

MATHEMATICS

CLASS (X)

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SA-I

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COURSE STRUCTURE

FIRST TERM

Class – x

First Term

Marks : 90

Units	Marks
I Number Systems	11
II Algebra	23
III Geometry	17
IV Trigonometry	22
V Statistics	17
Total	90

UNIT I : NUMBER SYSTEMS

1. Real Numbers (15 Periods)

1. Euclid's division lemma, Fundamental Theorem of Arithmetic - statements after reviewing work done earlier and after illustrating and motivating through examples. Proofs of irrationality of $\sqrt{2}$, $\sqrt{3}$, $\sqrt{5}$. Decimal representation of rational numbers in term of terminating/non-terminating recurring decimals.

UNIT II : ALGEBRA

1. Polynomials (7 Periods)

Zeros of polynomial. Relationship between zeros and coefficients of quadratic polynomials. Statement and simple problems on division algorithm for polynomials with real coefficients.

2. Pair of Linear Equations in Two Variables (15 Periods)

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

Algebraic conditions for number of solutions. Solution of a pair of linear equations in two variables algebraically - by substitution, by eliminating and by cross multiplication method. Simple situational problems. Simple problems on equations reducible to linear equations.

Unit III : Geometry

1. Triangles : Definitions, examples, counter examples of similar triangles. (15 Periods)

1. (Prove) If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.
2. (Motivate) If a line divides two sides of a triangle in the same ratio, the line is parallel to the third side.
3. (Motivate) If in two triangles, the corresponding angles are equal, their corresponding sides are proportional and the triangles are similar.
4. (Motivate) If the corresponding sides of two triangles are proportional, their corresponding angles are equal and the two triangles are similar.
5. (Motivate) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are proportional, the two triangles are similar.
6. (Motivate) If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, the triangle on each side of the perpendicular are similar to the whole triangle and to each other.
7. (Prove) The ratio of the areas of two similar triangles is equal to the ratio of the squares on their corresponding sides.
8. (Prove) In a right triangle, the square on the hypotenuse is equal to sum of the squares on the other two sides.
9. (Prove) In a triangle, if the square on one side is equal to sum of the squares on the other two sides, the angle opposite to the first side is a right angle.

UNIT IV : TRIGONOMETRY

1. Introduction to Trigonometry (10 Periods)

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

2. Trigonometric Identities

(15 Periods)

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

UNIT V : STATISTICS AND PROBABILITY

1. Statistics

(18 Periods)

Mean, median and mode of grouped data (bimodal situations to be avoided). Cumulative frequency graph.

QUESTION PAPER DESIGN 2016-17

CLASS-X

Mathematics (Code No. 041)		Time : 3 Hours				Marks : 90	
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
1.	Remembering (Knowledge Based Simple recall questions, to know specific facts, terms, concepts, principles, or theories; identify, define, or recite, information)	1	2	2	3	23	26%
2.	Understanding (Comprehension -to be familiar with meaning and to understand conceptually, interpret, compare, contrast, explain, paraphrase, or interpret information)	2	1	1	4	23	26%
3.	Application (Use abstract information in concrete situation, to apply knowledge to new situations; Use given content to interpret a situation provide an example, or solve a problem)	1	2	3	2	22	24%
4.	Higher Order Thinking Skills (Analysis & Synthesis - Classify compare, contrast, or differentiate between different pieces of information; Organize and/or integrate unique pieces of information from a variety of sources)	-	1	4	-	14	16%
5.	Creating : Evaluation and Multi-Disciplinary- (Generating new ideas , product or ways of viewing things Appraise, judge and/or justify the values or worth of a decision or outcome, or to predict outcomes based on values).	-	-	-	2*	8	8%
Total		4 × 1 = 4	6 × 2 = 12	10 × 3 = 30	11 × 4 = 44	90	100%

Note : The question paper will include a section on Open Text based assessment (questions of 10 marks). The case studies will be supplied to students in advance. These case studies are designed to test the analytical and higher order thinking skills of students.

*One of the LA (4 Marks) will be to assess the values inherent in the text.

CHAPTER 1

REAL NUMBERS

KEY POINTS

- **Euclid's Division Lemma** : For given positive integers 'a' and 'b' there exists unique whole numbers 'q' and 'r' satisfying the relation $a = bq + r$, $0 \leq r < b$
- **Euclid's Division Algorithm** : HCF of any two positive integers a and b with $a > b$ is obtained as follows :

Step 1 : Apply Euclid's division lemma to a and b to find q and r such that $a = bq + r$, $0 \leq r < b$.

Step 2 : If $r = 0$ then $\text{HCF}(a, b) = b$; if $r \neq 0$ then again apply Euclid's lemma to b and r. Repeat the steps till we get $r = 0$.

- **The fundamental Theorem of Arithmetic** : Every composite number can be expressed (factorized) as a product of primes and this factorization is unique, apart from the order in which the prime factors occur.
- Let $x = \frac{p}{q}$, $q \neq 0$ to be a rational number such that the prime factorization of 'q' is of the form $2^m 5^n$, where m, n are non-negative integers. Then x has a decimal expansion which is terminating.
- Let $x = \frac{p}{q}$, $q \neq 0$ be a rational number, such that the prime factorization of q is not of the form $2^m 5^n$, where m, n are non-negative integers. Then x has a decimal expansion which is non-terminating repeating.

NUMBER SYSTEMS

VERY SHORT ANSWER TYPE QUESTIONS

1. Write the general form of an even integer.
2. Write the form in which every odd integer can be written taking t as variable.
3. What would be the value of n for $n^2 - 1$ divisible by 8.
4. State whether $7 \times 11 \times 13 + 7$ is a composite number or a prime number.
5. Is $5.131131113\dots$ a rational number or irrational number?
6. Find the value of m if HCF of 65 and 117 is expressible in the form $65m - 117$.
7. What can you say about the product of a non-zero rational and irrational number?
8. After how many places the decimal expansion of $\frac{13497}{1250}$ will terminate?
9. Find the least number which is divisible by all numbers from 1 to 10 (both inclusive) is.
10. The number 525 and 3000 are divisible by 3, 5, 15, 25 and 75. What is the HCF of 525 and 3000.

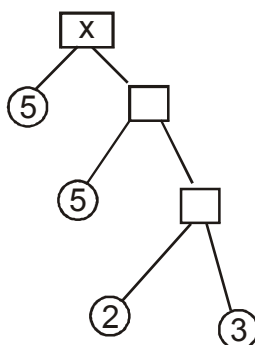
SHORT ANSWER TYPE-1 QUESTIONS

11. Can two numbers have 18 as their HCF and 380 as their LCM? Give reason.
12. If $a = 4q + r$ then what are the condition for a and q . What are the values that r can take?
13. What is the digit at unit's place of 9^n ?
14. If n is an odd integer then show that $n^2 - 1$ is divisible by 8.
15. Use Euclid's division algorithm to find the HCF of 16 and 28.
16. Show that 12^n cannot end with the digit 0 or 5 for any natural number n .
17. Without actual performing the long division, find if $\frac{395}{10500}$ will have terminating or non terminating (repeating) decimal expansion.

18. A rational number in its decimal expansion is 327.7081. What can you say about the prime factors of q , when this number is expressed in the form of $\frac{p}{q}$? Give reasons.
19. What is the smallest number by which $\sqrt{5} - \sqrt{2}$ is to be multiplied to make it a rational number? Also find the number so obtained?
20. Find one rational and one irrational number between $\sqrt{3}$ and $\sqrt{5}$.

SHORT ANSWER TYPE-II QUESTION

21. Show that square of any odd integer is of the form $4m + 1$, for some integer m .
22. Show that the square of any positive integer is either of the form $4q$ or $4q + 1$ for some integer q .
23. Show that the cube of any positive integer is of the form $4m$, $4m + 1$ or $4m + 3$ for some integer m .
24. Prove that $\sqrt{3}$ is an irrational number.
25. State fundamental theorem of Arithmetic and hence find the unique factorization of 120.
26. Prove that $\sqrt{3} + \sqrt{5}$ is irrational.
27. Prove that $5 - \frac{3}{7}\sqrt{3}$ is an irrational number.
28. Prove that $\frac{1}{2 - \sqrt{5}}$ is an irrational number.
29. Find HCF and LCM of 56 and 112 by prime factorization method.
30. In factor tree find x .



LONG ANSWER TYPE QUESTION

31. Solve $\sqrt{45} \times \sqrt{20}$ and state what type of number is this (Rational number or irrational number).
32. Find the HCF of 56, 96, 324 by Euclids algorithm.
33. Show that any positive odd integer is of the form $6q + 1$, $6q + 3$ or $6q + 5$, where q is some integer.
34. Prove that the square of any positive integer is of the form $5q$, $5q + 1$, $5q + 4$ for some integer, q .
35. Prove that the product of three consecutive positive integers is divisible by 6.
36. For any positive integer n , prove that $n^3 - n$ is divisible by 6.
37. Show that one and only one of n , $n + 2$, $n + 4$ is divisible by 3.
38. Show that one and only one out of n , $n + 4$, $n + 8$, $n + 12$ and $n + 16$ is divisible by 5, where n is any positive integer.
39. Three friends Salman, Hrithik and John were very good friends. They used to go for morning walk together. Once, on a morning walk, they step off together and their steps measure 40 cm, 42 cm and 45 cm respectively.
 - (a) What is the minimum distance each should walk so that each can cover the same distance in complete steps?
 - (b) What have you learnt (values/lesson) from above activity of three friends.
40. Aakriti decided to distribute milk in an orphanage on her birthday. The supplier brought two milk containers which contain 398 l and 436 l of milk. The milk is to be transferred to another containers so 7 l and 11 l of milk is left in both the containers respectively.
 - (a) What will be the maximum capacity of the drum.
 - (b) What qualities / values were shown by Aakriti.

ANSWER

1. $2m$ 2. $2t + 1$ 3. an odd integer 4. composite
5. Irrational 6. 2 7. Irrational 8. 4
9. 2520 10. 75
11. No, HCF is not a factor of LCM 12. a and q are positive integers $0 \leq r < 4$
13. Even power = 1; odd power = 9
15. 4 17. Non-terminating repeating
18. Denominator is the multiple of 2's and 5's
19. $\sqrt{5} + \sqrt{2}$, 3 25. $2 \times 2 \times 2 \times 3 \times 5$
29. HCF : 56, LCM : 112 30. 150
31. 30, Rational number 32. 4
39. (a) 2520 cm or 25.2 m
(b) ● Morning walk good for Health
● Religion doesnot matter in friendship
40. (a) 17 (b) Charity, concern for other etc.

PRACTICE TEST

[Duration : 50 Minutes]

[M.M. : 20]

SECTION – A

1. After how many decimal places the decimal expansion of $\frac{51}{1500}$ will terminate. 1
2. In Euclid's Division Lemma, when $a = bq + r$ where a, b are positive integers then what values r can take? 1

SECTION – B

3. Show that 9^n can never ends with unit digit zero. 2
4. Without actual division find the type of decimal expansion of $\frac{935}{10500}$. 2

SECTION – C

5. Prove that $\frac{1}{3 - 2\sqrt{5}}$ is an irrational number. 3
6. Find the HCF of 36, 96 and 120 by Euclid's Lemma. 3

SECTION – D

7. Show that cube of any positive integer is of the form $9m, 9m + 1$ or $9m + 8$. 4
8. Once a sports goods retailer organised a campaign "Run to Remember" to spread awareness about benefits of walking. In that Soham and Baani participated. There was a circular path around a sports field. Soham took 12 minutes to drive one round of the field while Baani took 18 minutes for the same. Suppose they started at the same point and at the same time and went in the same direction. 4
 - (a) After how many minutes have they met again at the starting point?
 - (b) What's your view about walking?

CHAPTER 2

POLYNOMIALS

KEY POINTS

- Polynomial : If x is a variable, n is a natural number and $a_0, a_1, a_2, a_3, \dots, a_n$ are real numbers then $p(x) = a_n x^n + a_{n-1}x^{n-1} + \dots + a_1x + a_0$, ($a_n \neq 0$) is called a polynomial in x .
- Polynomials of degree 1, 2 and 3 are called linear, quadratic and cubic polynomials respectively.
- A quadratic polynomial is an algebraic expression of the form $ax^2 + bx + c$, where a, b, c are real numbers with $a \neq 0$.
- Zeroes of a polynomial $p(x)$ are precisely the x -coordinates of the points where the graph of $y = p(x)$ intersects the x -axis, i.e., $x = a$ is a zero of polynomial $p(x)$ if $p(a) = 0$.
- A polynomial can have at most the same number of zeroes as the degree of the polynomial.
- (i) If one zero of a quadratic polynomial $p(x)$ is negative of the other, then coefficient of $x = 0$.
- (ii) If zeroes of a quadratic polynomial $p(x)$ are reciprocal of each other, then coefficient of $x^2 =$ constant term
- Relationship between zeroes and coefficient of a polynomial :

If α and β are zeroes of $p(x) = ax^2 + bx + c$ ($a \neq 0$), then

$$\text{sum of zeroes} = \alpha + \beta = -\frac{b}{a}$$

$$\text{Product of zeroes} = \alpha\beta = \frac{c}{a}$$

- If a, b are zeroes of a quadratic polynomial $p(x)$, then

$$p(x) = k[x^2 - (\text{sum of zeroes}) \cdot x + \text{product of zeroes}]$$

$$\Rightarrow p(x) = k[x^2 - (\alpha + \beta)x + \alpha\beta];$$

where k is any non-zero real number.

Class X - Maths

- Graph of linear polynomial $p(x) = ax + b$ is a straight line.
- Division Algorithm states that given any polynomials $p(x)$ and $g(x)$, there exist polynomials $q(x)$ and $r(x)$ such that :

$$p(x) = g(x) \cdot q(x) + r(x) ; \quad g(x) \neq 0,$$

[where either $r(x) = 0$ or degree $r(x) <$ degree $g(x)$]

CHAPTER 2

POLYNOMIALS**VERY SHORT ANSWER TYPE QUESTIONS**

1. What will be the number of zeroes of a linear polynomial $p(x)$ if its graph (i) passes through the origin. (ii) doesn't intersect or touch x-axis at any point?
2. Find the quadratic polynomial whose zeroes are $(5 + 2\sqrt{3})$ and $(5 - 2\sqrt{3})$
3. If one zero of $p(x) = 4x^2 - (8k^2 - 40k)x - 9$ is negative of the other, find values of k .
4. What number should be added to the polynomial $x^2 - 5x + 4$, so that 3 is a zero of polynomial so obtained.
5. How many (i) maximum (ii) minimum number of zeroes can a quadratic polynomial have?
6. What will be the number of real zeroes of the polynomial $x^2 + 1$?
7. If α and β are zeroes of polynomial $6x^2 - 7x - 3$, then form a quadratic polynomial whose zeroes are 2α and 2β .
8. If a and $\frac{1}{\alpha}$ are zeroes of $4x^2 - 17x + k - 4$, find values of k .
9. What will be the number of zeroes of the polynomials whose graphs are parallel to (i) y-axis; (ii) x-axis.
10. What will be number of zeroes of the polynomial whose graphs are either touching or intersecting the axes only at the points :
 - (i) $(-3, 0)$ $(0, 2)$ and $(3, 0)$
 - (ii) $(0, 4)$, $(0, 0)$ and $(0, -4)$

SHORT ANSWER TYPE (I) QUESTIONS

11. If -3 is one of the zeroes of the polynomial $(k - 1)x^2 + kx + 1$, find the value of k .
12. If the product of zeroes of $ax^2 - 6x - 6$ is 4 find the value of a . Hence find the sum of its zeroes.

13. If α and β are zeroes of the polynomial $x^2 - a(x + 1) - b$ such that $(\alpha + 1)(\beta + 1) = 0$, find the value of b .
14. If zeroes of $x^2 - kx + 6$ are in the ratio $3 : 2$, find k .
15. If one zero of the quadratic polynomial $(k^2 + k)x^2 + 68x + 6k$ is reciprocal of the other, find k .
16. If α and β are the zeroes of the polynomial $x^2 - 5x + m$ such that $\alpha - \beta = 1$, find m .
17. If the sum of squares of zeroes of the polynomial $x^2 - 8x + k$ is 40, find the value of k .
18. If α and β are zeroes of the polynomial $t^2 - t - 4$, form a quadratic polynomial whose zeroes are $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

SHORT ANSWER TYPE (II) QUESTIONS

19. If $(k + y)$ is a factor of each of the polynomial $y^2 + 2y - 15$ and $y^3 + a$, find values of k and a .
20. Obtain zeroes of $4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ and verify relation between its zeroes and coefficients.
21. If $x^4 + 2x^3 + 8x^2 + 12x + 18$ is divided by $(x^2 + 5)$, remainder comes out to be $(px + q)$, find values of p and q .
22. -5 is one of the zeroes of $2x^2 + px - 15$. Zeroes of $p(x^2 + x) + k$ are equal to each other. Find the values of k .
23. Find the value of k such that $3x^2 + 2kx + x - k - 5$ has the sum of zeroes as half of their product.
24. If α and β are zeroes of $y^2 + 5y + m$, find the value of m such that $(\alpha + \beta)^2 - \alpha\beta = 24$.
25. If α and β are zeroes of $x^2 - x - 2$, find a polynomial whose zeroes are $(2\alpha + 1)$ and $(2\beta + 1)$.
26. Find values of a and b so that $x^4 + x^3 + 8x^2 + ax + b$ is divisible by $x^2 + 1$.
27. What must be subtracted from $8x^4 + 14x^3 - 2x^2 + 7x - 8$ so that the resulting polynomial is exactly divisible by $4x^2 + 3x - 2$?
28. What must be added to $4x^4 + 2x^3 - 2x^2 + x - 1$ so that the resulting polynomial is divisible by $x^2 - 2x - 3$?

LONG ANSWER TYPE QUESTIONS

29. Find all zeroes of the polynomial $2x^3 + x^2 - 6x - 3$ if two of its zeroes are $\sqrt{3}$ and $-\sqrt{3}$.
30. If $\sqrt{2}$ is zero of $(6x^3 + \sqrt{2}x^2 - 10x - 4\sqrt{2})$, find its other zeroes.
31. If two zeroes of $x^4 - 6x^3 - 26x^2 + 138x - 35$ are $(2 \pm \sqrt{3})$, find other zeroes.
32. On dividing the polynomial $x^3 - 5x^2 + 6x - 4$ by a polynomial $g(x)$, quotient and remainder are $(x - 3)$ and $(-3x + 5)$ respectively. Find $g(x)$.
33. If sum and product of two zeroes of the polynomial $x^3 + x^2 - 3x - 3$ are 0 and 3 respectively, find all zeroes of the polynomial.
34. If $-\frac{1}{2}$ is a zero of the polynomial $2x^3 + x^2 - 6x - 3$, find the sum and product of its other two zeroes.
35. Obtain all zeroes of the polynomial $2x^4 - 2x^3 - 7x^2 + 3x + 6$ if two factors of this polynomial are $\left(x \pm \sqrt{\frac{3}{2}}\right)$.
36. Sum and product of two zeroes of $x^4 - 4x^3 - 8x^2 + 36x - 9$ are 0 and -9 respectively. Find the sum and product of its other two zeroes.
37. A person distributes k books to some needy students. If k is a zero of the polynomial $x^2 - 100x - 20,000$, then
- find the number of books distributed
 - Which moral values depicted by the person impressed you?
38. One zero of $x^3 - 12x^2 + 47x - 60$ is 3 and the remaining two zeroes are the number of trees planted by two students.
- Find the total number of trees planted by both students.
 - Which moral values of the students is depicted here?

ANSWER

1. (i) 1; (ii) 0 2. $x^2 - 10x + 13$ 3. $k = 0, 5$ 4. 2
5. (i) 2; (ii) 0 6. 0 7. $3x^2 - 7x - 6$ 8. $k = 8$
9. (i) 1; (ii) 0 10. (i) 2; (ii) 1 11. $\frac{4}{3}$
12. $a = -\frac{3}{2}$, sum of zeroes = -4
13. 1 14. -5, 5 15. 5 16. 6
17. 12 18. $4t^2 + t - 1$ 19. $k = 3, -5$ and $a = 27, -125$
20. $-\frac{2}{\sqrt{3}}, \frac{\sqrt{3}}{4}$ 21. $p = 2, q = 3$ 22. $\frac{7}{4}$ 23. 1
24. 1 25. $x^2 - 4x - 5$ 26. $a = 1, b = 7$ 27. $14x - 10$
28. $61x - 65$ 29. $\sqrt{3}, -\sqrt{3}, -\frac{1}{2}$ 30. $-\frac{\sqrt{2}}{2}, -\frac{2\sqrt{2}}{3}$
31. -5, 7 32. $x^2 - 2x + 3$ 33. $\sqrt{3}, -\sqrt{3}, -1$
34. 0, 3 35. $2, -1, \pm\sqrt{\frac{3}{2}}$ 36. 4, 1
37. (i) 200; (ii) Love & care, humanity, kindness etc.
38. (i) 9; (ii) Love for environment, eco-friendly, etc.

PRACTICE TEST

[Duration : 50 Minutes]

[M.M. : 20]

SECTION – A

1. If α and β are zeroes of a quadratic polynomial $p(x)$, then factorize $p(x)$ 1
2. If α and β are zeroes of $x^2 - x - 1$, find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$ 1

SECTION – B

3. If α and β are zeroes of $x^2 - (k + 6)x + 2(2k - 1)$. Find the values of k if $\alpha + \beta = \frac{1}{2}\alpha\beta$. 2
4. Find a quadratic polynomial one of whose zeroes is $(3 + \sqrt{2})$ and the sum of its zeroes is 6. 2

SECTION – C

5. Find values of a and b if $(x^2 + 1)$ is a factor of the polynomial $x^4 + x^3 + 8x^2 + ax + b$. 3
6. If truth and lie are zeroes of the polynomial $px^2 + qx + r$, ($p \neq 0$) and zeroes are reciprocal to each other, 3
 - (i) Find the relation between p and r .
 - (ii) Which value do you learn from this question?

SECTION – D

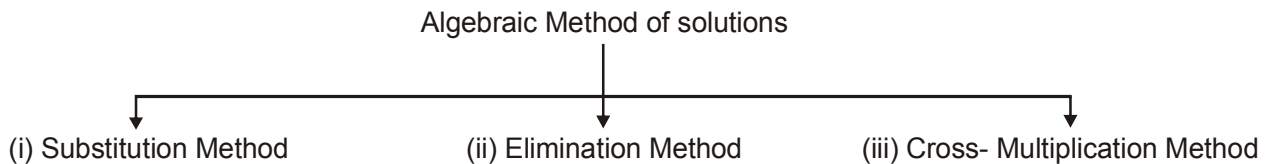
7. On dividing the polynomial $x^3 + 2x^2 + kx + 7$ by $(x - 3)$, remainder comes out to be 25. Find quotient and the value of k . Also find the sum and product of zeroes of the quotient so obtained. 4
8. If β and $\frac{1}{\beta}$ are zeroes of the polynomial $(\alpha^2 + \alpha)x^2 + 61x + 6\alpha$, find values of β and α . 4

CHAPTER 3

PAIR OF LINEAR EQUATIONS IN TWO VARIABLES

KEY POINTS

- The general form of a pair of linear equations is
$$a_1x + b_1y + c_1 = 0$$
$$a_2x + b_2y + c_2 = 0$$
Where $a_1, a_2, b_1, b_2, c_1, c_2$ are real numbers.
- The graph of a pair of linear equations in two variables is represented by two lines.
 - (i) If the lines intersect at a point, the pair of equations is consistent. The point of intersection gives the unique solution of the equations.
 - (ii) If the lines are parallel, then there is no solution. The pair of linear equations is inconsistent.
 - (iii) If the lines coincide, then there are infinitely many solutions. The pair of equations is consistent. Each point on the line is a solution.



- If a pair of linear equations is given by

$$a_1x + b_1y + c_1 = 0; \text{ and}$$

$$a_2x + b_2y + c_2 = 0$$

- (i) $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \Rightarrow$ The pair of linear equations is consistent (unique solution).
- (ii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2} \Rightarrow$ The pair of linear equation is inconsistent (no solution).
- (iii) $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2} \Rightarrow$ The pair of linear equations is dependent and consistent (infinitely many solutions).

CHAPTER 3

**PAIR OF LINEAR EQUATIONS
IN TWO VARIABLES****VERY SHORT ANSWER TYPE QUESTIONS**

1. If $x = 3m - 1$ and $y = 4$ is a solution of the equation $x + y = 6$. Then find the value of m .
2. What is the point of intersection of the line represented by $3x - 2y = 6$ and the y -axis.
3. For what value of p , system of equations
 $2x + py = 8$ and $x + y = 6$
have no solution.
4. A motor cyclist is moving along the line $x - y = 2$ and another motor cyclist is moving along the line $x - y = 4$. Find out their moving direction.
5. Find the value of k for which pair of linear equations
 $3x + 2y = -5$ and $x - ky = 2$ has a unique solution.
6. Express y in terms of x in the expression $3x - 7y = 10$
7. If $2x + 5y = 4$, write another linear equation, so that lines represented by the pair are coincident.
8. Check whether the graph of the pair of linear equations $x + 2y - 4 = 0$ and $2x + 4y - 12 = 0$ is intersecting lines or parallel lines.
9. If the lines $3x + 2ky = 2$, and $2x + 5y + 1 = 0$ are parallel, then find values of k .
10. If we draw lines of $x = 2$ and $y = 3$ what kind of lines do we get?

SHORT ANSWER TYPE (I) QUESTIONS

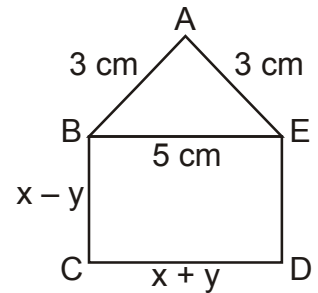
11. Form a pair of linear equations for : The sum of the numerator and denominator of the fraction is 3 less than twice the denominator. If the numerator and denominator both are decreased by 1, the numerator becomes half the denominator.

12. For what value of p the pair of linear equations

$$(p + 2)x - (2p + 1)y = 3(2p - 1)$$

$2x - 3y = 7$ has a unique solution.

13. ABCDE is a pentagon with $BE \parallel DE$ and $BC \parallel DE$, BC is perpendicular to CD. If the perimeter of ABCDE is 21 cm find x and y .



14. Solve for x and y

$$x - \frac{y}{2} = 3 \quad \text{and} \quad \frac{x}{2} - \frac{2y}{3} = \frac{2}{3}$$

15. Solve for x and y

$$3x + 2y = 11 \quad \text{and} \quad 2x + 3y = 4$$

also find p if $p = 8x + 5y$.

16. Solve the pair of linear equations by substitution method

$$x - 7y + 42 = 0 \quad \text{and} \quad x - 3y - 6 = 0$$

17. Ram is walking along the line joining $(1, 4)$ and $(0, 6)$.

Rahim is walking along the line joining $(3, 4)$ and $(1, 0)$. Represent on graph and find the point where both of them cross each other.

18. Given the linear equation $2x + 3y - 12 = 0$, write another linear equation in these variables, such that geometrical representation of the pair so formed is

(i) parallel lines; (ii) coincident lines.

19. The difference of two number is 66. If one number is four times the other, find the numbers.

20. For what values of k , the following system of equations will be inconsistent

$$kx + 3y = k - 3.$$

$$12x + ky = k$$

SHORT ANSWER TYPE (II) QUESTIONS

21. Solve graphically the pair of linear equations

$$5x - y = 5 \quad \text{and} \quad 3x - 2y = -4$$

Find the co-ordinates of the points where these lines intersect y -axis.

22. Solve for x and y

$$\frac{5}{x+y} + \frac{1}{x-y} = 2; \quad \frac{15}{x+y} - \frac{5}{x-y} = -2$$

23. Solve by cross-multiplication method

$$\frac{x}{a} + \frac{y}{b} = a + b; \quad \frac{x}{a^2} + \frac{y}{b^2} = 2.$$

24. For what values of a and b the following pair of linear equations have infinite number of solutions?

$$2x + 3y = 7$$

$$a(x + y) - b(x - y) = 3a + b - 2$$

25. Solve the pair of linear equations

$$152x - 378y = -74$$

$$-378x + 152y = -604$$

26. Pinky scored 40 marks in a test getting 3 marks for each right answer and losing 1 mark for each wrong answer. Had 4 marks been awarded for each correct answer and 2 marks were deducted for each wrong answer, then Pinky again would have scored 40 marks. How many questions were there in the test?
27. A two digit number is obtained by either multiplying sum of digits by 8 and adding 1 or by multiplying the difference of digits by 13 and adding 2. Find the number.
28. Father's age is three times the sum of ages of his two children. After 5 years his age will be twice the sum of ages of two children. Find the ages of the father.
29. On selling a T.V. at 5% gain and a fridge at 10% gain, a shopkeeper gain Rs. 2000. But if he sells the T.V. at 10% gain and fridge at 5% less, he gains Rs. 1500 on the transaction. Find the actual price of the T.V. and the fridge.
30. Sunita has some Rs. 50 and Rs. 100 notes amounting to a total of Rs. 15500. If the total number of notes is 200. The find how many notes of Rs. 50 and Rs. 100 each, she has.

LONG ANSWER TYPE QUESTIONS

31. Solve graphically the pair of linear equations $3x - 4y + 3 = 0$ and $3x + 4y - 21 = 0$. Find the co-ordinates of vertices of triangular region formed by these lines and x-axis. Also calculate the area of this triangle.
32. Solve for x and y

$$\frac{1}{2(2x + 3y)} + \frac{12}{7(3x - 2y)} = \frac{1}{2}$$

$$\frac{7}{(2x + 3y)} + \frac{4}{(3x - 2y)} = 2 \quad \text{for} \quad 2x + 3y \neq 0; \quad 3x - 2y \neq 0$$

33. Solve the pair of equations by reducing them to a pair of linear equations

$$\frac{3x + 2y}{xy} = 1 \quad \text{and} \quad \frac{4x - 2y}{xy} = 13$$

hence find a for which $y = ax - 4$.

34. A man travels 600 km to his home partly by train and partly by bus. He takes 8 hours, if he travels 120 km by train and rest by bus. Further, it takes 20 minutes longer, if he travels 200 km by train and rest by bus. Find the speeds of the train and the bus.
35. A and B are two points 150 km apart on a highway. Two cars start with different speeds from A and B at same time. If they move in same direction, they meet in 15 hours & if they move in opposite direction, they meet in one hour. Find their speeds.
36. A boat covers 32 km upstream and 36 km downstream in 7 hours. Also it covers 40 km upstream and 48 km downstream in 9 hours. Find the speed of boat in still water and that of the stream.
37. The sum of the numerator and denominator of a fraction is 4 more than twice the numerator. If the numerator and denominator are increased by 3, they are in the ratio 2 : 3. Determine the fraction.
38. Raju used 2 plastic bags and 1 paper bag in a day which cost him Rs. 35. While Ramesh used 3 plastic bags and 4 paper bags per day, which cost him Rs. 65.
- (i) Find the cost of each bag.
- (ii) Which bag has to be used and what value is reflected by using it.
39. 8 women and 12 men can complete a work in 10 days while 6 women and 8 men can complete the same work in 14 days. Find the time taken by one woman alone and that one man alone to finish the work. What value is indicated from this action?
40. The ratio of incomes of two persons A and B is 3 : 4 and the ratio of their expenditures is 5 : 7. If their savings are Rs. 15,000 annually, find their annual incomes. What value will be promoted if expenditure is under control.

ANSWERS

1. $m = 1$
2. $(0, -3)$
3. $p = 2$
4. Move parallel
5. $k \neq \frac{-2}{3}$
6. $y = \frac{3x - 10}{7}$
7. $4x + 10y = 8$
9. $k = \frac{15}{4}$
10. Intersecting lines.
11. $x - y = -3, 2x - y = 1$
12. $p \neq 4$
13. $x = 5; y = 0$
14. 4, 2
15. $x = 5, y = -2, p = 30$
16. 42, 12
17. (2, 2)
18. (i) $4x + 6y + 10 = 0$; (ii) $4x + 6y - 24 = 0$
19. 88, 22
20. $k = -6$
21. (2, 5) (0, -5) and (0, 2)
22. (3, 2)
23. a^2, b^2
24. $a = 5, b = 1$, 25. 2, 1
26. 40 questions
27. 41
28. 45 years
29. T.V. = Rs. 20,000; Fridge = Rs. 10,000
30. Rs. 50 notes = 90; Rs. 100 notes = 110
31. Solution (3, 3). Vertices (-1, 0) (7, 0) and (3, 3). Area = 12 sq. units.
32. (2, 1)
33. $x = \frac{-2}{5}, y = \frac{1}{2}, a = \frac{-45}{4}$
34. 60 km/hr; 80 km/hr
35. 80 km/hr; 70 km/hr
36. 10 km/hr; 2 km/hr
37. $\frac{5}{9}$
38. (i) 15, 5; (ii) Eco Friendly
39. 1 woman in 140 days
1 Man in 280 days.
Removal of gender bias, women can work faster than man.
40. Rs. 90,000, Rs. 1,20,000, Economic value, saving attitude.

PRACTICE TEST

[Duration : 50 Minutes]

[M.M. : 20]

Section A comprises of 2 questions of 1 mark each. Section B comprises 2 question of 2 marks each, Section C comprises of 2 questions of 3 marks eqch and Section D comprises of 2 questions of 4 marks each.

SECTION – A

1. For what value of k, system of equations 1
 $x + 2y = 3$ and $5x + ky + 7 = 0$ has a unique solution.
2. Does the point (2, 3) lie on line of graph of $3x - 2y = 5$. 1

SECTION – B

3. For what values of a and b does the pair of linear equations have infinite number of solutions. 2
 $2x - 3y = 7$
 $ax + 3y = b$
4. Solve for x and y 2
 $0.4x + 0.3y = 1.7$
 $0.7x - 0.2y = 0.8$

SECTION – C

5. Solve for x and y by cross multiplication method. 3
 $x + y = a + b$
 $ax - by = a^2 - b^2$
6. Sum of the ages of a father and the son is 40 years. If father's age is three times that of his son, then find their ages. 3

SECTION – D

7. Solve the following pair of equations graphically. 4
 $3x + 5y = 12$ and $3x - 5y = -18$. Also shade the region enclosed by these two lines and x-axis.
8. The sum of a two digit number and number obtained on reversing the digits is 99. If the number obtained on reversing the digit is 9 more than the original number, find the number. 4

CHAPTER 4

SIMILAR TRIANGLES

KEY POINTS

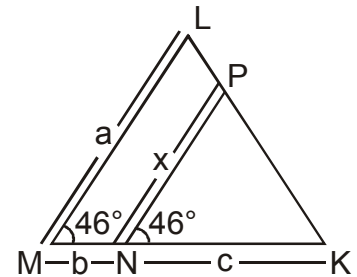
- **Similar Triangles** : Two triangles are said to be similar if their corresponding angles are equal and their corresponding sides are proportional.
- Criteria for Similarity :
In $\triangle ABC$ and $\triangle DEF$
 - (i) **AAA Similarity** : $\triangle ABC \sim \triangle DEF$ when $\angle A = \angle D$, $\angle B = \angle E$ and $\angle C = \angle F$
 - (ii) **SAS Similarity** : $\triangle ABC \sim \triangle DEF$ when $\frac{AB}{DE} = \frac{BC}{EF}$ and $\angle B = \angle E$
 - (iii) **SSS Similarity** : $\triangle ABC \sim \triangle DEF$, $\frac{AB}{DE} = \frac{AC}{DF} = \frac{BC}{EF}$.
- The Proof of the following theorems can be asked in the examination :
 - (i) **Basic Proportionality Theorem** : If a line is drawn parallel to one side of a triangle to intersect the other sides in distinct points, the other two sides are divided in the same ratio.
 - (ii) The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides.
 - (iii) **Pythagoras Theorem** : In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.
 - (iv) **Converse of Pythagoras Theorem** : In a triangle, if the square of one side is equal to the sum of squares of other two sides then the angle opposite to the first side is a right angle.

CHAPTER 4

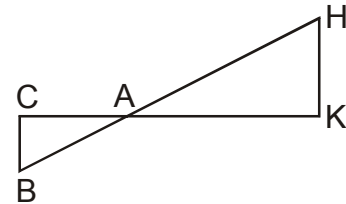
SIMILAR TRIANGLES**VERY SHORT ANSWER QUESTIONS**

1. Is the triangle with sides 12 cm, 16 cm and 18 cm a right triangle? Give reason.
2. If $\triangle ABC \sim \triangle QRP$, $\frac{\text{ar}(\triangle ABC)}{\text{ar}(\triangle PQR)} = \frac{9}{4}$, $AB = 18$ cm, $BC = 15$ cm, then find the length of PR .

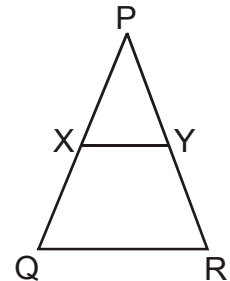
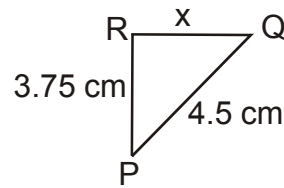
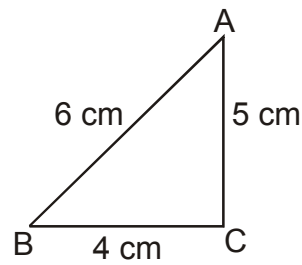
3. If the fig. $\angle M = \angle N = 46^\circ$, Express x in terms of a , b , and c .



4. In fig, $\triangle AHK \sim \triangle ABC$. If $AK = 10$ cm, $BC = 3.5$ cm and $HK = 7$ cm. Find AC .

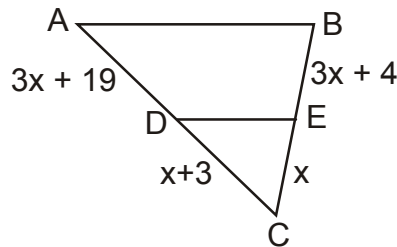


5. It is given that $\triangle DEF \sim \triangle RPQ$. Is it true to say that $\angle D = \angle R$ and $\angle F = \angle P$?
6. If the corresponding Medians of two similar triangles are in the ratio 5 : 7, then find the ratio of their sides.
7. A right angled triangle has its area numerically equal to its perimeter. The length of each side is an even number and the hypotenuse is 10 cm. What is the perimeter of the triangle?
8. An aeroplane leaves an airport and flies due west at a speed of 2100 km/hr. At the same time, another aeroplane leaves the same place at airport and flies due South at a speed of 2000 km/hr. How far apart will be the two planes after 1 hour?
9. The areas of two similar $\triangle ABC$ and $\triangle DEF$ are 225 cm^2 and 81 cm^2 respectively. If the longest side of the larger triangle $\triangle ABC$ be 30 cm, find the longest side of the smaller triangle DEF .
10. In the figure, if $\triangle ABC \sim \triangle PQR$, find the value of x ?



11. In the figure, $XY \parallel QR$ and $\frac{PX}{XQ} = \frac{PY}{YR} = \frac{1}{2}$, find $XY : QR$

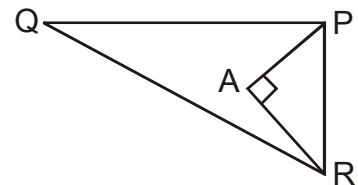
12. In figure, find the value of x which will make $DE \parallel AB$?



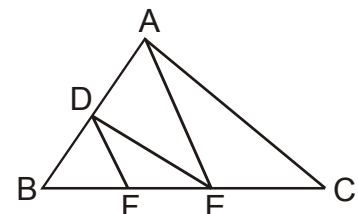
13. If $\triangle ABC \sim \triangle DEF$, $BC = 3EF$, and area $(\triangle ABC) = 117 \text{ cm}^2$ then find area $(\triangle DEF)$.
14. If $\triangle ABC$ and $\triangle DEF$ are similar triangles such that $\angle A = 45^\circ$ and $\angle F = 56^\circ$, then find $\angle C$.
15. If the ratio of the corresponding sides of two similar triangles is $2 : 3$, then find the ratio of their corresponding attitudes.

SHORT ANSWER TYPE (I) QUESTIONS

16. In the given figure $PQ = 24 \text{ cm}$, $QR = 26 \text{ cm}$, $\angle PAR = 90^\circ$, $PA = 6 \text{ cm}$ and $AR = 8 \text{ cm}$, find $\angle QPR$.

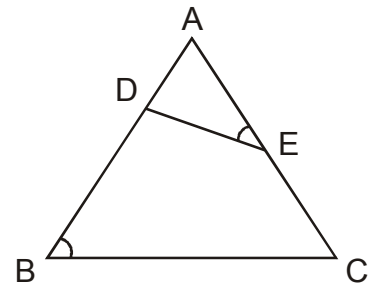


17. In the given figure, $DE \parallel AC$ and $DF \parallel AE$. Prove that $\frac{FE}{BF} = \frac{EC}{BE}$.

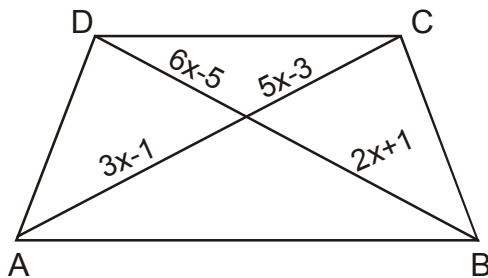


18. In $\triangle ABC$, $AD \perp BC$ such that $AD^2 = BD \times CD$. Prove that $\triangle ABC$ is right angled at A.

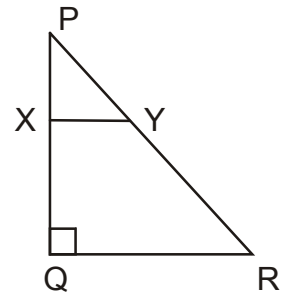
19. In the given figure, D and E are points on sides AB and CA of $\triangle ABC$ such that $\angle B = \angle AED$. Show that $\triangle ABC \sim \triangle AED$.



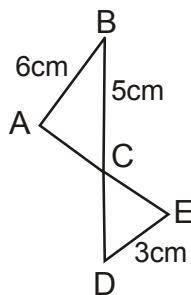
20. In the given figure, $AB \parallel DC$ and diagonals AC and BD intersect at O. If $OA = 3x - 1$ and $OB = 2x + 1$, $OC = 5x - 3$ and $OD = 6x - 5$. Find x.



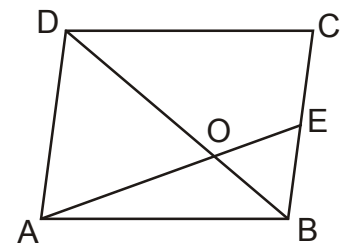
21. In the figure, PQR is a triangle right angled at Q & $XY \parallel QR$. If $PQ = 6$ cm, $PY = 4$ cm and $PX : XQ = 1 : 2$. Calculate the length of PR and QR.



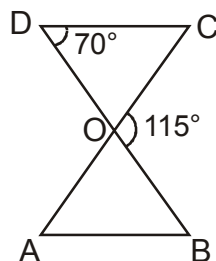
22. In figure, $AB \parallel DE$. Find the length of CD.



23. In the figure, ABCD is a Parallelogram. AE divides the line segment BD in the ratio 1 : 2. If $BE = 1.5$ cm, find BC.



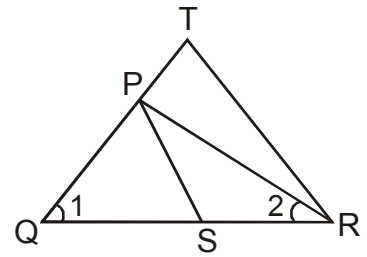
24. In the given figure, $\triangle ODC \sim \triangle OBA$, $\angle BOC = 115^\circ$ and $\angle CDO = 70^\circ$. Find (i) $\angle DOC$, (ii) $\angle DCO$, (iii) $\angle OAB$, (iv) $\angle OBA$.



25. Perimeter of two equilateral triangles ABC and PQR are 144 m and 96 m, find ar ($\triangle ABC$) : ar ($\triangle PQR$).

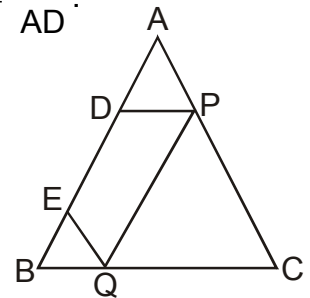
SHORT ANSWER TYPE (II) QUESTIONS

26. In figure, $\frac{QR}{QS} = \frac{QT}{PR}$ and $\angle 1 = \angle 2$, show that $\Delta PQS \sim \Delta TQR$.



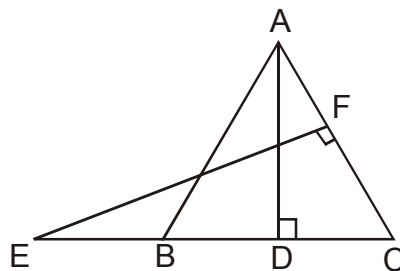
27. In equilateral ΔABC , $AD \perp BC$. Prove that $3BC^2 = 4AD^2$.

28. In ΔABC , $\angle ACB = 90^\circ$, also $CD \perp AB$, Prove that $\frac{BC^2}{AC^2} = \frac{BD}{AD}$.

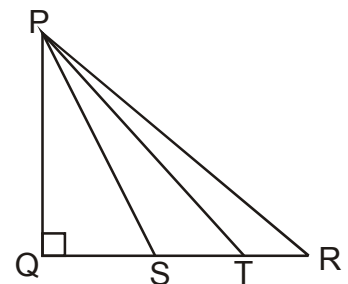


29. In ΔABC , D and E are two points on AB such that $AD = BE$. If $DP \parallel BC$ and $EQ \parallel AC$. Prove that $PQ \parallel AB$.

30. In the given figure, E is a point on side CB produced of an isosceles ΔABC with $AB = AC$. If $AD \perp BC$ and $EF \perp AC$, Prove that $\Delta ABD \sim \Delta ECF$.

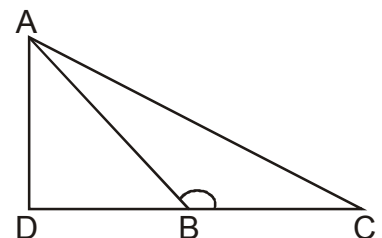


31. In figure, S & T trisect the side QR of a right triangle PQR, Prove that $8PT^2 = 3PR^2 + 5PS^2$.



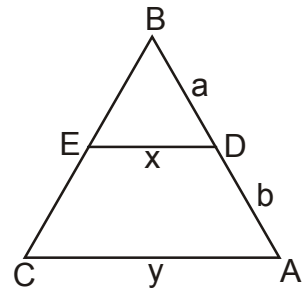
32. If AD and PS are medians of ΔABC and ΔPQR respectively where $\Delta ABC \sim \Delta PQR$, Prove that $\frac{AB}{PQ} = \frac{AD}{PS}$.

33. In the given figure, ABC is a triangle in which $\angle B$ is an obtuse angle and $AD \perp CB$ produced. Prove that $AC^2 = AB^2 + BC^2 + 2BC \cdot BD$.



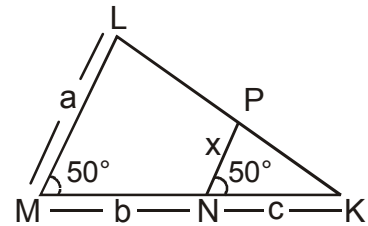
34. The given figure, $DE \parallel AC$. Which of the following is true?

$$x = \frac{a+b}{ay} \quad \text{or} \quad x = \frac{ay}{a+b}$$



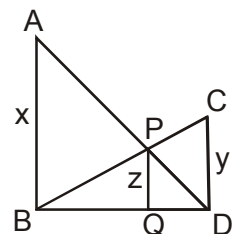
35. Prove that the sum of the square of the sides of a rhombus is equal to the sum of the squares of its diagonals?
36. A street light bulb is fixed on a Pole 6 m above, the level of the street. If a woman of height 1.5m casts a shadow of 3m, find how far she is away from the base of the pole.
37. Two poles of height a meters and b meters are p meter apart. Prove that the height of the point of intersection of the lines joining the top of each pole to the foot of the opposite pole is given by $\frac{ab}{a+b}$ Meters.

38. In the given figure, find the value of x in terms of a, b and c.

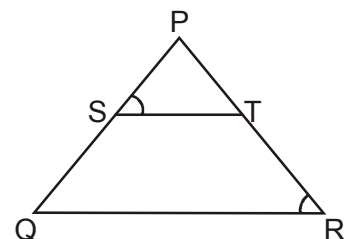


39. In figure, $AB \parallel PQ \parallel CD$, $AB = x$ units, $CD = y$ units and $PQ = z$ units. Prove that

$$\frac{1}{x} + \frac{1}{y} = \frac{1}{z}$$



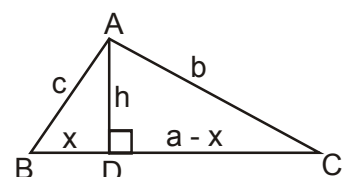
40. In the given figure, $\frac{PS}{SQ} = \frac{PT}{TR}$ and $\angle PST = \angle PRQ$. Prove that PQR is an isosceles Δ .



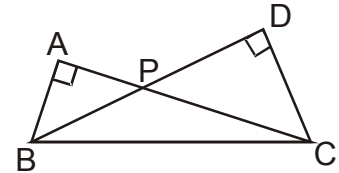
41. In the given figure, $\angle B < 90^\circ$ and segment $AD \perp BC$, show that

(i) $b^2 = h^2 + a^2 + x^2 - 2ax$

(ii) $b^2 = a^2 + c^2 - 2ax$

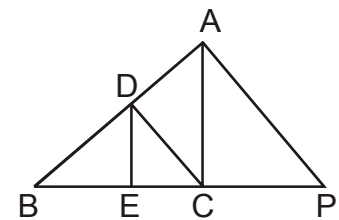


42. In the given figure, PQR is a right triangle right angled at Q. X and Y are the points on PQ and QR such that $PX : XQ = 1 : 2$, and $QY : YR = 2 : 1$, Prove that $9(PY^2 + XR^2) = 13PR^2$
43. If E is a point on side CA of an equilateral triangle ABC such that $BE \perp CA$, then prove that $AB^2 + BC^2 + CA^2 = 4BE^2$.
44. Two triangles ABC and BDC, right angled at A and D respectively are drawn on the same base BC and on the same side of BC. If AC and DB intersect at P, Prove that $AP \times PC = DP \times PB$.
45. Hypotenuse of a right triangle is 25 cm and out of the remaining two sides, one is longer than the other by 5 cm, find the length of the other two sides.

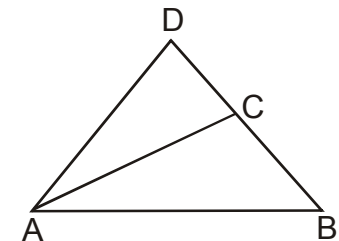


LONG ANSWER TYPE QUESTIONS

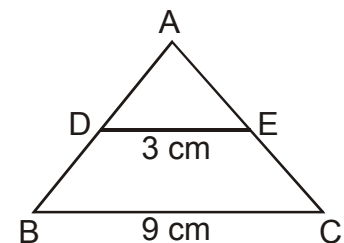
46. In the following figure, $DE \parallel AC$ and $\frac{BE}{EC} = \frac{BC}{CP}$. Prove that $DC \parallel AP$.



47. In a quadrilateral ABCD, $\angle B = 90^\circ$, $AD^2 = AB^2 + BC^2 + CD^2$. Prove that $\angle ACD = 90^\circ$.



48. In figure, $DE \parallel BC$, $DE = 3$ cm, $BC = 9$ cm and $\text{ar}(\triangle ADE) = 30$ cm². Find $\text{ar}(\text{trap. BCED})$.

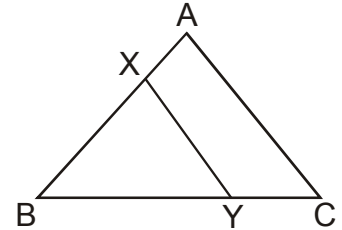


49. State and Prove Pythagoras Theorem.
50. In an equilateral $\triangle ABC$, D is a point on side BC such that $BD = \frac{1}{3}BC$. Prove that $9AD^2 = 7AB^2$.
51. In $\triangle PQR$, $PD \perp QR$ such that D lies on QR. If $PQ = a$, $PR = b$, $QD = c$ and $DR = d$ and a, b, c, d are positive units, Prove that $(a + b)(a - b) = (c + d)(c - d)$.

52. In a trapezium ABCD, $AB \parallel DC$ and $DC = 2AB$. EF drawn parallel to AB cuts AD in F and BC in E such that $\frac{BE}{BC} = \frac{3}{4}$. Diagonals DB intersects EF at G. Prove that $7EF = 10AB$.

53. Prove that the ratio of the area of two similar triangles is equal to the ratio of the squares of their corresponding sides.

54. In the given figure, the line segment XY is parallel to AC of $\triangle ABC$ and it divides the triangle into two parts of equal areas. Prove that $\frac{AX}{AB} = \frac{\sqrt{2}-1}{\sqrt{2}}$.



55. Through the vertex D of a parallelogram ABCD, a line is drawn to intersect the sides BA and BC produced at E and F respectively. Prove that

$$\frac{DA}{AE} = \frac{FB}{BE} = \frac{FC}{CD}.$$

56. Prove that if in a triangle, the square on one side is equal to the sum of the squares on the other two sides, then the angle opposite to the first side is a right angle.

ANSWER

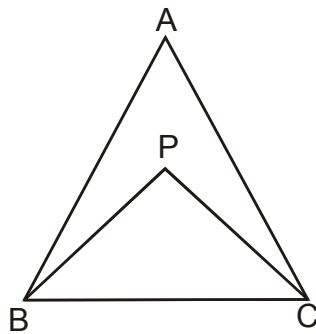
- | | | | |
|---|--------------------------|--|--------------------------|
| 1. No | 2. 10 cm | 3. $x = \frac{ac}{b+c}$ | 4. 5 cm |
| 5. $\angle D = \angle R$ True, $\angle F = \angle P$ False. | 6. 5 : 7 | 7. 24 cm | |
| 8. 2900 km | 9. 18 cm | 10. $x = 3$ | 11. 1 : 3 |
| 12. $x = 2$ | 13. 13 cm^2 | 14. 56° | 15. 2 : 3 |
| 16. 90° | 20. $x = 2$ | 21. $PR = 12 \text{ cm}$, $QR = 6\sqrt{3} \text{ cm}$ | |
| 22. 2.5 cm | 23. 3 cm | 24. $65^\circ, 45^\circ, 45^\circ, 70^\circ$ | |
| 25. 9 : 4 | 34. $x = \frac{ay}{a+b}$ | 36. 9 M | 38. $x = \frac{ac}{b+c}$ |
| 45. 15 cm, 20 cm | 48. 240 cm^2 | | |

PRACTICE TEST

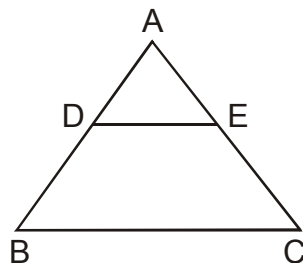
[Duration : 50 Minutes]

[M.M. : 20]

1. The length of the diagonals of rhombus are 16 cm and 12 cm, find the side of the rhombus. 1
2. In an equilateral $\triangle ABC$, $AD \perp BC$ and $\frac{AD^2}{BC^2} = x$. Find the value of x . 1
3. In $\triangle ABC$, if $DE \parallel BC$, $AD = x + 1$, $DB = x - 1$, $AE = x + 3$ and $EC = x$, then find the value of x . 2
4. In the given figure, can triangle ABC be similar to $\triangle PBC$? If yes, give reason. 2



5. PQR is a right angled triangle, having $\angle Q = 90^\circ$, If $QS = SR$, Show that $PR^2 = 4PS^2 - 3PQ^2$. 3
6. In figure, $DE \parallel BC$ and $AD : DB = 5 : 4$, find $\frac{\text{ar}(\triangle DEA)}{\text{ar}(\triangle CAB)}$ 3



7. State and prove Pythagoras Theorem. 4
8. In an equilateral $\triangle LMN$, the side MN is trisected at O . Prove that $\frac{LO^2}{LM^2} = \frac{7}{9}$. 4

CHAPTER 5

TRIGONOMETRY

BASIC CONCEPTS

- **Trigonometric ratio** : In $\triangle ABC$, $\angle B = 90^\circ$. For $\angle A$,

$$\sin A = \frac{\text{Perpendicular}}{\text{Hypotenuse}} = \frac{\text{Opposite side}}{\text{Hypotenuse}}$$

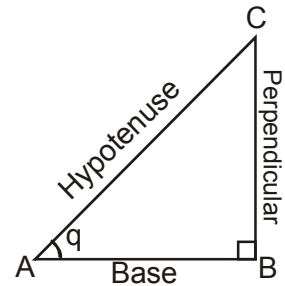
$$\cos A = \frac{\text{Base}}{\text{Hypotenuse}} = \frac{\text{adjacent side}}{\text{Hypotenuse}}$$

$$\tan A = \frac{\text{Perpendicular}}{\text{Base}} = \frac{\text{Opposite side}}{\text{adjacent side}}$$

$$\cot A = \frac{\text{Base}}{\text{Perpendicular}} = \frac{\text{adjacent side}}{\text{Opposite side}}$$

$$\sec A = \frac{\text{Hypotenuse}}{\text{Base}} = \frac{\text{Hypotenuse}}{\text{adjacent side}}$$

$$\operatorname{cosec} A = \frac{\text{Hypotenuse}}{\text{Perpendicular}} = \frac{\text{Hypotenuse}}{\text{Opposite side}}$$



- **Opposites**

$$\sin \theta = \frac{1}{\operatorname{cosec} \theta}, \operatorname{cosec} \theta = \frac{1}{\sin \theta}$$

$$\cos \theta = \frac{1}{\sec \theta}, \sec \theta = \frac{1}{\cos \theta}$$

$$\tan \theta = \frac{1}{\cot \theta}, \cot \theta = \frac{1}{\tan \theta}$$

- $\tan \theta = \frac{\sin \theta}{\cos \theta}, \cot \theta = \frac{\cos \theta}{\sin \theta}$

- **Identities**

$$\sin^2 \theta + \cos^2 \theta = 1 \Rightarrow \sin^2 \theta = 1 - \cos^2 \theta \text{ and } \cos^2 \theta = 1 - \sin^2 \theta$$

$$1 + \tan^2 \theta = \sec^2 \theta \Rightarrow \tan^2 \theta = \sec^2 \theta - 1 \text{ and } \sec^2 \theta - \tan^2 \theta = 1$$

$$1 + \cot^2 \theta = \operatorname{cosec}^2 \theta \Rightarrow \cot^2 \theta = \operatorname{cosec}^2 \theta - 1 \text{ and } \operatorname{cosec}^2 \theta - \cot^2 \theta = 1$$

● **Trigonometric ratio of some specific angles**

$\angle A$	0°	30°	45°	60°	90°
sin A	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
cos A	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
tan A	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	Not defined
cot A	Not defined	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0
sec A	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	Not defined
cosec A	Not defined	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1

● **Trigonometric ratios of complimentary angles**

$$\sin (90 - \theta) = \cos \theta$$

$$\cos (90 - \theta) = \sin \theta$$

$$\tan (90 - \theta) = \cot \theta$$

$$\cot (90 - \theta) = \tan \theta$$

$$\sec (90 - \theta) = \operatorname{cosec} \theta$$

$$\operatorname{cosec} (90 - \theta) = \sec \theta$$

CHAPTER 5

TRIGONOMETRY

VERY SHORT ANSWER TYPE QUESTIONS

1. If $\sin \theta = \cos \theta$, find the value of θ .
2. If $\tan \theta = \cot (30^\circ + \theta)$, find the value of θ .
3. If $\sin \theta = \cos (\theta - 6^\circ)$, find the value of θ .
4. If $\cos A = \frac{7}{25}$, find the value of $\tan A + \cot A$.
5. If $\tan \theta = \frac{4}{3}$ then find the value of $\frac{\sin \theta + \cos \theta}{\sin \theta - \cos \theta}$.
6. If $3x = \operatorname{cosec} \theta$ and $\frac{3}{x} = \cot \theta$ then find $3\left(x^2 - \frac{1}{x^2}\right)$.
7. If $x = a \sin \theta$ and $y = a \cos \theta$ then find the value of $x^2 + y^2$.
8. Find the value of $\operatorname{cosec} 70^\circ - \sec 20^\circ$.
9. If $5x = \sec \theta$ and $\frac{5}{x} = \tan \theta$ then find the value of $5\left(x^2 - \frac{1}{x^2}\right)$.
10. Find the value of $9 \sec^2 A - 9 \tan^2 A$.
11. Express $\sec \theta$ in terms of $\cot \theta$.
12. Find the value of $\cos \theta \cos (90 - \theta) - \sin \theta \sin (90 - \theta)$.
13. If $\sin (20^\circ + \theta) = \cos 30^\circ$ then find the value of θ .
14. Find the value of $\frac{1 + \tan^2 \theta}{1 + \cot^2 \theta}$.
15. Find the value of $\frac{\sin \theta}{\sqrt{1 - \sin^2 \theta}}$.

SHORT ANSWER TYPE (I) QUESTIONS

16. Prove that
 $\sec^4 \theta - \sec^2 \theta = \tan^4 \theta + \tan^2 \theta$.
17. $\sqrt{\frac{1+\sin \theta}{1-\sin \theta}} = \tan \theta + \sec \theta$
18. If $x = p \sec \theta + q \tan \theta$ & $y = p \tan \theta + q \sec \theta$ then prove that $x^2 - y^2 = p^2 - q^2$.
19. If $7 \sin^2 \theta + 3 \cos^2 \theta = 4$ then show that $\tan \theta = \frac{1}{\sqrt{3}}$.
20. If $\sin(A - B) = \frac{1}{2}$, $\cos(A + B) = \frac{1}{2}$, then find the value of A and B.
21. Find the value of $\frac{\cos^2 20^\circ + \cos^2 70^\circ}{\sin^2 59^\circ + \sin^2 31^\circ}$.
22. Prove that : $\tan 1^\circ \tan 11^\circ \tan 21^\circ \tan 69^\circ \tan 79^\circ \tan 89^\circ = 1$.
23. If $\sec 4A = \operatorname{cosec}(A - 20^\circ)$ then find the value of A.
24. If $3 \cot A = 4$, find the value of $\frac{\operatorname{cosec}^2 A + 1}{\operatorname{cosec}^2 A - 1}$.
25. If $\tan(3x - 15) = 1$ then find the value of x.

SHORT ANSWER TYPE (II) QUESTIONS

Prove that : (Q. 26 to Q. 30)

26. $\frac{\tan A + \sec A - 1}{\tan A - \sec A + 1} = \frac{1 + \sin A}{\cos A}$
27. $\frac{1}{\sec x - \tan x} - \frac{1}{\cos x} = \frac{1}{\cos x} - \frac{1}{\sec x + \tan x}$
28. $\frac{\tan \theta}{1 - \cot \theta} + \frac{\cot \theta}{1 - \tan \theta} = 1 + \tan \theta + \cot \theta = \sec \theta \operatorname{cosec} \theta + 1$
29. $(\sin \theta + \operatorname{cosec} \theta)^2 + (\cos \theta + \sec \theta)^2 = 7 + \tan^2 \theta + \cot^2 \theta$
30. $\sec A (1 - \sin A) (\sec A + \tan A) = 1$
31. If $\cos \theta + \sin \theta = \sqrt{2} \cos \theta$ then show that $\cos \theta - \sin \theta = \sqrt{2} \sin \theta$.

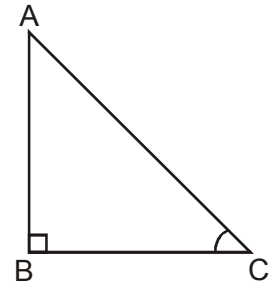
32. If $\tan \theta + \sin \theta = m$, $\tan \theta - \sin \theta = n$ then show that $m^2 - n^2 = 4\sqrt{mn}$.
33. If $\sec \theta = x + \frac{1}{4x}$, prove that $\sec \theta + \tan \theta = 2x$ or $\frac{1}{2x}$
34. If $\sin \theta + \sin^2 \theta = 1$, prove that $\cos^2 \theta + \cos^4 \theta = 1$.
35. Without using trigonometric table, find the value of $\cot \theta \tan (90 - \theta) \sec (90 - \theta) \operatorname{cosec} \theta + \sin^2 65^\circ + \sin^2 25^\circ + \sqrt{3} \tan 5^\circ \tan 85^\circ$.
36. Prove that : $\frac{\cot(90 - \theta)}{\tan \theta} + \frac{\operatorname{cosec}(90 - \theta) \sin \theta}{\tan(90 - \theta)} = \sec^2 \theta$
37. Find the value of :
- $$\frac{\cos 20^\circ + \cos^2 70^\circ}{\sec^2 50^\circ - \cot^2 40^\circ} + 2 \operatorname{cosec}^2 58^\circ - 2 \cot 58^\circ \tan 32^\circ - 4 \tan 13^\circ \tan 37^\circ \tan 77^\circ \tan 45^\circ \tan 53^\circ$$
38. If A, B, C are the angle of $\triangle ABC$ then prove that $\operatorname{cosec}^2 \left(\frac{B+C}{2} \right) - \tan^2 \frac{A}{2} = 1$
39. Find the value of $\sec^2 10^\circ - \cot^2 80^\circ + \frac{\sin 15^\circ \cos 75^\circ + \cos 15^\circ \sin 75^\circ}{\cos \theta \sin(90 - \theta) + \sin \theta \cos(90 - \theta)}$
40. Prove that : $\frac{\tan \theta - \cot \theta}{\sin \theta \cos \theta} = \tan^2 \theta - \cot^2 \theta$

Prove that : (Q. 41 to Q. 44)

41. $\frac{\sec \theta + \tan \theta - 1}{\tan \theta - \sec \theta + 1} = \frac{\cos \theta}{1 - \sin \theta}$
42. $\left(1 + \frac{1}{\tan^2 \theta} \right) \left(1 + \frac{1}{\cot^2 \theta} \right) = \frac{1}{\sin^2 \theta - \sin^4 \theta}$
43. $2(\sin^6 \theta + \cos^6 \theta) - 3(\sin^4 \theta + \cos^4 \theta) + 1 = 0$.
44. $(1 + \cot A + \tan A)(\sin A - \cos A) = \sin A \tan A - \cot A \cos A$.
45. If $\sin \theta + \cos \theta = m$ and $\sec \theta + \operatorname{cosec} \theta = n$ then show that $n(m^2 - 1) = 2m$
46. Find the value of :

$$\frac{\cot(90 - \theta) \tan \theta - \operatorname{cosec}(90 - \theta) \sec \theta}{\sin 12^\circ \cos 15^\circ \sec 78^\circ \operatorname{cosec} 75^\circ} + \frac{\cos^2(50 + \theta) \tan^2(40 - \theta)}{\tan 15^\circ \tan 37^\circ \tan 53^\circ \tan 75^\circ}$$

47. In given right triangle if base and perpendicular represents hardwork and success respectively and ratio between them is 1 : 1 then find $\angle AOB$. Which mathematical concepts has been used in the question? Which values are depicted here?



48. If timebound and continuity are two measurable quantities respectively equal to A & B. If $\sin(A - B) = \frac{1}{2}$, $\cos(A + B) = \frac{1}{2}$ whose $0 < A + B \leq 90^\circ$, find the values of A and B.
49. If $x = \sin^2 \theta$, $y = \cos^2 \theta$ where x and y represents honesty and hardwork.
- What will be the result after joining honesty and hardwork.
 - Which mathematical concept has been used here?
 - Which values are depicted here?

ANSWER

- | | | | |
|------------------|--------------------|--|----------------------------------|
| 1. 45° | 2. 30° | 3. 24° | 4. $\frac{625}{168}$ |
| 5. 7 | 6. $\frac{1}{3}$ | 7. a | 8. 0 |
| 9. $\frac{1}{5}$ | 10. 9 | 11. $\frac{\sqrt{1+\cos^2\theta}}{\cot\theta}$ | 12. 0° |
| 13. 50° | 14. $\tan^2\theta$ | 15. $\tan\theta$ | 20. $A = 45^\circ, B = 15^\circ$ |
| 21. 1 | 23. 22° | 24. $\frac{17}{8}$ | 25. 20° |
| 35. $\sqrt{3}$ | 37. -1 | 39. 2 | 46. 0 |
47. 45° Trigonometry, hardwork and success.
48. $A = 45^\circ, B = 15^\circ$ honesty, hardwork, co-operation
49. (a) 1; (b) Trigonometry; (c) Honesty and hardwork.

PRACTICE TEST

[Duration : 50 Minutes]

[M.M. : 20]

1. If $\sin \theta = \frac{4}{5}$ what is the value of $\cos \theta$. 1
2. Write the value of $\sin (45 + \theta) - \cos (45 - \theta)$ 1
3. If $5 \tan \theta = 4$ then find the value of $\frac{5 \sin \theta - 3 \cos \theta}{5 \sin \theta + 2 \cos \theta}$. 2
4. Find the value of $\tan 35^\circ \tan 40^\circ \tan 45^\circ \tan 50^\circ \tan 55^\circ$. 2
5. Prove that $\frac{\sin \theta}{1 + \cos \theta} + \frac{1 + \cos \theta}{\sin \theta} = 2 \operatorname{cosec} \theta$. 3
6. Prove that $\frac{\cos A}{1 - \tan A} - \frac{\sin^2 A}{\cos A - \sin A} = \sin A + \cos A$. 3
7. If $\tan (A + B) = \sqrt{3}$ and $\tan(A - B) = \frac{1}{\sqrt{3}}$ then find the value of x and y . 4
8. Prove that : $\frac{\tan \theta + \sec \theta - 1}{\tan \theta - \sec \theta + 1} = \frac{\cos \theta}{1 - \sin \theta}$. 4

CHAPTER 6

STATISTICS

KEY POINTS

- The mean for grouped data can be found by :

(i) The direct method $\bar{X} = \frac{\sum f_i x_i}{\sum f_i}$

- (ii) The assumed mean method

$$\bar{X} = a + \frac{\sum f_i d_i}{\sum f_i} \text{ where } d_i = x_i - a.$$

- (iii) The step deviation method

$$\bar{X} = a + \frac{\sum f_i u_i}{\sum f_i} \times h \text{ where } u_i = \frac{x_i - a}{h}$$

- The mode for the grouped data can be found by using the formula

$$\text{mode} = l + \left[\frac{f_1 - f_0}{2f_1 - f_0 - f_2} \right] \times h$$

l = lower unit of the modal class

f_1 = frequency of the modal class.

f_0 = frequency of the preceding class of the modal class.

f_2 = frequency of the succeeding class of the modal class

h = size of the class interval.

Modal class : Class interval with highest frequency.

- The median for the grouped data can be found by using the formula

$$\text{median} = l + \left(\frac{\frac{n}{2} - Cf}{f} \right) \times h$$

l = lower limit of the median class

n = number of observations

Cf = cumulative frequency of class interval preceeding the median class

f = frequency of median class

h = class size

- Cumulative frequency curve or an ogive
 - (i) Ogive is the graphical representation of the cumulative frequency distribution.
 - (ii) Less than type Ogive :
 - (a) Construct a cumulative frequency table.
 - (b) Mark the upper class limit on the x-axis.
 - (iii) More than type Ogive :
 - (a) Construct a frequency table.
 - (b) Mark the lower class limit on the x-axis.
 - (iv) To obtain the median of frequency distribution from the graph :
 - (a) Locate point of intersection of less than type Ogive and more than type Ogive
Draw a perpendicular from this point on x-axis.
 - (b) The point at which it cuts the x-axis gives the median.
- Mode = 3 median – 2 mean.

CHAPTER 6

STATISTICS

VERY SHORT ANSWER TYPE QUESTIONS

1. What is the mean of first 12 prime numbers?
2. The mean of 20 numbers is 18. If 2 is added to each number, what is the new mean?
3. The mean of 5 observations 3, 5, 7, x and 11 is 7, find the value of x.
4. What is the median of first 10 natural numbers?
5. What is the value of x, if the median of the following data is 27.5?
24, 25, 26, x + 2, x + 3, 30, 33, 37.
6. What is the mode of the observations 5, 7, 8, 5, 7, 6, 9, 5, 10, 6.
7. Write the relation between mean, median and mode.
8. What measure of the central tendency is represented by the abscissa of the point where 'less than' and 'more than' ogive intersect?
9. Which measure of the central tendency cannot be determined graphically.
10. The arithmetic mean and mode of a data are 24 and 12 respectively. Find the median.
11. Write the class mark of the class 19.5 – 29.5.
12. The mean of 5 numbers is 18. If one number is excluded then their mean is 16. Find the excluded number.

SHORT ANSWER TYPE (I) QUESTIONS

13. The mean of 11 observations is 50. If the mean of first six observations is 49 and that of last six observations is 52, then find sixth observation.
14. Find the mean of following distribution.

x	12	16	20	24	28	32
f	5	7	8	5	3	2

15. Find the median of the following distribution

x	10	12	14	16	18	20
f	3	5	6	4	4	3

16. Find the mode of the following frequency distribution.

Class	0-5	5-10	10-15	15-20	20-25	25-30
Frequency	2	7	18	10	8	5

17. Draw a 'less than' ogive of the following data

Marks	No. of Students
Less than 20	0
Less than 30	4
Less than 40	16
Less than 50	30
Less than 60	46
Less than 70	66
Less than 80	82
Less than 90	92
Less than 100	100

18. Write the following data into less than cumulative frequency distribution table.

Marks	0-10	10-20	20-30	30-40	40-50
No. of Students	7	9	6	8	10

SHORT ANSWER TYPE (II) QUESTIONS

19. Find the mean of the following data

C.I.	0-10	10-20	20-30	30-40	40-50
F	8	12	10	11	9

Class X - Maths

20. If the mean of the following distribution is 54, find the value of P.

Class	0-20	20-40	40-60	60-80	80-100
Frequency	7	P	10	9	13

21. Find the median of the following frequency distribution.

C.I.	0-10	10-20	20-30	30-40	40-50	50-60
F	5	3	10	6	4	2

22. The median of following frequency distribution is 24. Find the missing frequency x.

Age (in years)	0-10	10-20	20-30	30-40	40-50
No. of Persons	5	25	x	18	7

23. Find the median of the following data.

Marks	Below 10	Below 20	Below 30	Below 40	Below 50	Below 60
No. of students	0	12	20	28	33	40

24. Draw a 'more than type' ogive of the following data.

Weight (in kg.)	30-35	35-40	40-45	45-50	50-55	55-60
No. of Students	2	4	10	15	6	3

How is the overweight harmful for a person?

25. Find the mode of the following data.

Height (In cm)	Above 30	Above 40	Above 50	Above 60	Above 70	Above 80
No. of Plants	34	30	27	19	8	2

LONG ANSWER TYPE QUESTIONS

26. The mean of the following data is 53, find the value of f_1 and f_2 .

C.I.	0-20	20-40	40-60	60-80	80-100	Total
F	15	f_1	21	f_2	17	100

27. The mean of the following distribution is 57.6 and the sum of its frequencies is 50, find the missing frequencies f_1 and f_2 .

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	7	f_1	12	f_2	8	5

28. If the median of the distribution given below is 28.5, find the values of x and y .

C.I.	0-10	10-20	20-30	30-40	40-50	50-60	Total
F	5	8	x	15	y	5	60

29. The median of the following distribution is 35, find the value of a and b .

C.I.	0-10	10-20	20-30	30-40	40-50	50-60	60-70	Total
F	10	20	a	40	b	25	15	170

30. Find the mean, median and mode of the following data

C.I.	45-55	55-65	65-75	75-85	85-95	95-105	105-115
F	7	12	17	30	32	6	10

31. Find the mean, median and mode of the following data

C.I.	11-15	16-20	21-25	26-30	31-35	36-40	41-45	46-50
F	2	3	6	7	14	12	4	2

Class X - Maths

32. The rainfall recorded in a city for 60 days is given in the following table :

Rainfall (in cm)	0-10	10-20	20-30	30-40	40-50	50-60
No. of Days	16	10	8	15	5	6

Calculate the median rainfall using a more than type ogive. Why is water conservation necessary?

33. Find the mean of the following distribution by step-deviation method.

Daily Expenditure	100-150	150-200	200-250	250-300	300-350
No. of Households	4	5	12	2	2

34. The distribution given below shows the marks of 100 students of a class

Marks	No. of Students
0-5	4
5-10	6
10-15	10
15-20	10
20-25	25
25-30	22
30-35	18
35-40	5

Draw a less than type and a more than type ogive from the given data. Hence obtain the median marks from the graph.

35. The annual profit earned by 30 factories in an industrial area is given below. Draw both ogives for the data and hence find the median.

Profit (Rs. in Lakh)	No. of Factories
More than or equal to 5	30
More than or equal to 10	28
More than or equal to 15	16
More than or equal to 20	14
More than or equal to 25	10
More than or equal to 30	7
More than or equal to 35	3

36. If the mode of the given data is 340. Find the missing frequency x for the following data.

Class	0-100	100-200	200-300	300-400	400-500	500-600
Frequency	8	12	x	20	14	7

ANSWERS

1. 16.4 2. 20 3. 9 4. 3
5. $x = 25$ 6. 5 7. Mode = 3 median – 2 mean
8. Median 9. Mean 10. Median = 20 11. 24.5
12. 26 13. 56 14. 20 15. 14
16. 12.89
18. Marks No. of Students
- | | |
|--------------|----|
| Less than 10 | 7 |
| Less than 20 | 16 |
| Less than 30 | 22 |
| Less than 40 | 30 |
| Less than 50 | 40 |
19. 25.2 20. 11 21. 27 22. 25
23. 20 25. 63.75 26. $f_1 = 18, f_2 = 29$
27. $f_1 = 8, f_2 = 10$ 28. $x = 20, y = 7$ 29. $a = 35, b = 25$
30. Mean = 81.05, Median = 82, Mode = 85.71
31. Mean = 32, Median = 33, Mode = 34.38
32. Median = 25 33. Mean = 211 34. Median = 24 35. Median = 17.5
36. $x = 16$

PRACTICE TEST

[Duration : 50 Minutes]

[M.M. : 20]

1. What is the class mark of a class $a - b$. 1
2. Find the mean of all the even numbers between 11 and 21. 1
3. The mean of 50 observations is 20. If each observation is multiplied by 3, then what will be the new mean? 2
4. The mean of 10 observations is 15.3. If two observations 6 and 9 are replaced by 8 and 14 respectively. Find the new mean. 2
5. Find the mode :

Marks	less than 20	less than 40	less than 60	less than 80	less than 100
No. of Students	4	10	28	36	50

6. Find the missing frequency, if the mode is given to be 58.

Age (in Yrs).	20-30	30-40	40-50	50-60	60-70	70-80
No. of Patients	5	13	x	20	18	19

7. The mean of the following frequency distribution is 57.6 and the number of observations is 50. Find the missing frequencies f_1 and f_2 .

Class	0-20	20-40	40-60	60-80	80-100	100-120
Frequency	7	f_1	12	f_2	8	5

8. Following is the age distribution of cardiac patients admitted during a month in a hospital :

Age (in Yrs.)	20-30	30-40	40-50	50-60	60-70	70-80
No. of Patients	2	8	15	12	10	5

Draw a 'less than type' and 'more than type' ogives and from the curves, find the median.

GENERAL VALUES FOR VALUE BASED QUESTIONS

[Duration : 50 Minutes]

[M.M. : 20]

1. Honesty
2. Punctuality, Discipline
3. Humanity
4. Gender Equality
5. Eco Friendly / Environment Loving
6. Hard work
7. Logical Reasoning
8. knowledge
9. Love and care
10. Sportsmanship
11. Healthy Competition / Team Spirit
12. Ambition
13. Courage
14. Equality
15. Economic Value / Habit of Saving
16. Social Value
17. Religious value
18. Co-operation
19. Unity
20. Health Awareness

SUMMATIVE ASSESSMENT-I

SUBJECT : MATHEMATICS

CLASS : X

[Time : 3 Hrs.]

[M.M. : 90]

General Instruction :

- (i) All questions are compulsory.
 - (ii) The question paper consists of 31 questions divided into four sections A, B, C and D section A comprises of 4 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 11 questions 4 marks each.
 - (iii) There is no overall choice in this question paper.
 - (iv) Use of calculator is not permitted.
-

SECTION – A

Question number 1 to 4 carry one mark each.

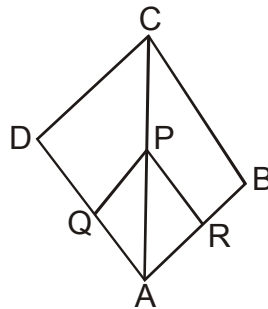
1. If $\triangle ABC \sim \triangle EDF$ then write relation between the sides.
2. What is the value of $\tan 1^\circ \tan 2^\circ \tan 3^\circ \dots \tan 89^\circ$?
3. If $\sin \alpha = \frac{1}{2}$, α is acute, then find value of $3 \cos \alpha - 4 \cos^2 \alpha$.
4. Write empirical relationship among Median, Mode and Mean of a data.

SECTION – B

Question numbers 5 to 10 carry two marks each.

5. If α, β are zeroes of the quadratic polynomial $x^2 - 6x + a$ find a if $3\alpha + 2\beta = 20$
6. Find LCM (306, 1314) if HCF (306, 1314) is equal to 18.
7. Solve for x and y.
$$47x + 31y = 63$$
$$31x + 47y = 15$$

8. In the given figure $PQ \parallel CD$ and $PR \parallel CB$, prove $\frac{AQ}{QD} = \frac{AR}{RB}$.



9. Find mean of the following data.

Marks	0-10	10-20	20-30	30-40	40-50
No. of Students	8	12	10	11	9

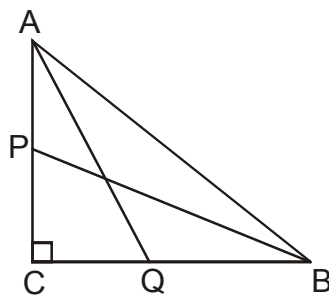
10. If $3 \cot A = 4$, find the value of

$$\frac{\operatorname{cosec}^2 A + 1}{\operatorname{cosec}^2 A - 1}$$

SECTION – C

Question Numbers 11 to 20 carry three marks each.

11. Use Euclid's division algorithm to find HCF of 10224 and 9648.
12. In the given figure, P and Q are mid point of the sides CA and CB respectively of $\triangle ABC$ right angled at C Prove $4(AQ^2 + BP^2) = 5AB^2$.



13. Find values of a and b for which the system of linear Equations has infinite number of solutions :
- $$(a + b)x - 2by = 5a + 2b + 1$$
- $$3x - y = 14$$
14. Compute f_1 and f_2 if mean of the following distribution is 62.8 :-

Class Interval	0-20	20-40	40-60	60-80	80-100	100-120	Total
Frequency	5	f_1	10	f_2	7	8	50

15. Evaluate

$$\frac{2 \cos 58^\circ}{\sin 32^\circ} - \frac{\cos 38^\circ \operatorname{cosec} 52^\circ}{\tan 18^\circ \tan 35^\circ \tan^2 60^\circ \tan 72^\circ \tan 55^\circ}$$

16. Find K if $x^2 + 2x + k$ is a factor of

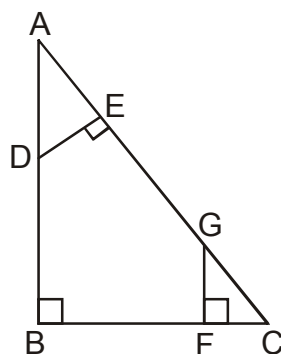
$$2x^4 + x^3 - 14x^2 + 5x + 6$$

17. Find median of the given data

Marks	0-20	20-40	40-60	60-80
Frequency	15	6	18	10

18. Prove $\sqrt{3} + \sqrt{5}$ is irrational.

19. In the adjoining figure $AB \perp BC$, $DE \perp AC$ and $GF \perp BC$. Prove $\triangle ADE \sim \triangle GCF$.



20. Nine times a two digit number is the same as twice the number obtained by interchanging the digits of the number. If one digit of the number exceeds the other digit by 7, find the number.

SECTION – D

Question numbers 21 to 31 carry four marks each.

21. Obtain all the zeroes of $3x^4 + 6x^3 - 2x^2 - 10x - 5$ if two zeros are $\sqrt{\frac{5}{3}}$ and $-\sqrt{\frac{5}{3}}$.

22. Draw the graph of $x - y + 1 = 0$, $3x + 2y - 12 = 0$ and show that there is a unique solution. Calculate the area bounded by these lines and y-axis.

23. Prove that if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

Class X - Maths

24. If $x = \tan A + \sin A$, $y = \tan A - \sin A$ then prove that

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

25. Prove that

$$(\cot A + \sec B)^2 - (\tan B - \operatorname{cosec} A)^2 = 2(\cot A \sec B + \tan B \cdot \operatorname{cosec} A)$$

26. Daily pocket expenses (in Rs.) of 80 students of a school are given below.

Pocket Expenses in Rs.	0-5	5-10	10-15	15-20	20-25	25-30	30-35
No. of students	5	15	20	10	10	15	5

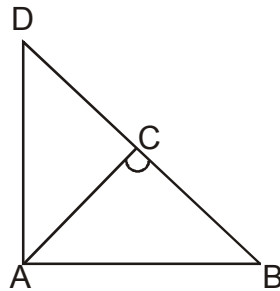
(i) Convert the above distribution into 'More than type'.

(ii) Draw its ogive.

27. Find the mode of the following frequency distribution

Class Interval	10-20	20-30	30-40	40-50	50-60	60-70	70-80
Frequency	4	8	10	12	10	4	2

28. In the adjoining figure, ABD is a triangle in which $\angle DAB = 90^\circ$ and $AC \perp BD$. Prove that $AB^2 = BC \times BD$.



29. Find the largest positive integer that will divide 122, 150 and 115 leaving remainder 5, 7, 11 respectively.

30. Scooter charges consist of fixed charges and remaining depending upon the distance travelled in km. If a person travels 10 km, he pays Rs. 65 and for travelling 16 km he pays Rs. 95. Find the total cost if he travels 20 km.

31. Prove

$$\frac{\tan A + \sec A - 1}{\tan A - \sec A + 1} = \frac{1 + \sin A}{\cos A}$$

ANSWER KEY

1. $\frac{AB}{ED} = \frac{BC}{DF} = \frac{AC}{EF}$ 2. 1 3. $3\left(\frac{\sqrt{3}}{2} - 1\right)$
4. Mode = 3 Median – 2 mean 5. $a = -16$ 6. 22338
7. $x = 2, y = -1$ 8. Prove it 9. 25.2 10. $\frac{17}{8}$
11. 144 12. Prove it 13. $a = -5, b = -1$ 14. $f_1 = 18, f_2 = 12$
15. $\frac{5}{3}$ 16. $k = -3$ 17. 43.88 18. Prove it
19. Prove it 20. 18 21. $-1, -1$
22. Unique solution $x = 2, y = 3$, Area = 5 sq. units.
23. Prove it 24. Prove it 25. Prove it
26. (i) More than Series

<i>Pocket Expenses (in Rs.)</i>	<i>No. of Students</i>
More than 0	80
More than 5	75
More than 10	60
More than 15	40
More than 20	30
More than 25	20
More than 30	5

- (ii) Draw ogive.
27. 45 28. Prove
29. Largest positive integer is 13
30. Rs. 115 31. Prove

MODEL PAPER - I

SUMMATIVE ASSESSMENT-I

SUBJECT : MATHEMATICS

CLASS : X

[Time : 3 Hrs.]

[M.M. : 90]

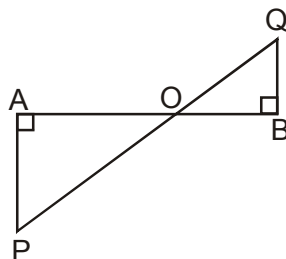
General Instruction :

- (i) All questions are compulsory.
 - (ii) The question paper consists of 31 questions divided into four sections A, B, C and D. Section 'A' comprises of 4 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 11 questions of 4 marks each.
 - (iii) There is no overall choice in this question paper.
 - (iv) Use of calculator is not permitted.
-

SECTION – A

Question number 1 to 4 carry one mark each.

1. In the given figure, if $\angle A = 90^\circ$, $\angle B = 90^\circ$, $AO = 6$ cm, $OB = 4.5$ cm and $AP = 4$ cm, then find QB .



2. Find the value of $\sin^2 41^\circ + \sin^2 49^\circ$
3. If A and B are acute angles and $\operatorname{cosec} A = \sec B$, then find the value of $A + B$.
4. In the following frequency distribution, find the median class.

Height (in cm)	140-145	145-150	150-155	155-160	160-165	165-170
Frequency	5	15	25	30	15	10

SECTION – B

Question number 5 to 10 carry two marks each.

5. Explain whether $3 \times 12 \times 101 + 4$ is a prime number or a composite number.
6. Find the prime factorisation of the denominator of the rational number equivalent to 8.39.
7. Divide the polynomial $f(x) = x^3 - 4x + 6$ by the polynomial $g(x) = 2 - x^2$, and find the quotient and the remainder.
8. In an equilateral triangle of side 24 cm, find the length of the altitude.
9. Find the value of Q, if

$$\frac{\cos \theta}{1 - \sin \theta} + \frac{\cos \theta}{1 + \sin \theta} = 4; \quad \theta \leq 90^\circ.$$

10. Find the mean of the following distribution :

Class Interval	0-6	6-12	12-18	18-24	24-30
Frequency	5	4	1	6	4.

SECTION – C

Question Number 11 to 20 carry three marks each.

11. Show that number 8^{th} can never end with digit 0 for any natural number n.
12. Determine graphically whether the following pair of linear equation.
 $3x - y = 7$
 $2x + 5y + 1 = 0$ has
 - (i) a unique solution
 - (ii) infinitely many solutions or
 - (iii) no solution.
13. Quadratic polynomial $2x^2 - 3x + 1$ has zeroes as a and b. Now form a quadratic polynomial whose zeroes are $3a$ and $3b$.
14. If zeroes of the polynomial $x^2 + 4x + 2$ are a and $\frac{2}{\alpha}$, then find the value of a.

Class X - Maths

15. From an airport, two aeroplanes start at the same time. If speed of first aeroplane due North is 500 km/hr and that of other due East is 650 km/hr, then find the distance between the two aeroplanes after 2 hours.
16. In $\triangle ABC$, $DE \parallel BC$. If $AD = x + 2$, $DB = 3x + 16$, $AE = x$ and $EC = 3x + 5$, then find x .
17. If $\cos(40^\circ + x) = \sin 30^\circ$, find the value of x .
18. When is an equation called an 'identity'? Prove that trigonometric identity $1 + \tan^2 A = \sec^2 A$.
19. A group of students conducted a survey of their locality to collect the data regarding number of plants and recorded it in the following table :

No. of Plants	0-3	3-6	6-9	9-12	12-15
No. of Hours	2	4	5	1	2

Find the mode for the above data.

20. Find the median of the following data :

Height (in cm)	Less than 120	Less than 140	Less than 160	Less than 180	Less than 200
No. of Students	12	26	34	40	50

SECTION – D

Question numbers 21 to 31 carry four marks each.

21. Find the HCF of 256 and 36 using Euclid's Division algorithm. Also, find their LCM and Verify that $HCF \times LCM = \text{Product of the two number}$.
22. Raghav scored 70 marks in a test, getting 4 marks for each correct answer and losing 1 mark for each wrong answer. Had 5 Marks been awarded for each correct answer and 2 marks been deducted for each wrong answer, then Raghav would have scored 80 marks. How many questions were there in the test? Which values would have Raghav violated if he resorted to unfair means ?
23. Obtain all other zeroes of the polynomial $x^4 + 6x^3 + x^2 - 24x - 20$, if two of its zeroes are 2 and -5 .
24. Solve graphically the pair of linear equations :
 $3x - 4y + 3 = 0$ and $3x + 4y - 21 = 0$
Find the coordinates of the vertices of the triangular region formed by these lines and x-axis. Also, calculate the area of this triangle.

25. In $\triangle ABC$, $AD \perp BC$ and Point D lies on BC such that $2DB = 3CD$. Prove that $5AB^2 = 5AC^2 + BC^2$.
26. Prove that the diagonals of a trapezium intersect each other in the same ratio.
27. Prove that : $(\cot A + \sec B)^2 - (\tan B - \operatorname{cosec} A)^2 = 2(\cot A \sec B + \tan B \operatorname{cosec} A)$.
28. If $\cos(A + B) = 0$ and $\cot(A - B) = \sqrt{3}$, find the value of
 (i) $\sec A \tan B - \cot A \sin B$
 (ii) $\operatorname{cosec} A \cot B + \sin A \tan B$.
29. If $x = \tan A + \sin A$ and $y = \tan A - \sin A$
 Prove that : $\left(\frac{x+y}{x-y}\right)^2 - \left(\frac{x+y}{2}\right)^2 = 1$.
30. The following distribution given the distribution of life times of washing machines of a certain company.

Life time (in hrs.)	1000-1200	1200-1400	1400-1600	1600-1800	1800-2000	2000-2200	2200-2400
No. of Washing Machines	15	60	68	86	75	61	45

Convert the above distribution into 'less than type' and draw its ogive.

31. On the Sports day of a school, 300 students participated. Their ages are given in the following distribution :

Age (in yrs.)	5-7	7-9	9-11	11-13	13-15	15-17	17-19
No. of Students	67	33	41	95	36	13	15

Find the mean and mode of the data.

ANSWER KEY

1. BQ = 3 cm
2. 1
3. $A + B = 90^\circ$
4. Median class = 155–160
5. Composite Number
6. Prime factors of 100 = $2^2 \times 5^2$
7. $Q = -x$, $R = -2x + 6$
8. AD = $12\sqrt{3}$ cm
9. $Q = 60^\circ$
10. $\bar{x} = 15$
12. intersecting at (2, -1), unique solution
13. $x^2 - \frac{9}{2}x + \frac{9}{2}$
14. $a = 1$,
15. $100\sqrt{269}$ km
16. $x = 2$
17. $x = 20^\circ$
19. Mode = 6.6
20. Median = 138.6 cm
21. HCF = 4, LCM = 2304
22. Total No. of questions = 30, Honesty, done injustice to his own soul.
23. zeroes are - 2 and - 1
24. Vertices (-1, 0), (3, 3) and (7, 0) Area of $\Delta = 12$ sq. units.
25. (i) $\frac{\sqrt{3}}{2}$ (ii) $\frac{5}{2}$
26. Mean = 10.66; Mode = 11.96