrilateral with sides 6 cm, 8 cm, 6 cm and 6 cm is cut into two parts along its diagonal PR. Part I is given to Ram and II part given to Shashi.
- Is this distribution fair? Justify.
  - Which geometrical concept is used here.



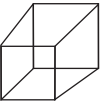
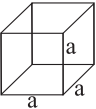

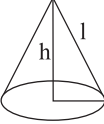
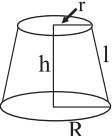
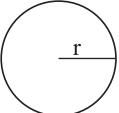

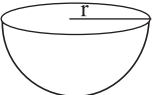
**CHAPTER-12**  
**HERON'S FORMULA**

**ANSWERS**

- |  |                                 |                           |
|--|---------------------------------|---------------------------|
| 1. $20 \text{ cm}^2$   | 2. $4\sqrt{3} \text{ cm}^2$     | 3. 13 cm                  |
| 4. 12 cm   | 5. 3 times                      | 6. 10 cm                  |
| 7. 8 cm  | 8. 1 : 1                        | 9. $5\sqrt{2} \text{ cm}$ |
| 10. $40 \text{ cm}^2$  | 11. 100%                        | 12. $57 \text{ m}^2$      |
| 13. 60cm, 100cm, 140cm   |                                 | 14. ₹ 1150                |
| 15. $45 \text{ cm}^2$  | 16. $1644 \text{ m}^2$          | 17. $12 \text{ cm}^2$     |
| 18. $84 \text{ cm}^2$ , 12cm   | 20. $40\sqrt{3} \text{ cm}^2$   |                           |
| 21. 40 m   | 22. $0.96 \text{ m}^2$          | 23. 75 km                 |
| 24. $1074 \text{ m}^2$   | 25. $300 \text{ m}^2$           | 26. ₹ 900                 |
| 27. $600\sqrt{6} \text{ cm}^2$ each  | 28. 1 : 9                       |                           |
| 29. $\sqrt{\frac{x}{2}\left(\frac{x}{2} - p\right)\left(\frac{x}{2} - q\right)\left(\frac{x}{2} - r\right)}$ |                                 |                           |
| 30. (i) ₹ 12250  | (ii) $375\sqrt{15} \text{ m}^2$ |                           |
| (iii) Caring about environment, clean air etc.   |                                 |                           |
| 31. Ram $210 \text{ m}^2$  | 32. ₹ 141000                    |                           |
| 33. (i) Not Proper   |                                 |                           |
| (ii) Area of triangle or Mensuration or Heron's formula.   |                                 |                           |

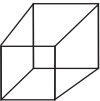
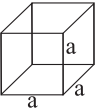

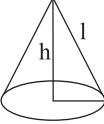
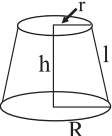
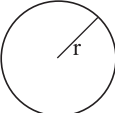

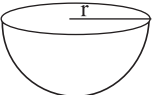
## CHAPTER-13 SURFACE AREAS AND VOLUMES

### 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.	Frustum of Cone		$\pi l(R+r)$	$\pi l(R+r) + \pi r^2 + \pi R^2$	$\frac{1}{3} \pi h(R^2 + r^2 + Rr)$	$R$ = Bigger Radius $r$ = Smaller Radius
6.	Sphere		$4\pi r^2$	$4\pi r^2$	$\frac{4}{3} \pi r^3$	$r$ = radius
7.	Hemisphere Solid		$2\pi r^2$	$3\pi r^2$	$\frac{2}{3} \pi r^3$	$r$ = radius
8.	Hemisphere hollow		$2\pi r^2$	$2\pi r^2$	$\frac{2}{3} \pi r^3$	$r$ = radius

## CHAPTER-13 SURFACE AREAS AND VOLUMES

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8.	Hemisphere hollow		$2\pi r^2$	$2\pi r^2$	$\frac{2}{3} \pi r^3$	$r$ = radius



respectively. Find the cost of white washing the walls of the room and the ceiling at the rate of ₹ 7.50 per  $\text{m}^2$ .

- Q.17 Three spheres of radii 3cm, 4cm and 5cm are melted together to form a single sphere. Find the radius of new sphere.
- Q.18 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.
- Q.19 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?
- Q.20 What is the volume of the largest cone that can be inscribed completely in a hollow hemisphere of radius 7 cm?

#### PART-C

- Q.21 A cuboidal vessel is 10m long and 8m wide. How high must it be made to hold  $380 \text{ m}^3$  of a liquid.
- Q.22 A wall of length 10m was to be built across an open ground. The height of the wall is 4m and thickness of the wall is 24cm. If this wall is to be built up with bricks whose dimensions are 24cm x 10cm x 8cm, how many bricks would be required.
- Q.23  $1.1 \text{ cm}^3$  of gold is drawn into a wire of 0.1 mm in diameter. Find the length of the wire in metre.
- Q.24 A hemispherical bowl of internal diameter 36cm contain a liquid. This liquid is to be filled in cylindrical bottles of radius 3cm and height 6 cm. How many bottles are required to empty the bowl?
- Q.25 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.
- Q.26 Water in a canal, 30 dm wide and 12 dm deep is flowing with a speed of 20 km per hour. How much area will it irrigate in 30 min if 9 cm of standing water is desired ? (10dm=1m)
- Q.27 The radius of a sphere is 10cm. If the radius is increased by 1 cm. then prove that volume of the sphere is increased by 33.1%.
- Q.28 The diameter of a hemisphere is decreased by 30%. What will be the

percentage change in its total surface area?

- Q.29 A sphere and a cube have the same surface area. Find the ratio of their volumes.
- Q.30 The volume of a sphere is  $4851 \text{ cm}^3$ . How much should its radius be reduced so that its volume becomes  $\frac{4312}{3} \text{ cm}^3$ ?

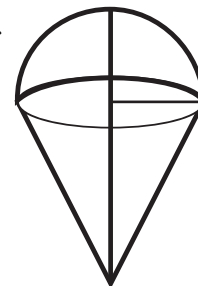
#### PART-D

- Q.31 A cuboidal tank can store 5040 litres of water. The external dimensions of the tank are  $2.2\text{m} \times 1.7\text{m} \times 1.7\text{m}$ . If the walls of the tank are 5 cm thick, then what is the thickness of the bottom of the tank?
- Q.32 A metallic sheet is of the rectangular shape with dimensions  $48\text{cm} \times 36\text{cm}$ . From each one of its corners, a square of 8cm is cut of An open box is made of the remaining sheet. Find the volume of the box.
- Q.33 A right triangle having sides 6cm, 8cm and 10cm is revolved about the side of length 8cm. Find the volume of the solid so formed.
- Q.34 A right circular cone is 5.4 cm high and radius of its base is 2cm. It is melted and recast into another right circular cone with radius of base as 1.5 cm. Find the height of new cone formed.
- Q.35 A cylindrical tub of radius 12 cm contains water to the depth of 20cm. A spherical ball is dropped into the tub raising the level of water by 6.75cm. What is the radius of ball?
- Q.36 A cylinder is within the cube touching all the vertical faces. A cone is inside the cylinder. If their height are the same with the same base. Find the ratio of their volumes.
- Q.37 A plot of land is in the form of rectangle has dimension  $240\text{m} \times 180\text{m}$ . A drain let 10m wide is dug around it (on the outside). and the earth dug out is evenly spread out over the plot increasing its surface level by 25cm. Find the depth of the drainlet.
- Q.38 A residential colony has a population of 5400 and 60 litres of water is required per person per day. For the effective utilization of rain water, a group of people decided to the WATER HARVESTING. They constructed a water reservoir measuring  $48\text{m} \times 27\text{m} \times 25\text{m}$  to collect the rain water.

- a) For how many days the water of this tank is sufficient-if during rain the height of water level is 5 m.
- b) Which value is shown by the group of people?
- Q.39 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.
- a) What is the amount spent for purchasing the card board at the rate of 20 per  $100\text{m}^2$ .
- b) What values are depicted by the students?
- Q.40 Rahul wanted to make a temporary shelter for street dogs, by making a box like structure with tarpaulin that covers all the four sides and the top of the house. How much tarpaulin would be required to make the shelter of height 2.5 m with base dimensions  $4\text{m} \times 3\text{m}$ . Assuming stitching margin is negligible. Which values are depicted in this question?
- Q.41 Twenty Seven solid iron spheres each of radius  $r$  and surface area  $S$  are melted to form a sphere with surface area  $S^1$ . Find the
- i) radius  $R$  of the new sphere.
- ii) ratio of  $S$  and  $S^1$ .
- Q.42 The diameter of a metallic ball is 4.2cm. What is the mass of the ball, if the density of the metal is  $8.9\text{g per cm}^3$ .
- Q.43 A lead pencil consists of a cylinder of wood with a solid cylinder of graphite filled in the interior.
- The diameter of the pencil is 7mm and the diameter of the graphite is 1mm. If the length of the pencil is 14cm. Find the volume of the wood and that of the graphite.
- Q.44 A soft drink is available in two packs. (i) a tin can with a rectangular base of length 5cm and width 4cm, having a height of 15cm and (ii) a plastic cylinder with circular base of diameter 7cm and height 10cm. Which container has greater capacity and by how much?
- Q.45 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 of all these cones? (Use  $\pi = 3.14$  and  $\sqrt{1.04} = 1.02$ )

- Q.46 A sphere of diameter 6cm is dropped in a right circular cylinder vessel partly filled with water. The diameter of the cylindrical vessel is 12cm. If the sphere is completely submerged in water, by how much will the level of water rise in the cylindrical vessel?
- Q.47 Marbles of diameter, 1.4cm are dropped into a cylindrical beaker, of diameter 7cm. containing some waters. Find the number of marbles that should be dropped into the beaker, so that the water level rises by 5.6cm.
- Q.48 Right circular cylinder having diameter 12cm and height 15cm is full of ice-cream. The Ice-Cream is to be filled in cones of height 12cm and diameter 6cm having a hemispherical shaped on the top. Find the number of such cones which can be filled with Ice-Cream.
- Q.49 A toy is in the form of a cone mounted on a hemisphere of diameter 7cm. The total height of the toy is 14.5 cm. Find the volume and the total surface area of the toy. (Take  $\pi = \frac{22}{7}$ )



- Q.50 If  $h$ ,  $c$  and  $v$  respectively, are the height, the curved surface and volume of the cone, prove that  $3\pi v h^3 - c^2 h^2 + 9v^2 = 0$

## CHAPTER-13 SURFACE AREAS AND VOLUMES

### ANSWERS

- |   |   |
|---|---|
| 1. $512 \text{ cm}^2$                   | 23. 140m                                    |
| 2. $180 \text{ cm}^2$                   | 24. 72                                      |
| 3. 20 : 27                              | 25. $59.4 \text{ m}^2, 95.04 \text{ m}^2$   |
| 4. $550 \text{ m}^2$                    | 26. $4,00,000 \text{ m}^2$                  |
| 5. 4 : 3                                | 28. 51%                                     |
| 6. 28cm, 14cm, 7cm                      | 29. $\sqrt{6} : \sqrt{\pi}$                 |
| 7. $\pi r \left(1 + \frac{r}{4}\right)$ | 30. 3.5cm                                   |
| 8. 2:1                                  | 31. 10cm                                    |
| 9. 1:4                                  | 32. $5120 \text{ cm}^3$                     |
| 10. $v = \frac{1}{12} \pi r^3$          | 33. $96\pi \text{ cm}^3$                    |
| 11. 500                                 | 34. 9.6cm                                   |
| 12. 2m, 4m, 6m                          | 35. 9cm                                     |
| 13. $269.5 \text{ cm}^2$                | 36. $V_1 : V_2 : V_3 = 42:33:11$            |
| 14. 20cm                                | 37. 1.227 m                                 |
| 15. 6cm                                 | 38. 20 days, Environmental values           |
| 16. 555                                 | Co-operation                                |
| 17. 6cm                                 | 39. 3511.20                                 |
| 18. $308 \text{ cm}^3$                  | 40. $47 \text{ m}^2$ , care for animals     |
| 19. $8 \text{ cm}^3$                    | 41. i) $R=3r$ (ii) $S : S^1 = 1 : 9$        |
| 20. $359.33 \text{ cm}^3$               | 42. 345.39g                                 |
| 21. 4.75m                               | 43. $5.28 \text{ cm}^3, 0.11 \text{ cm}^3$  |
| 22. 5000                                | 44. Plastic Cylinder, $85 \text{ cm}^3$     |
|   | 45. 384.34                                  |
|   | 46. 1cm                                     |
|   | 47. 150                                     |
|   | 48. 10                                      |
|   | 49. $231 \text{ cm}^3, 204.05 \text{ cm}^2$ |

## CHAPTER-14 STATISTICS

### KEY POINTS

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

If number of observations ' $n$ ' is odd

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

If number of observations ' $n$ ' is even

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

### PART-A

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

### PART-B

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

xi	5	6	7	8	4
fi	3	2	1	3	2

17. The mean of five numbers is 27. If one of the number is excluded, the mean gets reduced by 2. What is the value of the excluded number?
18. Find the mode of the data 15, 14, 19, 20, 14, 15, 16, 14, 15, 18, 14, 19,

- 15, 17, 15. If last observation is changed to 14 then find the new mode.
19. If the median of the data arranged in ascending order is 63, find the value of  $x$  in the data 29, 32, 48,  $x-2$ ,  $x$ ,  $x+2$ , 72, 78, 84, 95.
  20. The mean monthly salary of 40 workers of a factory is  $x$  in a particular year. Each one was given 3000 as Diwali Bonus. What will be the mean monthly salary in that month.
  21. In the question 20 instead of bonus, ₹300 be deducted from each workers salary for April to February. What will be their mean monthly salary for December month?
  22. For what value of  $x$  the mode of the following data is 17. The frequency of  $x$  is maximum. 13, 24, 13, 27, 17, 16, 17,  $x$ , 22, 21, 13, 17.4, ?
  23. The average age of Shikha and her husband Amit is 48 years. The average age of Shikha, Amit and their daughter Advika is 39 years. Find the age of Advika.
  24. The mean of 6, 10, 11,  $x$ , 12,  $y$  is 10. Also  $y$  is 7 more than  $x$ . Find the value of  $x$  and  $y$ .

### PART-C

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

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

27. Find the mean from the following table

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

28. Draw the histogram from the following data

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



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

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

From a frequency table from the above data.

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

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

Draw a bar graph for above data.

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

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

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

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

Draw double bar graph.

What values are depicted for these mandatory activities?

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

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

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

34. Define the term "Median". If the median of 6, 7,  $x-2$ ,  $x$ , 17, 20 written in ascending order is 16. Find the value of  $x$ .
35. Draw histogram to represent the data given below.

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

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

#### PART-D

37. The mean of the following data is 50.

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

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

38. Draw a frequency polygon for the following data

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

39. If the 26 English alphabets are taken such that A=1, B=2, C=3,....., Z=26 then find
- the mean and median of the numbers corresponding to the vowels.
  - Which alphabet corresponds to the median.

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

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

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

41. The blood group of 30 students of class IX are recorded as follows.  
A, B, B, B, O, B, B, A, AB, A, O, B, O, AB, O  
AB, AB, B, AB, B, A, O, AB, B, A, O, AB, A, A, AB
- Make a frequency distribution table for the above data.
  - Mr. 'X' meets an accident and needs blood. His blood group is AB. How many of these students can donate their blood to Mr. 'X'?
  - How many of the above students are universal donors and universal acceptors?
42. 15 students of Govt. school spend the following numbers of hours in a month for dong, cleaning in their street 25, 15, 20, 20, 9, 20, 25, 15, 7, 13, 20, 12, 10, 15, 8
- Find mean, median and mode from above data.
  - Which value is depicted from above information.
43. In an assembly election the number of seats won by the different political parties is shown below.

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

- i) Draw a bar graph.
  - ii) Which political party won by availing maximum number of seats?
  - iii) What is the minimum age of a voter to cast his/her vote India in assembly election?
44. A doctor suggests two ways for treatment of a particular diseases one by taking medicine only and other by doing meditation and yoga.

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

- i) Draw Frequency polygon for the above data on the graph.
  - ii) What is the importance of Yoga and meditation in our life?
45. The following table given the distribution of students of two sections according to marks obtained by them.

Section A		Section B	
Marks	Frequency	Marks	Frequency
0-10	3	0-10	5
10-20	9	10-20	19
20-30	17	20-30	15
30-40	12	30-40	10
40-50	9	40-50	1

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

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

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

- i) Draw a bar graph showing above informations.
- ii) On which day donation was maximum and on which day it was minimum.
- iii) Why blood donation is necessary?

## CHAPTER-14 SURFACE AREAS AND VOLUMES

### ANSWERS

1. 23

2. 51

3. 5.5

4. 6-11

5. 2.6cm

6. 5.6

7. 15

8. 150

9. 6

10. 12

11. 19

12. 13

13. 50

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

15. 37

16. 06

17. 35

18. 15, 14

19. 62

20.  $x + 3000$

22. 17

23. 21 years

24.  $x = 7, y = 14$

25. 93

26.

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

27. 25

29.

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

31.  $P=7$

32. These activities are best for health

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

34.  $x=17$

36. 2 : 1

37. 5, 28, 24

39. 9.8, 9, I

40. 79.83, 80.33, Vinayak

41. a) 30, b) 6 c) 8

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

43. i) B ii) 18 years

46. ii) Saturday, Thursday

iii) Save the other life.

**CHAPTER-15**  
**PROBABILITY**  
**KEY POINTS**

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

Example -

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

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

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

**PART-A**

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

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

### PART-B

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

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

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



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

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

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

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

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

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

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

What is the probability that a person chosen likes.

- i) Natural drink
- ii) Canned Juice

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

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

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

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

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

A student is chosen. What is the probability that

- its birth month is November
- The month contains 31 days.

### PART-C

21. After a medical check up for HB level of 35 students of class IX, the 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.
22. To know the opinion of 35 students about sixth subject as automobile engineering or financial management, a survey was done. The data is recorded in the following table in favour of choosing automobile engineers.

No. of student like 20

Dislike 15

Find the probability that a student will opt.

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

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

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

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

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

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

Find the probability that a student is chosen.

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

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

- (i) Geometry
- (ii) Algebra

What values of teacher are shown here.

#### PART-D

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

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

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

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

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

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

The following table shows the BMI of different categories.

S.No.	Category	BMI (kg/m <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 choosen in overweight.

30. Read the lines carefully

Horse is horse, of course, of course.

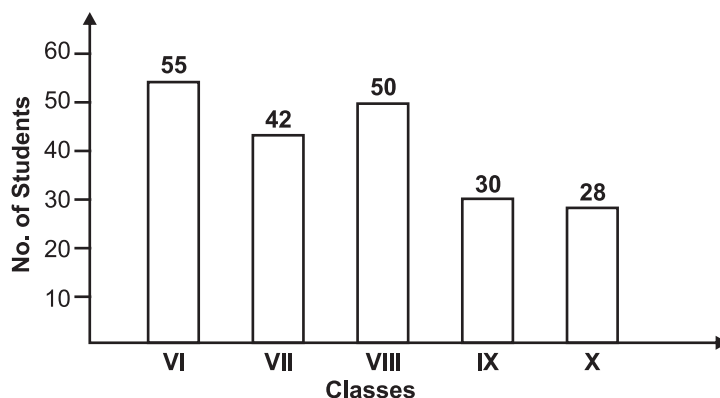
And no one can talk to horse of course.

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

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

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

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



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

Find the probability that a student chosen is

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

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

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

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

- i) Four wheeler
- ii) Two wheeler

## CHAPTER-15

# PROBABILITY

### Answers

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

Question  
**PRACTICE PAPER-1**  
MATHEMATICS  
CLASS-IX

Time Allowed : 3 Hours

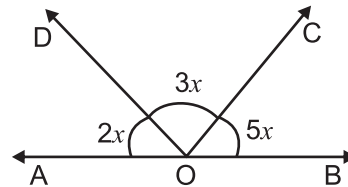
Maximum Marks : 80

**General Instructions :**

1. All questions are compulsory.
2. The question paper consists of 30 questions divided into four sections A, B, C, and D. Section-A comprises of 6 questions of 1 mark each; Section-B comprises of 6 questions of 2 marks each; Section-C comprises of 10 questions of 3 marks each and section-D comprises of 8 questions of 4 marks each.
3. There is no overall choice in this question paper.
4. Use of calculator is not permitted.

**Section-A**

1. Find the value of  $(64)^{1/2} \times (125)^{1/3}$ .
2. If  $p(x) = x^3 - 3x^2 + 2x$ , then find the value of  $p(1)$ .
3. Points A (8, 4) & B (-2, 4) lie on a line. AB is parallel to which axis.
4. If the graph of equation  $2x + ky = 10k$ , intersects  $x$ -axis at point (5, 0). Find value of  $k$ .
5. Find the value of  $x$  from the adjacent figure.



6. Find the ratio of total surface area of a sphere and a solid hemisphere of same radius.

**Section-B**

7. Factorise :  $8a^3 + \sqrt{27}b^3$
8. Find the coordinates of the point where the graph of the equation  $5x + 2y = 10$  intersects both axes.
9. The sides of a triangle are 22cm, 20cm and 18 cm. Find its area.
10. The two consecutive class marks of a distribution are 52 & 57. Find the class limits.



11. A die is rolled 200 times & its outcomes are released as below:

Outcomes	1	2	3	4	5	6
Frequency	25	35	40	28	42	30

Find the probability of getting:

- A multiple of 3.
  - not a prime number.
12. Consider the following frequency distribution which gives the weights of 38 students of a class :

Weights (kg)	31-35	36-40	41-45	46-50	51-55	56-60	61-65	66-70	Total
No. of Std.	9	5	14	3	1	2	2	2	38

- Find the probability that the weight of a student in the class lies between 36-45 kg.
- Give one event in this context having probability zero.

### Section-C

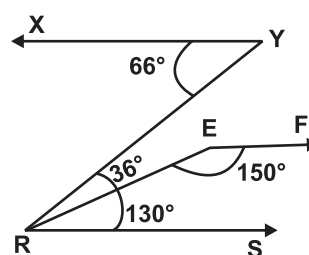
13. If  $x = 5 - 2\sqrt{6}$ , find  $x^2 + \frac{1}{x^2}$

14. Simplify :

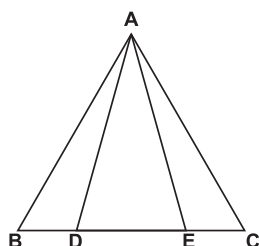
$$\left(\frac{x^a}{x^{-b}}\right)^{a-b} \left(\frac{x^b}{x^{-c}}\right)^{b-c} \left(\frac{x^c}{x^{-a}}\right)^{c-a}$$

15. Plot the points A(1,1), B(-1,5), C(7,9) and D(9,5). Name the type of figure ABCD. In which quadrant the point of intersection of diagonals lie?

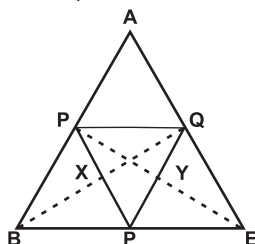
16. In the given figure, Show that  $XY \parallel EF$ .



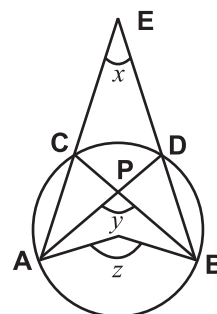
17. In the given figure, if  $AB = AC$ ,  $\angle BAD = \angle CAE$  then prove that  $\triangle ADE$  is an isosceles triangle.



18. P, Q & R are respectively, the mid points of sides BC, CA & AB of a triangle ABC. PR & BQ meet at X. CR & PQ meet at Y. Prove that  $XY = \frac{1}{4}BC$ .



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



20. Construct  $\triangle ABC$  such that  $BC = 8\text{cm}$ ,  $\angle B = 45^\circ$ ,  $AB - AC = 3.5\text{cm}$
21. If  $h$ ,  $c$  and  $v$  respectively, are the height, the curved surface area and volume of a cone, prove that
- $$3\pi vh^3 - c^2h^2 + 9v^2 = 0$$
22. The radius of a sphere is 10 cm. If the radius is increased by 1 cm. Then prove that volume of the sphere is increased by 33.1%.

### Section-D

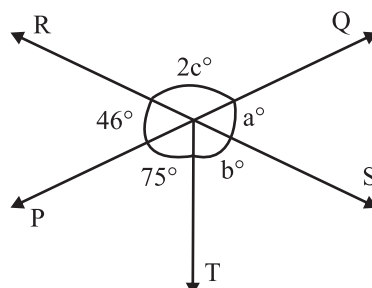
Express  $0.6 + 0.4\overline{7} + 0.\overline{7}$  in the form  $\frac{p}{q}$ , where  $p$  and  $q$  are integers and  $q \neq 0$ .

24. Verify :

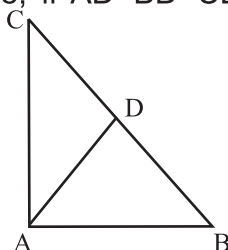
$$a^3 + b^3 + c^3 - 3abc = \frac{1}{2} (a+b+c) [(a-b)^2 + (b-c)^2 + (c-a)^2]$$

25. A pharmacist needs to strengthen a 15% alcohol solution to one of 32% alcohol. How much pure alcohol should be added to 800 ml of 15% solution?

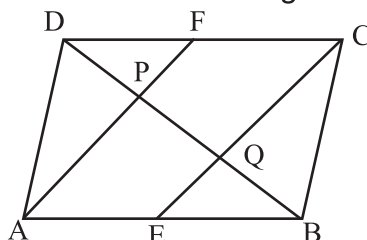
26. In the figure two straight lines PQ & RS intersect each other at O. If  $\angle POT = 75^\circ$ , find the values of a, b & c.



27. In the given figure, if  $AD = BD = CD$ . Prove that  $\angle BAC$  is right angle.



28. In a parallelogram ABCD, E & F are the mid points sides AB & CD respectively. Show that the line segment AF & EC trisect the diagonal BD.



29. The residential colony has 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 for WATER HARVESTING. They constructed a water reservoir measuring 49m X 27m x 25m to collect the rain water. If this water reservoir is full of water then for how many days it will last for the colony
30. The Following table shows the life of LED bulbs.

Life Time (in hours)	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
No. of Bulbs	14	56	60	86	74	62	48

- Represent the above information with the help of a histogram & frequency polygon.
- How many bulbs have a life time of 700 hours & more?

## PRACTICE PAPER-1

### SOLUTIONS

1. 40
2. 0
3.  $x$ -axis
4.  $K=1$
5.  $x=18$
6. 4:3
7.  $8a^3 + \sqrt{27}b^3 = (2a)^3 + (\sqrt{3}b)^3$   
 $= (2a + \sqrt{3}b)((2a)^2 - (2a)(\sqrt{3}b) + (\sqrt{3}b)^2)$   
 $[ \because x^3 + y^3 = (x+y)(x^2 - xy + y^2) ]$   
 $= (2a + \sqrt{3}b)(4a^2 - 2\sqrt{3}ab + 3b^2)$
8. Let  $5x+2y=10$  intersect  $x$ -axis and  $y$ -axis at points  $A(x,0)$  and  $B(0,y)$  respectively.  
 $\therefore$  for point  $A(x,0)$   
 $5x + 2(0) = 10 \quad x=2$   
 For point  $B(0,y)$   
 $5(0) + 2y = 10 \quad y=5$   
 $\therefore A(2,0), B(0,5)$
9. Let  $a=22$  cm,  $b=20$ cm,  $c=18$ cm  
 Semi perimeter  $(s) = \frac{a+b+c}{2} = \frac{22+20+18}{2} = 30$  cm  
 By Heron's Formula  
 Area of triangle  $= \sqrt{s(s-a)(s-b)(s-c)}$   
 $= \sqrt{30(30-22)(30-20)(30-18)} \text{ cm}^2$   
 $= \sqrt{30 \times 8 \times 10 \times 12} \text{ cm}^2$   
 $= 120\sqrt{2} \text{ cm}^2$
10. Class size  $= 57-52=5$   
 Class limits  $= 52 - \frac{5}{2}, 52 + \frac{5}{2}, 57 - \frac{5}{2}, 57 + \frac{5}{2}$   
 Class limits for class mark 52  $= 49.5 - 54.5$   
 Class limits for class mark 57  $= 54.5 - 59.5$
11. i)  $P(\text{multiple of 3}) = \frac{40+30}{200} = \frac{7}{20}$   
 ii)  $P(\text{not a prime number}) = \frac{25+28+30}{200} = \frac{83}{200}$

12. i) Required probability =  $\frac{5}{38}$   
 ii) eg. student selected at random have weight more than 70 kg. (other favourable outcomes are also possible).

13.  $x = 5 - 2\sqrt{6}$

$$\frac{1}{x} = \frac{1}{5-2\sqrt{6}} \times \frac{5+2\sqrt{6}}{5+2\sqrt{6}} = 5 + 2\sqrt{6}$$

$$x + \frac{1}{x} = 10 \Rightarrow x^2 + \frac{1}{x^2} + 2 = 100 \quad [\because (a+b)^2 = a^2 + 2ab + b^2]$$

$$\boxed{x^2 + \frac{1}{x^2} = 98}$$

14.  $\left(\frac{x^a}{x^{-b}}\right)^{a-b} \left(\frac{x^b}{x^{-c}}\right)^{b-c} \left(\frac{x^c}{x^{-a}}\right)^{c-a}$

$$= (x^{a+b})^{a-b} (x^{b+c})^{b-c} (x^{c+a})^{c-a}$$

$$= x^{a^2-b^2} \cdot x^{b^2-c^2} \cdot x^{c^2-a^2}$$

$$= x^{a^2-b^2+b^2-c^2+c^2-a^2}$$

$$= x^0 = 1$$

$$\left[ \because \frac{a^m}{a^n} = a^{m-n} \right]$$

$$\left[ \because (a^m)^n = a^{mn} \right]$$

$$\left[ \because a^m \times a^n = a^{m+n} \right]$$

$$\left[ \because a^0 = 1 \right]$$

15. Plot the points on graph.

ABCD is a rectangle.

Intersecting point of diagonals is in I-quadrant

16.  $\therefore \angle XYR = \angle YRS = 66^\circ \Rightarrow XY \parallel RS$  \_\_\_\_\_ I

$$\angle FER + \angle SRE = 180^\circ \Rightarrow EF \parallel RS$$
 \_\_\_\_\_ II

From I and II

$$XY \parallel EF$$

17. In  $\triangle ABC$

$$AB = AC$$

(Given)

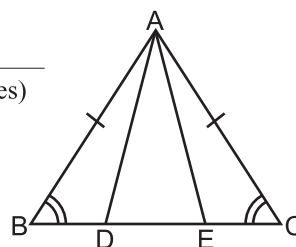
$$\therefore \angle B = \angle C \dots (1) \quad (\text{Angles opposite to equal sides})$$

In  $\triangle BAD$  and  $\triangle CAE$

$$\angle BAD = \angle CAE \quad (\text{given})$$

$$AB = AC \quad (\text{given})$$

$$\angle B = \angle C \quad (\text{from (1)})$$



$$\therefore \triangle BAD \cong \triangle CAE \quad (\text{ASA congruency})$$

$$\therefore AD = AE \quad (\text{CPCT})$$

$\therefore$  ADE is an Isosceles Triangle.

18. Given :  $\triangle ABC$  with P, Q, R, as the mid-points of BC, CA and AB respectively. PR and BQ meet at X and CR and PQ meet at Y.

Construction :- The Join X & Y

**Proof :** Since the line Segment joining the mid-point of two sides of a triangle is parallel to the third side and half of it. Therefore Q & R are mid-points of AC and AB respectively.

By Mid Point theorem

$$\Rightarrow RQ \parallel BC \text{ and } RQ = \frac{1}{2} BC$$

$$\Rightarrow RQ \parallel BP \text{ and } RQ = \frac{1}{2} BP \quad [ \because P \text{ is the mid point of BC, } \frac{1}{2} BC = BP ]$$

BPQR is a parallelogram

$\therefore$  the diagonal of a parallelogram bisect each other.

$\therefore$  X is the mid point of PR

Similarly , Y is the midpoint of PQ.

Consider,  $\triangle PQR$ , XY is the line segment joining the mid points of sides PR and PQ.

$$XY = \frac{1}{2} RQ$$

$$RQ = \frac{1}{2} BC$$

$$\boxed{XY = \frac{1}{4} BC}$$

19.  $\angle CPD = \angle Y$  (V.O.A.)

$$\angle ACB = \angle ACP = \frac{\angle z}{2}, \angle ADB = \angle BDP = \frac{\angle z}{2} \quad (\text{Angle at centre if a circle is double the angle on remaining part of the circle})$$

$$\angle BCE = \angle PCE = 180^\circ - \frac{\angle z}{2} \quad (\text{By Linear Pair})$$

$$\angle ADE = \angle PDE = 180^\circ - \frac{\angle z}{2}$$

In quadrilateral ACPD

$$\angle DEC + \angle PCE + \angle CPD + \angle PDE = 360^\circ \quad (\text{By Angle sum property of quadrilateral})$$

$$\angle x + 180 - \frac{\angle z}{2} + \angle y + 180 - \frac{\angle z}{2} = 360^\circ$$

$$\angle x + \angle y = \frac{\angle z}{2} + \frac{\angle z}{2} + \cancel{360^\circ} - \cancel{360^\circ}$$

$$\boxed{\angle x + \angle y = \angle z}$$

21. Height of cone = h

$$\text{slant height of cone} = l = \sqrt{h^2 + r^2}$$

curved surface area of cone

$$C = \pi r l = \pi r \sqrt{h^2 + r^2}$$

$$C^2 = \pi^2 r^2 (h^2 + r^2) = \pi^2 r^2 h^2 + \pi^2 r^4$$

$$\text{Volume of cone} = V = \frac{1}{3} \pi r^2 h$$

$$\begin{aligned} 3 \pi V h^3 - C^2 h^2 + 9 V^2 &= 3 \pi \left( \frac{1}{3} \pi r^2 h \right) \times h^3 - (\pi^2 r^2 h^2 + \pi^2 r^4) h^2 + 9 \left( \frac{1}{3} \pi r^2 h \right)^2 \\ &= \frac{3 \pi^2 r^2 h^4}{3} - \pi r^2 h^4 - \pi^2 r^4 h^2 + \frac{9 \times \pi^2 r^4 h^2}{9} \\ &= \cancel{\pi^2 r^2 h^4} - \cancel{\pi^2 r^2 h^4} - \cancel{\pi^2 r^4 h^2} + \cancel{\pi^2 r^4 h^2} = 0 \\ \therefore 3 \pi v h^3 - c^2 h^2 + 9 v^2 &= 0 \end{aligned}$$

22.  $r_1$  = radius of sphere = 10 cm.

$$\text{Volume of sphere} = v_1 = \frac{4}{3} \pi r_1^3 = \frac{4}{3} \pi \times (10)^3 = \frac{4}{3} \pi \times 1000$$

$$V_1 = \frac{4000}{3} \pi \text{ cm}^3 \quad \text{_____ (1)}$$

If the radius of sphere increases by 1 cm

$$r_2 = 10 \text{ cm} + 1 \text{ cm} = 11 \text{ cm}$$

New Volume of sphere

$$V_2 = \frac{4}{3} \pi r_2^3 = \frac{4}{3} \pi \times (11)^3$$

$$V_2 = \frac{4}{3} \pi \times 1331 = \frac{5324}{3} \pi \text{ cm}^3$$

$$V_2 = \frac{5324}{3} \pi \text{ cm}^3 \quad \text{_____ (2)}$$

Increased in volume of sphere

$$V = V_2 - V_1 = \frac{5324\pi}{3} - \frac{4000\pi}{3}$$

$$V = \frac{1324\pi}{3} \text{ cm}^3 \quad \text{_____ (3)}$$

% increase in the volume of sphere

$$= \frac{V}{V_1} \times 100\%$$

$$\begin{aligned}
&= \frac{\frac{1324\pi}{3}}{\frac{4000\pi}{3}} \times 100\% \\
&= \frac{1324\pi}{4000} \times 100\% \\
&= \frac{331}{10} = 33.1\%
\end{aligned}$$

% Increase in the volume of sphere

$$= 33.1\%$$

23.  $0.6 = \frac{6}{10}$

Let  $x = 0.4\overline{7} = 0.4777\ldots$

$$10x = 4.77 \text{ ..... I}$$

$$100x = 47.77 \text{ ..... II}$$

$$\text{II-I} \Rightarrow 100x - 10x = (47.7\ldots) - (4.77\ldots)$$

$$\Rightarrow 90x = 43$$

$$\Rightarrow x = \frac{43}{90}$$

Let  $y = 0.\overline{7} = 0.77\ldots$  ..... III

$$10y = 7.77 \text{ .... IV}$$

$$\text{IV-III} \Rightarrow$$

$$ay = 7 \Rightarrow y =$$

$$\begin{aligned}
\therefore 0.6 + 0.4\overline{7} + 0.\overline{7} &= \frac{6}{10} + \frac{43}{90} + \frac{7}{9} \\
&= \frac{167}{90}
\end{aligned}$$

24. 
$$\begin{aligned}
a^3 + b^3 + c^3 - 3abc &= (a+b+c) (a^2+b^2+c^2-ab-bc-ca) \\
&= \frac{1}{2} (a+b+c) (2a^2+2b^2+2c^2-2ab-2bc-2ca) \\
&= \frac{1}{2} (a+b+c) (a^2+b^2-2ab+b^2+c^2-2bc+c^2+a^2-2ca) \\
&= \frac{1}{2} (a+b+c) [(a-b)^2 + (b-c)^2 + (c-a)^2]
\end{aligned}$$

25. Let  $x$  ml of pure alcohol be added

Quantity of pure alcohol in (800+x) ml of 32% solution

= Quantity of pure alcohol in 800 ml of 15%

Solution  $x$  ml of pure alcohol



$$\begin{aligned}
&32\% \text{ of } (800+x) = 15\% \text{ of } 800 + x \\
\Rightarrow &\frac{32}{100} \times (800+x) = 15 \times \frac{1}{100} \times 800 + x \\
\Rightarrow &25600 + 32x = 12000 + 100x \\
\Rightarrow &100x - 32x = 25600 - 12000 \\
\Rightarrow &x = 200\text{ml}
\end{aligned}$$

$\therefore$  200ml of pure alcohol should be added

26.  $4b + 75 + b = 180$

$$5b = 105$$

$$\Rightarrow b = 21$$

$$4b = a \quad (\text{V.O.A})$$

$$\Rightarrow a = 84$$

$$\therefore 2c = 180 - a = 96$$

$$\Rightarrow c = 48$$

27. In  $\triangle ABD$

$$AD = BD \text{ (given)}$$

$$\therefore \angle BAD = \angle ABD \text{ (Equal } \angle\text{s opp to equal sides)}$$

$$\text{Let } \angle BAD = \angle ABD = x$$

$$\text{In } \triangle ACD$$

$$AD = CD \text{ (given)}$$

$$\therefore \angle CAD = \angle ACD = y$$

$$\text{In } \triangle ABC \quad \angle A + \angle B + \angle C = 180^\circ$$

$$\Rightarrow (x + y) + x + y = 180^\circ$$

$$\Rightarrow x + y = 90^\circ$$

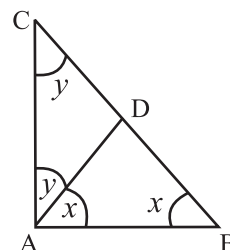
$$\therefore \angle BAC = 90 \Rightarrow \angle BAC \text{ is right angle.}$$

28. Since E & F are mid points of AB & CD

$$\therefore AE = \frac{1}{2} AB \text{ \& } CF = \frac{1}{2} CD \dots\dots\dots(1)$$

But ABCD is a parallelogram

$$\Rightarrow AB = CD \text{ \& } AB \parallel DC$$



$$\Rightarrow \frac{1}{2} AB = \frac{1}{2} CD \text{ \& } AB \parallel DC$$

$$\Rightarrow AE = FC \text{ \& } AE \parallel DL$$

$\Rightarrow$  AECF is a parallelogram

$$\Rightarrow FA \parallel CF \text{ \& } FP \parallel CQ \dots\dots\dots(2)$$

In  $\triangle PCD$  F is the mid point of CD &  $FP \parallel CQ$

$\therefore$  P is the mid point of DQ

$$\Rightarrow PQ = DP \dots\dots\dots(3)$$

Similarly in  $\triangle ABP$ , E is the mid point of AB &  $AP \parallel EQ$

$\Rightarrow$  Q is the mid point of BP

$$\Rightarrow BQ = PQ \dots\dots\dots(4)$$

From (3) & (4)  $DP = PQ = QB$

$\Rightarrow$  BD Trisects AP & CE

$$\begin{aligned} 29. \text{ Vol. of tank} &= 48\text{m} \times 27\text{m} \times 5\text{m} \\ &= 6480 \text{ m}^3 \\ &= 6480 \times 1000\text{l} \\ &= 6480000\text{l} \end{aligned}$$

$$\begin{aligned} \text{Vol. of water required in 1 day} &= 60 \times 5400\text{l} \\ &= 324000\text{l} \end{aligned}$$

$$\text{No. of Days} = \frac{\text{Vol. of water in tank}}{\text{Vol. of water required in 1 day}}$$

$$= \frac{6480000}{324000} = 20 \text{ days}$$

(ii) values (i) Environmental Values

(ii) Cooperation

30 (b) No. of LED Bulbs working for

$$\begin{aligned} 700 \text{ hours of more} &= 74 + 62 + 48 \\ &= 184 \\ &= 184 \text{ Bulbs} \end{aligned}$$

## PRACTICE QUESTION PAPER-2

Mathematics  
Class-IX

Time Allowed : 3 Hours

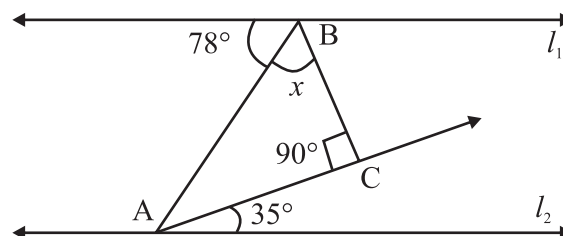
Maximum Marks : 80

### General Instructions :

1. All question are compulsory.
  2. The question paper consists of 30 questions divided into four section A, B, C, and D. Section-A comprises of 6 questions of 1 mark each; Section-B comprises of 6 questions of 2 marks each; Section-C comprises of 10 question of marks each and Section-D comprises of 8 questions of 4 marks each.
  2. There is no overall choice in this question paper.
  3. Use of calculator is not permitted.
- 

### SECTION-A

1. Find Two irrational numbers between 2017 and 2018.
2. Find the co-efficient of  $a^2$  in  $(a-1)(a^2+1)$ .
3. If abscissa of a point is zero, on which axis do the point lies.
4. In the figure, for what value of  $x$  is  $l_1 \parallel l_2$ ?

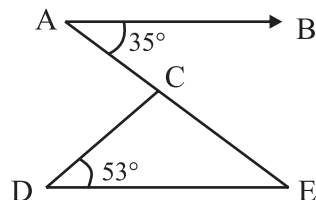


5. The diagonal of cube is  $\sqrt{12}$  cm. What is length of its edge.
6. A & B are the only two outcomes of an event. Probability of  $P(A)=0.72$ , then what will be the probability  $P(B)$ .

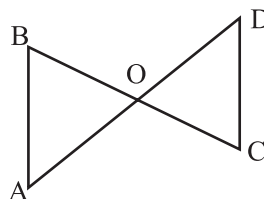
### SECTION-B

7. Give possible expression for the length and the breadth of the rectangle, whose area is  $6x^2 + x - 12$ .

8. If  $AB \parallel DE$ ,  $\angle BAC = 35^\circ$  &  $\angle CDE = 53^\circ$ , find  $\angle DCE$  &  $\angle DEC$ .



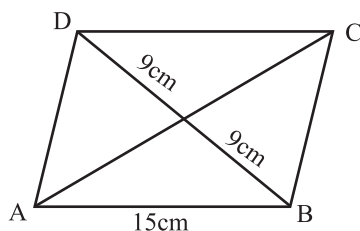
9. In the given figure,  $\angle B < \angle A$  and  $\angle C < \angle D$ . Show that  $AD < BC$ .



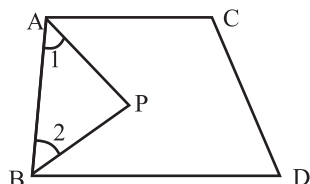
10. If two adjacent angles of a parallelogram PQRS are  $(10y-9)^\circ$  &  $(8y+45)^\circ$ , Find all the four angles of parallelogram.
11. The longest side of a right angled triangle is  $125m$  and one of the remaining two sides is  $100m$ . Find its area using Heron's formula.
12. The numbers 2, 3, 4, 4,  $3x-1$ ,  $3x+1$ , 7, 7, 8 are written in ascending order. If the median is 5, find  $x$ .

### SECTION-C

13. Find the values of  $a$  and  $b$ , if  $\frac{3+\sqrt{2}}{3-\sqrt{2}} = a+b\sqrt{2}$
14. Factorise :  $(2x-y-z)^3 + (2y-z-x)^3 + (2z-x-y)^3$
15. Find three different solutions of  $3m-8n=27$ .
16. Plot two points  $P(0,-4)$  &  $Q(0,4)$  on the graph paper. Now plot  $R$  &  $S$  such that  $\triangle PQR$  &  $\triangle PQS$  are isosceles triangles.
17. ABCD is a rhombus with one diagonal equal to  $18cm$ . & length of each side equal to  $15cm$ . Find the length of the other diagonal and area of rhombus.



18. In the figure, AP and BP are the bisectors of two adjacent angles A and B of quadrilateral ABCD. Prove that  $2 \angle APB = \angle C + \angle D$ .



19. Construct a triangle whose perimeter is 15cm and its two base angles are  $90^\circ$  and  $30^\circ$ .
20. A Conical tent is 16m high and the diameter of its base is 24m. Find the cost of Canvas required to make the tent, if cost of  $1m^2$  Canvas is ₹ 210.
21. A Hemispherical tank full of water is to be emptied by a pipe at the rate of 3 liters per minutes. How long will its take to empty the tank, if the diameter of the tank is  $1\frac{3}{4}$  m?
22. The marks of 80 students (out of 80) in English speaking skills was recorded as follows:

Marks	0-20	21-39	40-60	61-80
No. of students	18	19	23	20

If the passing marks are 50% then find the probability that the student chosen at random:

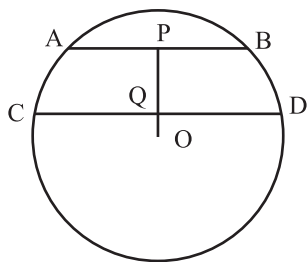
- Got the passing mark.
- Failed to get the passing marks.
- Got below 21 marks.

#### SECTION-D

23. Represent  $(1 + \sqrt{9.5})$  on the number line.
24.  $x + 2$  is a factor of polynomial  $ax^3 + bx^2 + x - 2$  and the remainder 4 is obtained by dividing this polynomial by  $x - 2$ . Find the value of  $a$  and  $b$ .
25. Solve for  $x$  :

$$\frac{3x+2}{7} + \frac{4(x+1)}{5} = \frac{2}{3}(2x+1)$$

26. If two parallel lines are intersected by a transversal prove that the bisectors of the interior angles on the same side of transversal intersect each other at right angles.
27. In a square PQRS, diagonals PR and QS intersect at O. Show that  $\triangle POQ \cong \triangle QOR \cong \triangle ROS \cong \triangle SOP$ .
28. In the given figure O is the centre of the circle of radius 5cm,  $OP \perp CD$ ,  $AB \parallel CD$ ,  $AB=6\text{cm}$  and  $CD=8\text{cm}$ , Determine PQ.



29. A right triangle having sides 6cm, 8cm and 10m is revolved about the side of length 6cm. Find the volume of solid so formed.
30. If the 26 English alphabets are taken such that  $A=1$ ,  $B=2$ ,  $C=3$ , ..... $Z=26$  then find
- The mean & median of the numbers corresponding to the vowels.
  - Which alphabet corresponds to the median.

## PRACTICE QUESTION PAPER-2

### ANSWERS

1. 2017.01010001....., 2017.020020002.....(other answers are also possible)
2.  $-1$
3.  $y$ -axis
4. 47
5. 2cm
6. 0.28
7.  $(2x+3, (3x-4))$
8.  $\angle DCE = 92^\circ, \angle DEC = 35^\circ$
10.  $71^\circ, 119^\circ, 71^\circ, 119^\circ$
11.  $3750m^2$
12. 2
13.  $a = \frac{11}{7}, b = \frac{6}{7}$
14.  $3(2x-y-z)(2y-z-x)(2z-x-y)$
15. Any 3 correct solutions
17.  $AC = 24cm, \text{Area} = 216cm^2$
20. 158400
21. 7.8 hours (approx)
22. (i)  $\frac{43}{80}$  (ii)  $\frac{37}{80}$  (iii)  $\frac{18}{80}$
24.  $a=0, b=2$
25.  $x=4$
28. 1cm
29.  $128\pi cm^3$
30. i) Mean = 9.8  
Median = 9  
ii) I

## PRACTICE QUESTION PAPER-3

Mathematics  
Class-IX

Time Allowed : 3 Hours

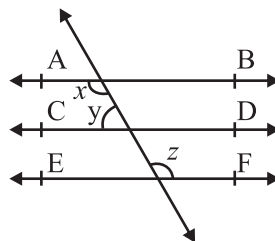
Maximum Marks : 80

### General Instructions :

1. All question are compulsory.
  2. The question paper consists of 30 questions divided into four section A, B, C, and D. Section-A comprises of 6 questions of 1 mark each; Section-B comprises of 6 questions of 2 marks each; Section-C comprises of 10 question of marks each and Section-D comprises of 8 questions of 4 marks each.
  2. There is no overall choice in this question paper.
  3. Use of calculator is not permitted.
- 

### SECTION-A

1. Find the value of  $(625)^{0.18} \times (625)^{0.07}$
2. Find the remainder when  $x^3 + 2x^2 - 3x - 1$  is divided by  $x + 1$ .
3. Write the coordinates of a point P where perpendicular distance from  $x$ -axis is 2 units and perpendicular distance from  $y$ -axis is 3 units P lies in III quadrant.
4. If  $AB \parallel CD \parallel EF$  and  $y : z = 3 : 7$  then what will be the value of  $x$ ?
5. If the radius & length of a cone are  $\frac{r}{2}$  &  $2l$  respectively , what is its total surface area ?
6. The probability of guessing the correct answer to certain question is  $\frac{x}{2}$ . If the probability of not guessing the correct answer to the question is  $\frac{2}{3}$  , then what is the value of  $x$ .

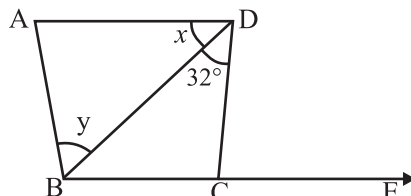


### SECTION-B

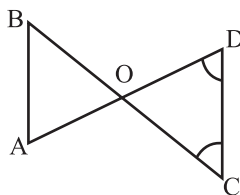
7. Find if  $(-2x-5)$  is a factor of the polynomial  $p(x) = 3x^4 + 5x^3 - 2x^2 - 4$  or not.



8. In the adjacent figure if  $x : y = 11 : 19$   $AD \parallel BE$ . Find  $\angle DCE$ .



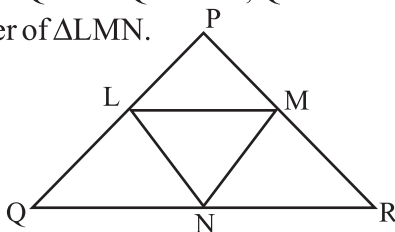
9. In the given figure,  $\angle B < \angle A$  and  $\angle C < \angle D$ . Show that  $AD < BC$ .



10. Show that opposite angles of parallelogram are equal.
11. Find area of a triangle whose two sides are 8cm & 11cm and its semi perimeter is 16cm.
12. The mean of first 8 observations is 18 & the mean of last 8 observations is 20. If mean of all 15 observations is 19. Find eighth observation.

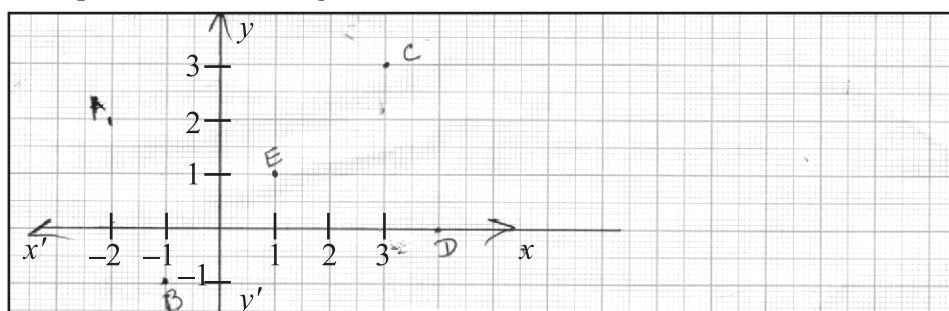
### SECTION-C

13. Evaluate  $\sqrt{13+4\sqrt{10}} - \sqrt{7-2\sqrt{10}}$
14. Find the values of a & b if  $\frac{3+\sqrt{2}}{3-\sqrt{2}} = a + b\sqrt{2}$ .
15. Find the value of 'a' if (1,-1) is the solution of the Equation  $2x + ay = 5$ . Find the other two solutions of the Equation.
16. AD is a median of  $\triangle ABC$  and E is the midpoint of AD, BE, Produced meets AC in F. Prove that  $AF = \frac{1}{3}AC$ .
17. In the figure L, M and N are mid-point of the side PQ, PR and QR respectively of  $\triangle PQR$ . If  $PQ = 4.4$ cm,  $QR = 5.6$ cm and  $PR = 4.8$  cm. Then find the perimeter of  $\triangle LMN$ .



18. Construct a  $\Delta STU$ , in which  $\angle T = 150^\circ$ ,  $TU = 3\text{cm}$  &  $ST + US = 8\text{cm}$ .
19.  $1.1\text{cm}^3$  of gold is drawn into the wire of  $0.1\text{mm}$  in diameter. Find the length of the wire in meter.
20. From the graph, write the co-ordinates of the points A, B, C, D & E. Is a ABCD, a rectangle on joining the points. If yes, Write the name of the point where the diagonals meet.

x



21. The volume of a sphere is  $4851\text{ cm}^3$ . How much should its radius be reduced so that its volume become  $\frac{4312}{3}\text{ cm}^3$ ?
22. 14 packets of Sugar, each marked  $5\text{kg}$ , actually contained the following weights in Kg.
- 5.095, 4.995, 4.800, 5.120, 4.890, 5.000, 5.150, 5.000, 5.995, 5.995, 5.000, 4.900, 4.995, 5.000, 5.050.

Find the probability of the following when a packet is chosen and it.

- Contains more than  $5\text{kg}$ . Sugar.
- Contains correct weight.
- Contains weight less than  $4.995\text{ Kg}$ .

### SECTION-D

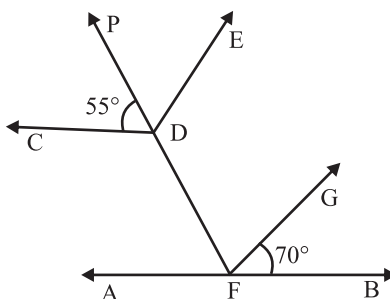
23. Prove that.
- $$\frac{1}{3-\sqrt{8}} - \frac{1}{\sqrt{8}-\sqrt{7}} + \frac{1}{\sqrt{7}-\sqrt{6}} - \frac{1}{\sqrt{6}-\sqrt{5}} + \frac{1}{\sqrt{5}-2} = 5$$
24. Without actually calculating the cubes, Find the value of  $(-1)^3 + (-2)^3 + (-3)^3 + (-4)^3 + 2(5^3)$ . Write the identity used.
25. A man went to the Bank with ₹1000. He asked the cashier to give him ₹5

and 10 notes only in return. Write the linear Equation in two variable. If number of 10 notes are 25, then find the number of 5 notes? Also represent it graphically?

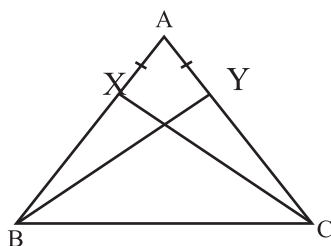
26. In the adjacent figure.

$AB \parallel CD, DE \parallel FG$ . Find

- $\angle PDE$
- $\angle AFD$
- $\angle DFG$



27. In the figure, X and Y are the points on equal sides AB and AC of a  $\Delta ABC$  such that  $AX=AY$ . Prove that  $XC=YB$



28. 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 an angle subtended by the Chord AC and DE at the Centre.  $\angle ABC = \frac{1}{2} [\angle DOE - \angle AOC]$
29. 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.
30. Mean of a class of 35 students in a Mathematics class test was found to be 15. A chance was given to improve marks of those students who score less than 8 marks. Three students score 3, 5 & 6 marks respectively. A remedial class was taken by the teacher & then test was taken again. The three students score 7,10,12 marks respectively in improvement test. What will be the new mean of the class. What values of the teacher are depicted here.

## PRACTICE QUESTION PAPER-3

### ANSWERS

1. 5
2. 3
3.  $(-3, -2)$
4.  $126^\circ$
5.  $\pi r(l + \frac{r}{4})$
6.  $\frac{2}{3}$
7.  $\frac{361}{16}$
8.  $65^\circ$
24. 150
25. 150
11.  $8\sqrt{30}$  Sq. cm.
12. 19
13.  $\sqrt{(2\sqrt{2} + \sqrt{5})^2} - \sqrt{(\sqrt{5} - \sqrt{2})^2}$   
 $= 3\sqrt{2}$
14.  $a = \frac{11}{7}, b = \frac{6}{7}$
15.  $a = -3$
17. 7.4cm
19. 140m
20. A(2,2), B(-1,-1), D(4,0),  
C(3,3), E(1,1) Yes, E
22.  $\frac{6}{15}, \frac{4}{15}, \frac{3}{15}$
26.  $55^\circ, 55^\circ, 55^\circ$
29.  $V_1 : V_2 : V_3 : 42 : 33 : 11$
30. 15.7