

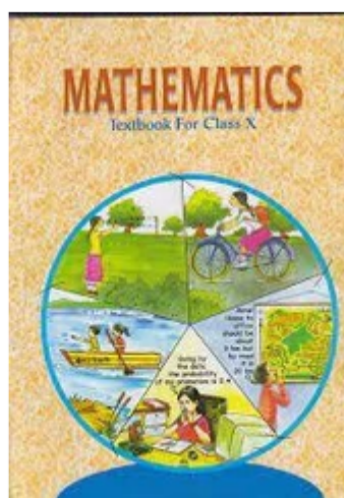
KENDRIYA VIDYALAYA SANGATHAN



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CLASS 10
MATHEMATICS
2025 - 26

MINIMUM LEVEL
OF LEARNING



ZONAL INSTITUTE OF EDUCATION AND TRAINING
MYSURU

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CLASS X (2025-26)

FORMULAE

1. REAL NUMBERS

HCF = Take the least power of common factors only

LCM = Take the highest power of each prime factor

$\text{HCF} \times \text{LCM} = 1^{\text{st}} \text{ number} \times 2^{\text{nd}} \text{ number}$,

2. POLYNOMIALS

Quadratic polynomial: $p(x) = ax^2 + bx + c$ has two zeroes α and β then

$$\alpha + \beta = \frac{-b}{a} \quad \text{and} \quad \alpha\beta = \frac{c}{a}$$

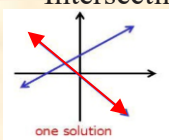
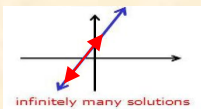
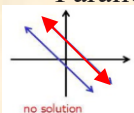
Formation of quadratic polynomial: $p(x) = [x^2 - (\alpha + \beta)x + \alpha\beta]$
OR

$$P(x) = x^2 - (\text{sum of zeroes})x + (\text{product of zeroes})$$

3. Linear equation in two variables

The pair of linear equations are $a_1x + b_1y + c_1 = 0$

and $a_2x + b_2y + c_2 = 0$

Ratio comparison	Graphical representation	Algebraic interpretation	Consistent/ Inconsistent
$\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$	Intersecting lines  one solution	Exactly one solution (unique)	consistent
$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$	Coinciding lines  infinitely many solutions	Infinite solution	dependent (consistent)
$\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$	Parallel lines  no solution	no solution	Inconsistent

4. Quadratic equations

Solving a Quadratic Equation by Formula:

The real roots of the Quadratic Equation $ax^2 + bx + c = 0$ are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

For nature of the roots: Discriminant $D = b^2 - 4ac$

If i) $D > 0$, Real and distinct

ii) $D = 0$, Real and Equal

iii) $D < 0$, no real roots(imaginary roots)

5. Arithmetic progression

n^{th} term of an A.P.

$$a_n = a + (n-1)d$$

n^{th} term from the end of an A.P. is given by

$$a_n = \underline{\underline{l}} - (n-1)d$$

sum of n terms of an A.P

$$S_n = \frac{n}{2} [2a + (n-1)d] \quad (\text{OR})$$

$$s_n = \frac{n}{2} [a + \ell]$$

6. Coordinate Geometry

Distance formula

$$D = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

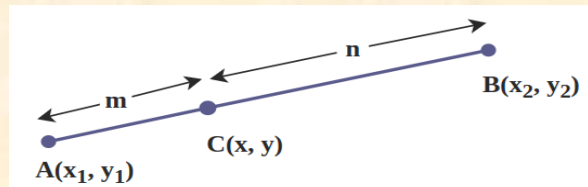
Distance of a point p(x,y) from origin.

Since coordinate of origin is (0,0), Then by applying distance formula,

$$\text{distance from } P(x,y) \text{ is } OP = \sqrt{x^2 + y^2}$$

Section formula

$$P(x, y) = \left(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n} \right)$$



mid-point formula

$$P(x, y) = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

Any point of x-axis (x,0) , Any point of y-axis (0,y)

7. Introduction to trigonometry

Trigonometric Ratios

θ	0°	30°	45°	60°	90°
$\sin \theta$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$\cos \theta$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0
$\tan \theta$	0	$\frac{\sqrt{3}}{3}$	1	$\sqrt{3}$	undef.

Reciprocals

$$1) \operatorname{cosec} \theta = \frac{1}{\sin \theta} \quad 2) \sec \theta = \frac{1}{\cos \theta} \quad 3) \cot \theta = \frac{1}{\tan \theta}$$

Identities

$$\begin{array}{lll} 1) \sin^2 \theta + \cos^2 \theta = 1 & 2) \sec^2 \theta - \tan^2 \theta = 1 & 3) \operatorname{Cosec}^2 \theta - \cot^2 \theta = 1 \\ 1 - \sin^2 \theta = \cos^2 \theta & \sec^2 \theta - 1 = \tan^2 \theta & \operatorname{Cosec}^2 \theta - 1 = \cot^2 \theta \\ 1 - \cos^2 \theta = \sin^2 \theta & 1 + \tan^2 \theta = \sec^2 \theta & 1 + \cot^2 \theta = \operatorname{Cosec}^2 \theta \end{array}$$

8. Area related to circle

$$\text{Area of the sector} = \frac{\theta}{360} \times \pi r^2$$

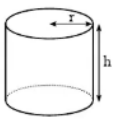
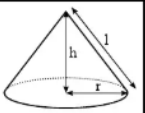
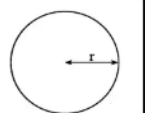
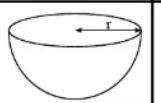
$$\text{length of the arc} = \frac{\theta}{360} \times 2\pi r$$

$$\text{Area of segment} = \text{Area of sector} - \text{Area of triangle}$$

$$\text{Area of segment with central angle } 60^\circ \text{ or } 120^\circ = \frac{\theta}{360} \times \pi r^2 - \frac{\sqrt{3}}{4} \times r^2$$

$$\text{Area of segment with central angle } 90^\circ = \frac{\theta}{360} \times \pi r^2 - \frac{1}{2} \times r^2$$

Surface areas and volumes

	Solid	Curved Surface Area	Total Surface Area	Volume
Cylinder		$2\pi rh$	$2\pi rh + 2\pi r^2$	$\pi r^2 h$
Cone		πrl	$\pi rl + \pi r^2$	$\frac{1}{3}\pi r^2 h$
Sphere		$4\pi r^2$	$4\pi r^2$	$\frac{4}{3}\pi r^3$
Hemisphere		$2\pi r^2$	$3\pi r^2$	$\frac{2}{3}\pi r^3$

8. Statistics

1. Class Mark is the Mid-Point of the Class Interval . $\left(\frac{\text{Upper Class Limit} + \text{Lower Class Limit}}{2}\right)$

2. Mean of Grouped Data :

i Mean for ungrouped data = $\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$

ii Mean by Assumed Mean Method : $\bar{x} = a + \frac{\sum f_i d_i}{\sum f_i}$; a = Assumed Mean ; $d_i = x_i - a$

3. Mean by Step Deviation Method : $\bar{x} = a + \left[\frac{\sum f_i u_i}{\sum f_i}\right] (h)$, $u_i = (x_i - a) / h$

Median of grouped data

$$\text{Median} = l + \frac{\left(\frac{n}{2} - \text{c.f.}\right)}{f} \times h$$

Where l = lower limit of median class

f = frequency of the median class

c.f. = cum. freq. preceeding to the median class

Mode of Grouped Data :

$$\text{Mode} = l + \left[\left(\frac{f_1 - f_0}{2f_1 - f_0 - f_2}\right) \times h\right] \quad l = \text{lower limit of modal class .}$$

(Modal class is the one with highest frequency)

f_1 = frequency of the modal class f_0 = frequency of the preceeding class

f_2 = frequency of the succeeding class h = size of the modal class

Empirical formula

$$\text{Mode} = 3(\text{median}) - 2(\text{mean})$$

Probability

$$\text{probability of any event } p(E) = \frac{\text{no. of favourable outcomes}}{\text{Total no. of outcomes}}$$

$$p(E) + P(\text{not}E) = 1$$

$$\text{Range : } 0 \leq p(E) \leq 1$$

The sum of the probabilities of all elementaries events is 1.

CHAPTER – 1

REAL NUMBERS

1. Find the HCF and LCM of 6, 72 and 120, using the prime factorisation method.
2. Find the HCF of 96 and 404 by the prime factorisation method. Hence, find their LCM.
3. Find the LCM and HCF of the following pairs of integers and verify that $\text{LCM} \times \text{HCF} = \text{product of the two numbers}$: (i) 26 and 91 (ii) 336 and 54
4. Find the LCM and HCF of the following integers by applying the prime factorisation method: (i) 12, 15 and 21 (ii) 17, 23 and 29 (iii) 8, 9 and 25
5. Explain why $3 \times 5 \times 7 + 7$ is a composite number.
6. Can the number 6^n , n being a natural number, end with the digit 5? Give reasons.
7. Given that $\text{HCF}(306, 657) = 9$, find $\text{LCM}(306, 657)$.
8. If two positive integers a and b are written as $a = x^3y^2$ and $b = xy^3$; x, y are prime numbers, then find the LCM and HCF of a and b .
9. Find the largest number which divides 245 and 1029 leaving remainder 5 in each case.
10. Find the largest number which divides 2053 and 967 and leaves a remainder of 5 and 7 respectively.
11. Two tankers contain 850 litres and 680 litres of kerosene oil respectively. Find the maximum capacity of a container which can measure the kerosene oil of both the tankers when used an exact number of times.
12. In a morning walk, three persons step off together. Their steps measure 80 cm, 85 cm and 90 cm respectively. What is the minimum distance each should walk so that all can cover the same distance in complete steps?
13. Find the least number which when divided by 12, 16, 24 and 36 leaves a remainder 7 in each case.
14. The length, breadth and height of a room are 825 cm, 675 cm and 450 cm respectively. Find the longest tape which can measure the three dimensions of the room exactly.
15. Prove the following numbers are irrationals

(i) $\sqrt{2}$ (ii) $\sqrt{3}$ (iii) $2 + 5\sqrt{2}$ (iv) $5 - 2\sqrt{3}$ (v) $\frac{7}{\sqrt{3}}$ (vi) $\sqrt{3} + \sqrt{2}$

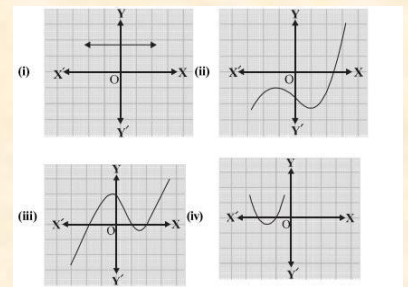
(vii) $\sqrt{5} - \sqrt{2}$

CHAPTER - 2

POLYNOMIALS

1. The zero of the linear polynomial $px + q$ is
(a) $-\frac{p}{q}$ (b) $-\frac{q}{p}$ (c) 0 (d) 1
2. If one zero of the quadratic polynomial $x^2 + 3x + k$ is 2, then the value of k is
(a) 10 (b) -10 (c) 5 (d) -5
3. A polynomial of degree n has
(a) only one zero (b) at least n zeroes (c) at most n zeroes (d) more than n zeroes
4. A quadratic polynomial whose zeroes are -2 and 5 is

- (a) $x^2 - x + 12$ (b) $x^2 - 3x - 10$ (c) $2x^2 + 2x - 24$ (d) $x^2 + 3x - 10$
5. If α and $\frac{1}{\alpha}$ are the zeroes of the polynomial $ax^2 + bx + c$, then the value of 'c' is
 (a) 0 (b) a (c) -a (d) 1
6. If α and β are the zeroes of a quadratic polynomial $2x^2 - 3x + 5$ then find $\frac{1}{\alpha} + \frac{1}{\beta}$
7. If the sum and product of zeroes of a quadratic polynomial are 5 and -6, then find the polynomial.
8. Factorize : $x^2 - 7x + 12$.
9. What should be added from the polynomial $x^2 - 5x + 4$, so that 3 is the zero of the resulting polynomial?
10. If a and b are the zeroes of the polynomial $p(x) = kx^2 - 30x + 45k$ and $a + b = ab$, then find the value of k
11. If α and β are the zeroes of the polynomial $ax^2 + bx + c$, then find $\alpha^2 + \beta^2$.
12. Find the zeroes of the quadratic polynomial $x^2 + 5x + 6$ and verify the relationship between the zeroes and the co-efficients
13. Graphs of $y = p(x)$ are given in the figure below, for some polynomials $p(x)$. Find the number of zeroes of $p(x)$.
14. Number of polynomials can be written with the zeroes 2 and 3
15. Find the zeroes of $x^2 - 5x + 6$ and name the graph obtained for this polynomial.



CHAPTER - 3

LINEAR EQUATIONS IN TWO VARIABLES

- Solve the following system of equations for x and y : $\frac{x}{2} + \frac{2y}{3} = -1$ and $x - \frac{y}{3} = 3$
- Solve the following system of equations graphically: $x + 3y = 6$; $2x - 3y = 12$
- x and y are complementary angles such that $x : y = 1 : 2$. Express the given information as a system of linear equations in two variables and hence solve it.
- If (0, 0) is the solution of the equation $x + y = c - 1$, then find the value of c
- Find the value of c for which the following pair of linear equations has infinitely many solutions : $cx + 3y = c - 3$, $12x + cy = c$
- Solve for x and y : $3x + 2y = 65$ $2x + 3y = 60$
- Solve graphically the following pair of linear equations: $2x - y = 2$ and $4x - y = 4$ Also, write the coordinates of the points where the lines represented by these equations cut the y-axis.
- An academy offering cricket coaching bought 10 bats and 5 balls for Rs.32,500. Later, the academy bought 2 bats and 8 balls for Rs. 10,000. If there is no change in the cost of the bat and of the ball, find the cost of 1 bat and 1 ball.
- For what value(s) of k does the system of equations $kx + 2y = 3$ and $2x + y = 5$ have a unique solution ?
- Solve the following system of equations graphically: $2x - 3y = -6$ and $x = 3$
- If the lines given by $2x + ky = 1$ and $3x - 5y = 7$ are parallel, then find the value of 'k'
- If (6, k) is a solution of the equation $3x + y - 22 = 0$, then find the value of k .
- The sum of the digits of a two digit number is 9. If 27 is added to it, the digits of the number get reversed. Find the number.
- Check whether $x = 2$ and $y = 5$ are the solutions of $2x + 5y = 13$.
- Solve graphically $x + 4y = 10$, $y - 2 = 0$.
- The father's age is six times his son's age. Four years hence, the age of the father will be four times his son's age. Find their present ages.

CHAPTER - 4

QUADRATIC EQUATIONS

1. If one root of the quadratic equation $6x^2 - x - k = 0$ is 2, then find the value of k .
2. If $x = -1$, is a solution of the quadratic equation $3x^2 + 2kx - 3 = 0$, find the value of k .
3. Find the roots of the quadratic equation $\sqrt{2}x^2 + 7x + 5\sqrt{2} = 0$.
4. If the quadratic equation $px^2 - 2px + 15 = 0$ has two equal roots, then find the value of p .
5. If the sum of two natural numbers is 8 and their product is 15, find the numbers
6. Solve for x : $\sqrt{3}x^2 + 10x - 8\sqrt{3} = 0$.
7. Solve for x : $\sqrt{3}x^2 - 2\sqrt{2}x - 2\sqrt{3} = 0$
8. The sum of two numbers is 9 and the sum of their reciprocals is $\frac{1}{2}$. Find the numbers.
9. A motor boat whose speed is 20 km/h in still water, takes 1 hour more to go 48 km upstream than to return downstream to the same spot. Find the speed of the stream.
10. Find the consecutive natural numbers, the sum of whose squares is 145.
11. Find the nature of roots of the equation $3x^2 + 2x - 3 = 0$
12. For what Value of k for which $x = 2$ is a solution of the equation $5x^2 - 4x + (2+k) = 0$

CHAPTER - 5

ARITHMETIC PROGRESSION

1. An AP is 72 and the sum of 7th and 12th terms is 97. Find the AP. A woman borrowed 10,00,000 from her friend and promised to return the borrowed money in monthly instalments beginning from the next month. After one month, she returned 10,000, the next month she returned 15,000, the third month she returned 20,000 and so on, thereby increasing the monthly instalment uniformly

Based on the above information, answer the following questions :

- (i) Find the amount of instalment paid in the tenth month.
- (ii) In which instalment did she pay Rs.40000
- (iii) (a) If she returned Rs 11,50,000 in all, how many instalments did she pay ?

OR

- (b) By which instalment has she returned a total amount of 3,25,000 ?
2. Find the 10th term of the AP : 2, 7, 12, ...
 3. Which term of the AP : 21, 18, 15, ... is -81 ?
 4. Which term of the AP : 3, 8, 13, 18, ... is 78?
 5. How many two-digit numbers are divisible by 3?
 6. How many three-digit numbers are divisible by 7?
 7. How many multiples of 4 lie between 10 and 250?
 8. Find the 31st term of an AP whose 11th term is 38 and the 16th term is 73.
 9. An AP consists of 50 terms of which 3rd term is 12 and the last term is 106. Find the 29th term.
 10. If the 3rd and the 9th terms of an AP are 4 and -8 respectively, which term of this AP is zero?

11. Which term of the AP : 3, 15, 27, 39, ... will be 132 more than its 54th term?
12. Determine the AP whose third term is 16 and the 7th term exceeds the 5th term by 12
13. The sum of 4th term and 8th term of an AP is 24 and the sum of 6th and 10th terms is 44. Find the AP.
14. The sum of 5th term and 9th term of
15. If the numbers $n - 2$, $4n - 1$ and $5n + 2$ are in AP, find the value of n .

CHAPTER - 6

TRIANGLES

1. If in $\triangle ABC$ and $\triangle PQR$, we have $\frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP}$ then:

a) $\triangle PQR \sim \triangle CAB$ b) $\triangle PQR \sim \triangle ABC$ c) $\triangle CBA \sim \triangle PQR$ d) $\triangle BCA \sim \triangle PQR$

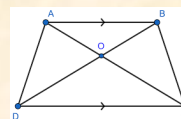
2. Which of the following is NOT a similarity criterion?

a) AA b) SAS c) AAA d) RHS

3. In trapezium ABCD, $AB \parallel CD$, $AB = 3$ cm. The diagonals AC and BD intersect at O

such that $\frac{AO}{CO} = \frac{BO}{DO} = \frac{1}{2}$, then, $CD =$ _____ cm.

(a) 3 (b) 4 (c) 5 (d) 6



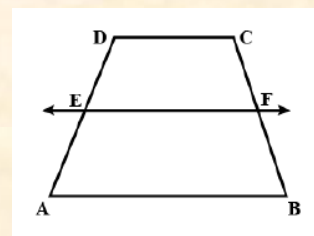
4. Two equilateral triangles are:

(a) Always congruent (b) Never similar (c) Always similar (d) Sometimes similar

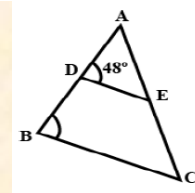
5. In triangle ABC, DE is drawn parallel to BC, intersecting AB and AC at D and E respectively. Then triangle ADE is similar to:

(a) Triangle DBC (b) Triangle ABC
(c) Triangle EBC (d) Triangle BCA

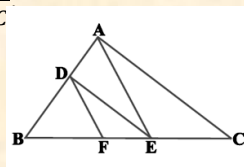
6. In the given figure, if ABCD is a trapezium in which $AB \parallel CD \parallel EF$, then prove that $\frac{AE}{ED} = \frac{BF}{FC}$.



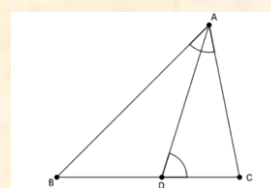
7. In figure, if $AD = 6$ cm, $DB = 9$ cm, $AE = 8$ cm and $EC = 12$ cm and $\angle ADE = 48^\circ$. Find $\angle ABC$.



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



9. BPT: 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.



10. D is a point on the side BC of a triangle ABC such that $\angle ADC = \angle BAC$, prove that $CA^2 = CB \cdot CD$.

CHAPTER - 7

COORDINATE GEOMETRY

1. Find the distance between the given pairs of points (a, b) , $(-a, -b)$
2. Find the length of all the sides of a triangle whose vertices are $A(1, -1)$, $B(-4, 6)$ and $C(-3, -5)$.
3. Find the coordinates of a point A, where AB is the diameter of a circle whose centre is $(2, -3)$ and B is $(1, 4)$.
4. Find the coordinates of the point which divides the join of $(-1, 7)$ and $(4, -3)$ in the ratio $2 : 3$
5. Find the point on the x-axis which is equidistant from $(2, -5)$ and $(-2, 9)$.
6. Find a relation between x and y such that the point (x, y) is equidistant from the point $(3, 6)$ and $(-3, 4)$.
7. Show that the points $(1, 7)$, $(4, 2)$, $(-1, -1)$ and $(-4, 4)$ are the vertices of a square.
8. Find the ratio in which the line segment joining $A(1, -5)$ and $B(-4, 5)$ is divided by the x-axis. Also find the coordinates of the point of division.
9. If $A(-2, 1)$, $B(a, 0)$, $C(4, b)$ and $D(1, 2)$ are the vertices of a parallelogram ABCD, find the values of a and b .
10. Find the coordinates of the point Q which divides the line segment A(3, 4) and B(-2, 5) such that $\frac{AQ}{AB} = \frac{3}{5}$.

CHAPTER - 8

TRIGONOMETRY

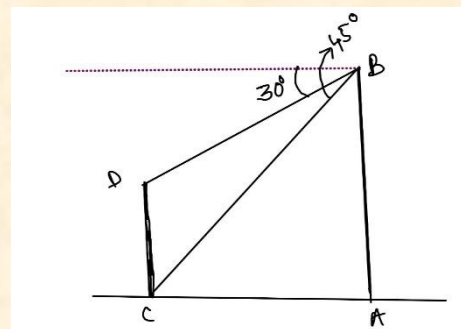
1. Find the value of $3 \sin 30^\circ - 4 \sin 60^\circ$.
2. Prove that $\cot A + \tan A = \sec A \operatorname{cosec} A$ (Proof)
3. Find the value of $\tan 60^\circ \cot 30^\circ + \tan 30^\circ \cot 60^\circ$
4. Find all the trigonometric ratios, if $\tan =$
5. If $\tan(A+B) =$ and $\tan(A-B) =$; $0^\circ < A+B \leq 90^\circ$; $A > B$, find A and B.
6. Prove that $(\sin A + \operatorname{cosec} A)^2 + (\cos A + \sec A)^2 = 7 + \tan^2 A + \cot^2 A$
7. $= \operatorname{cosec} A + \cot A$, Using the identity $\operatorname{cosec}^2 A = 1 + \cot^2 A$
8. Prove that
9. If $\tan 3 = 1$ Find the value of .
10. If then find the ratio of x:y

CHAPTER - 9

SOME APPLICATIONS OF TRIGONOMETRY

1. Glory is standing on the terrace of a 50-meter high building that observes the top and the bottom of a nearby tower. The angle of depression to the top of the tower is 30° , and the angle of depression to the foot of the tower is 45° . Assume both the building and the tower stand on the same horizontal ground.

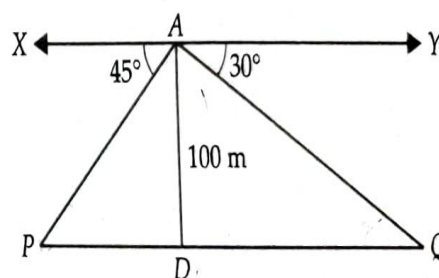
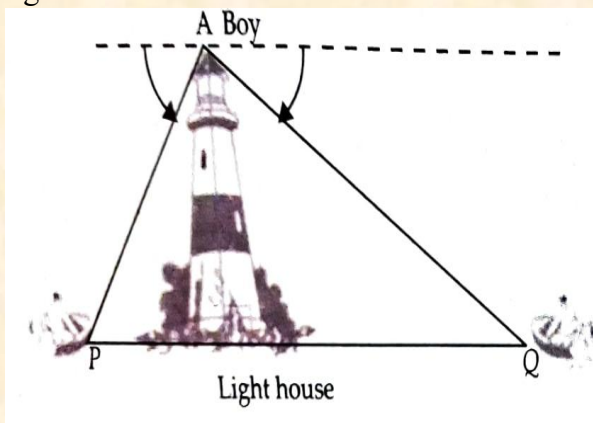
- (i) How high is the portion of the tower that lies above the top of the building?
(ii) Write an expression for the horizontal distance between the building and the tower using the angle of depression to the bottom of the tower.
(iii) Using the given information, calculate the total height of the tower.



(OR)

Prove that the tower is taller than the building, and find by how many meters it is taller.

2. Aryan is standing in a park and notices the top of a tall tree at an angle of elevation of 30° . He walks 50 meters closer to the tree, and now the angle of elevation becomes 60° . The man's eye level remains constant throughout the observation, and the tree is standing vertically on level ground. Write an expression for the height of the tree in terms of initial distance. Write a second expression using the new distance after walking forward. Find the man's initial distance from the tree.
3. Surya is standing on the top of the lighthouse. He observed that boat P and boat Q were approaching the lighthouse from opposite directions. He finds that the angle of depression of boat P is 45° and angle of depression of boat Q is 30° . He also knows that the height of the lighthouse is 100 meters.



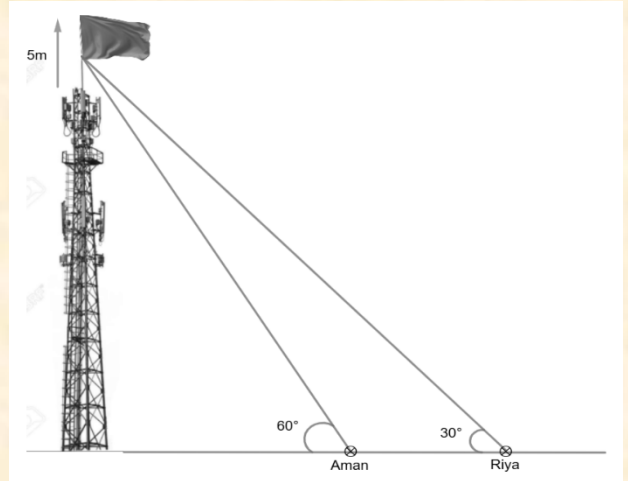
What is the measure of $\angle APD$?

- (ii) If $\angle YAQ = 30^\circ$, then $\angle AQD$ is also 30° . Why?
(iii) How far is the boat P from the lighthouse?

(OR)

How far is the boat Q from the lighthouse?

4. Two friends, Aman and Riya, are standing on level ground at different distances from a tower on top of which a flag is hoisted. Aman, who is closer to the tower, observes the top of the flag at an angle of elevation of 60° , while Riya, farther away, observes it at an angle of 30° . The height of the flag alone is 5 meters, and both friends' eye levels are at the same horizontal plane.



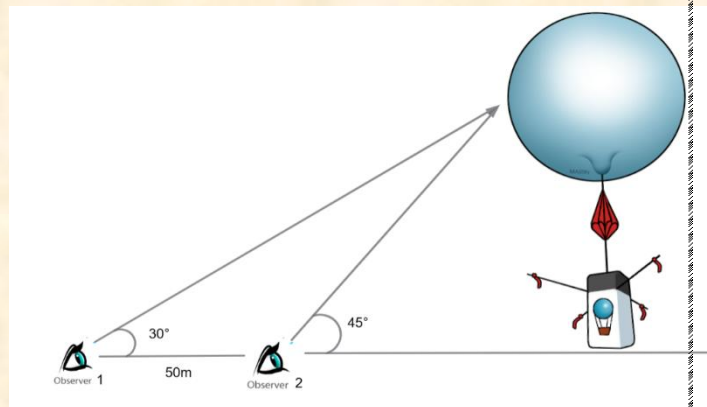
- Write an expression for the height of the tower (excluding the flag) in terms of Aman's distance from the tower.
- Write another expression for the height of the tower (excluding the flag) in terms of Riya's distance from the tower.
- Calculate the height of the tower.

(OR)

Find the difference in distance of Aman and Riya from the base of the tower.

- Two hikers are standing on opposite sides of a steep cliff. One hiker sees the top of the cliff at an angle of elevation of 45° , while the other sees it at an angle of 30° . The distance between the two hikers is 100 meters, and the cliff rises vertically from the horizontal ground between them. Both hikers are at ground level. Write expressions for the distances of the hikers from the base of the cliff using trigonometric ratios. Using those expressions, write an equation relating the height of the cliff and the total distance. Find the distance of each hiker from the base of the cliff.
- A hot air balloon is flying horizontally at a constant altitude above a flat field. A person on the ground first sees the balloon at an angle of elevation of 30° . After 10 seconds, the balloon moves and the angle increases to 60° . The balloon's height remains constant throughout its flight. Assume the horizontal speed of the balloon is 5 m/s. Write an expression for the initial horizontal distance between the person and the balloon. Write a second expression after 10 seconds, considering the horizontal movement. Calculate the height of the balloon.
- Rakesh is standing on a 15-meter high pedestrian bridge over a wide river. They observe a boat approaching from a distance. Initially, the angle of depression to the boat is 30° , and after a few seconds, it becomes 60° . The boat is moving in a straight line along the surface of the river, which is assumed flat. Write expressions for the boat's distance from the bridge base at both angles. Write the expression for the distance travelled by the boat. Calculate how far the boat moved between the two observations.
- On a calm day, a tall tree stands at the edge of a still lake. Lara is standing on the opposite bank, 40 meters away from the base of the tree, on level ground. She notices that the angle of elevation to the top of the tree is 30° , and the angle of depression to the bottom of the tree's reflection in the water is 45° . The line of sight from her eyes is perfectly horizontal. Assume the height of the girl's eyes from the ground is negligible compared to the height of the tree. The lake reflects the entire visible part of the tree clearly. Write an expression for the height of the tree in terms of the distance and angle of elevation. Write an expression for the length of the tree's reflection in the water using the angle of depression. Find the total vertical distance between the top of the tree and the bottom of its reflection as seen by Lara.

9. A weather balloon is floating at a fixed height above a field. Two observers, A and B are standing on the ground on the same side of the balloon, 50 meters apart. The angle of elevation from the closer observer to the balloon is 45° , and from the farther observer, it is 30° . All three — the balloon and the two observers — are aligned in a straight line on level ground.



- Write a trigonometric expression for the height of the balloon using the 45° angle.
- Write another expression for the height using the 30° angle and 50-meter distance.
- Find the height of the balloon and the distance of the closer observer from its base.

(OR)

Calculate the horizontal distances of both observers from the vertical line passing through the balloon.

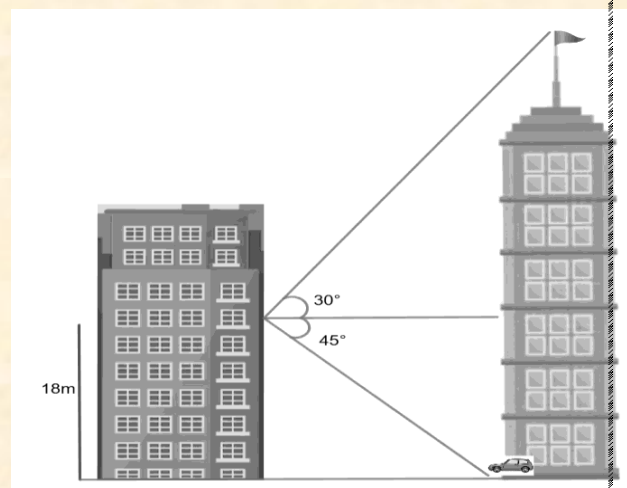
10. Evan is standing at a window on the 6th floor of a building, which is 18 meters above the ground.

From this position, he observes:

The top of a flag mounted on a pole on a nearby building at an angle of elevation of 30° .

A car parked on the ground at the base of that building at an angle of depression of 45° .

The two buildings stand on level ground, and the pole is vertical.



- Write an expression for the height of the flagpole above the ground using the given angles and the observer's height.
- Write an expression for the horizontal distance between the two buildings using the angle of depression.
- Calculate the total height of the flagpole (including the building it is mounted on) and the horizontal distance between the buildings.

(OR)

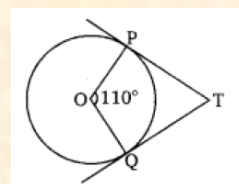
If the height of the nearby building (without the pole) is 25 meters, find the height of the flagpole alone.

CHAPTER - 10

CIRCLES

1. In Fig, If TP & TQ are two tangents to a circle with centre O so that $\angle POQ = 110^\circ$, then $\angle PTQ$ is equal to

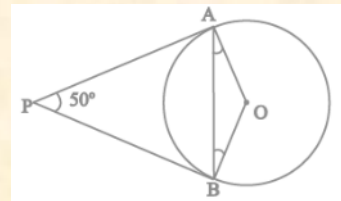
- (a) 60° (b) 70° (c) 80° (d) 90°



2. In the figure, if PA and PB are tangents to the circle

with centre O such that $\angle APB = 50^\circ$, then $\angle AOB$ is equal to

- (a) 25° (b) 130°
(c) 140° (d) 50°



3. If tangents PA and PB from a point P to a circle with centre O are inclined to each other at angle of 80° , then $\angle POA$ is equal to

- (a) 50° (b) 60° (c) 70° (d) 80°

4. A circle with centre O is of radius 5 cm. A point P is 7 cm. away from O. Number of tangents that can be drawn from P to the circle is ____.

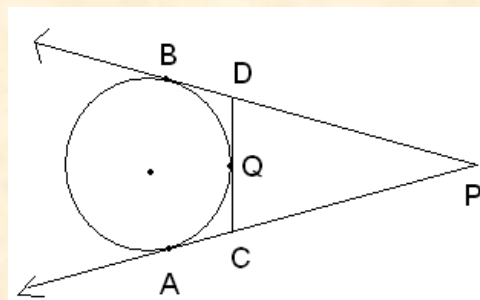
- (a) 0 (b) 1 (c) 2 (d) Infinitely many.

5. The angle between the radius and tangent to a circle at the point of contact is

- (a) Acute angle (b) Obtuse angle (c) Right angle (d) straight angle

6. The length of a tangent from a point A at distance 5cm from the centre of the circle is 4cm. Find the radius of the circle.

7. In the figure PA and PB are tangents to the circle drawn from an external point P. CD is the third tangent touching the circle at Q. If $PB = 10$ cm, $CQ = 2$ cm find the length of PC.



8. Prove that the lengths of tangents drawn from an external point to a circle are equal.

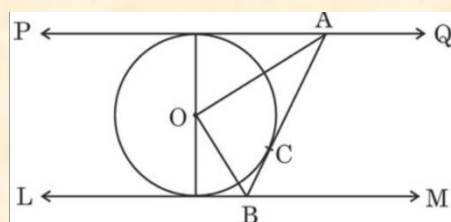
9. Prove that the angle between the radius and tangent to a circle at the point of contact is a right angle.

10. Prove that the tangents drawn at the ends of a diameter of a circle are parallel.

11. Prove that the rectangle circumscribing a circle is square.

12. Prove that a parallelogram circumscribing a circle is a rhombus.

13. In the figure PQ and LM are two parallel tangents to a circle with centre O and another tangent AB with point of contact C intersecting PQ at A and LM at B, what is the measure of $\angle AOB$.



to a
of

14. Two concentric circles are of radii 5 cm and 3 cm. Find the length of the chord of the larger circle which touches the smaller circle.

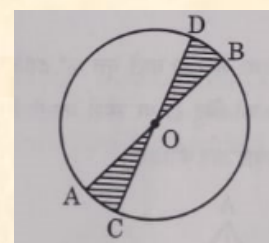
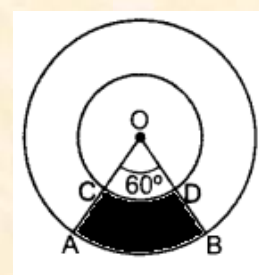
15. Prove that the angle between the two tangents drawn from an external point to a circle is supplementary to the angle subtended by the line-segment joining the points of contact at the centre.

16. Show that the angles subtended by the opposite sides of a quadrilateral circumscribing a circle are supplementary.

CHAPTER - 11

AREA RELATED TO CIRCLES

- Find the area of a sector of a circle with radius 6 cm if angle of the sector is 60° .
- Find the area of a quadrant of a circle whose circumference is 22 cm.
- A chord of a circle of radius 15 cm subtends an angle of 60° at the centre. Find the areas of the corresponding minor and major SECTOR of the circle.
- A horse is tied to a peg at one corner of a square shaped grass field of side 15 m by means of a 5 m long rope (see Fig. 12.11). Find the area of that part of the field in which the horse can graze.
- In a circle of radius 21 cm, an arc subtends an angle of 60° at the centre.
Find:
(i) the length of the arc
(ii) area of the sector formed by the arc.
- The length of the minute hand of a clock is 14 cm. Find the area swept by the minute hand in 5 minutes
- Find the distance covered by a wheel of diameter 35 cm, in one revolution.
- In Figure, two concentric circles with centre O, have radii 21 cm and 42 cm. If $\angle AOB = 60^\circ$, find the area of the shaded region.
- AB and CD are diameters of a circle with centre O and radius 7 cm if angle bod is equal to 300 degrees then find the area and perimeter of the shaded region.



CHAPTER - 12

SURFACE AREAS AND VOLUMES

- What is the total surface area of a cube with an edge of 5cm ?
(A) 25 cm^2 (B) 50 cm^2 (C) 100 cm^2 (D) 150 cm^2
- The diameter of a sphere is 10 cm. What is its volume ?
(A) 314.16 cm^3 (B) 523.6 cm^3 (C) 1000 cm^3 (D) 1256.64 cm^3
- A cylinder with a radius of 7 cm and a height of 10 cm has a total surface area of :
(A) 440 cm^2 (B) 480 cm^2 (C) 490 cm^2 (D) 494 cm^2
- The height of a cone is 12 cm and the radius of its base is 5 cm . What is its slant height ?
(A) 13 cm (B) 14 cm (C) 15 cm (D) 16 cm
- A cube has a volume of 729 cm^3 . What is the length of its diagonal ?
(A) 9 cm (B) 27 cm (C) 81 cm (D) 243 cm

In the following questions , Mark the correct choice as :

- Both assertion and reason are true and reason is the correct explanation of assertion .
 - Both assertion and reason are true but reason is not the correct explanation of assertion.
 - Assertion is true but reason is false
 - Assertion is false but reason is true .
6. **Assertion:** If the radius of a cone is halved and volume is not changed , then height remains same.

Reason: If the radius of a cone is halved and volume is not changed then height must become four times of original height.

7. **Assertion:** There are 1000 balls of diameter 0.6 cm which can be formed by melting a solid sphere of radius 3 cm.

Reason: Number of spherical balls = volume of bigger solid sphere / volume of one spherical ball

8. If the total surface area of a solid hemisphere is 462 cm^2 , find its volume? (Take $\pi = \frac{22}{7}$)
9. Two cubes each of volume 27 cm^3 are joined end to end to form a solid. Find the surface area of resulting cuboid?
10. Find the number of coins of 1.5 cm diameter and 0.2 cm thickness to be melted to form a right circular cylinder of height 10 cm and diameter 4.5 cm ?
11. A cone of height 20 cm and radius of base 5 cm is made up of modelling clay. A child reshapes it in the form of a sphere. Find the diameter of sphere.
12. The dimensions of a metallic cuboid are $100 \text{ cm} \times 80 \text{ cm} \times 64 \text{ cm}$. It is melted and recast into a cube. Find the surface area of the cube.
13. A cylindrical pipe has inner diameter of 4 cm and water flows through it at rate of 20 meter per minute. How long would it take to fill a conical tank of radius 40 cm and depth 72 cm?
14. The sum of the radius of base and height of a solid right circular cylinder is 37 cm . If the total surface area of the solid cylinder is 1628 sq.cm , Find the volume of cylinder ?
15. A solid toy is in the form of a hemisphere surmounted by a right circular cone . The height of the cone is 4 cm and diameter of the base is 8 cm. Determine the volume of the toy. If the cube circumscribes the toy, then find the difference of the volume of cube and the toy. Also, find the total surface area of the toy.
16. A cylindrical tub, whose diameter is 12 cm and height 15 cm is full of ice-cream. The whole ice-cream is to be divided into 10 children in equal ice-cream cones, with conical base surmounted by hemispherical top. If the height of conical portion is twice the diameter of base, find the diameter of conical part of ice-cream cone.

CHAPTER - 13

STATISTICS

1. For the following distribution

C.I.	0-10	10-20	20-30	30-40	40-50
f	20	30	24	40	18

the lower limit of the modal class is

- (a) 20 (b) 30 (c) 40 (d) 50

2. For the following distribution

C.I.	0-5	6-11	12-17	18-23	24-29
f	26	20	30	16	22

the upper limit of the median class is

- (a) 18.5 (b) 18 (c) 17.5 (d) 17

3. For the following distribution the sum of the upper limit and the lower limit of the modal class is

Cl	0-5	5-10	10-15	15-20	20-25
f	10	15	12	20	9

- (a) 0 (b) 5 (c) 10 (d) 35

4. The lower limit of the median class of the distribution is _____

Classes	0 – 25	25 – 50	50 – 75	75 – 100	100 – 125
Frequency	18	12	10	15	5

- (a) 25 (b) 50 (c) 75 (d) 100

5. For the following data the lower limit of the modal class

Height (In cm)	Less than 120	Less than 140	Less than 160	Less than 180	Less than 200
students	12	26	34	40	50

- (a) 120 (b) 140 (c) 160 (d) 180

6. In a continuous frequency distribution if $n=50$ lower limit of median class is 24.5, $cf=9$, frequency of median class is 8 and class size is 10 , then what is its median.

- (a) 24.5 (b) 36.5 (c) 44.5 (d) 55

7. The modal class of the following distribution is

Marks obtained	0-20	20-40	40-60	60-80	80-100
Number of students	15	18	21	29	17

- a) 0 – 20 (b) 20 – 40 (c) 40 – 60 (d) 60 – 80

8. In the following distribution the values of $x + y$.

C I	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	50 -60	Total
f	5	x	20	15	y	5	60

9 . Find the value of x if mean of the data given is 27.

C I	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50
f	8	x	12	13	10

10. Find the mode of the following distribution of marks obtained by the students in an

Marks obtained	0-20	20-40	40-60	60-80	80-100
Number of students	15	18	21	29	17

examination:

11. Find the median and mode of the data

Percentage	30-35	35-40	40-45	45-50	50-55	55-60
No. of students	15	16	19	23	18	9

12. Find the modal monthly pocket money of a child for the following data.

Monthly Pocket money given (in Rupees)	30 – 60	60 – 90	90 – 120	120 – 150	150 – 180
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No. of children	15	24	28	22	12
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13. Median of the following distribution 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	x	20	15	y	5	60

14. Median of the following distribution is 52.5. Find the values of x and y if the total frequency is 100.

Class Interval	0-100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000
Frequency	2	5	x	12	17	20	y	9	7	4

15. Find the missing frequency if the mode of the following distribution is 154.

Classes	120 – 130	130 – 140	140 – 150	150 – 160	160 – 170	170 – 180
frequency	2	8	12	F	8	7

16. The median of the following data is 50. Find the values of 'p' and 'q', if the sum of all frequencies is 90. Also find the mode.

Marks	20 – 30	30 – 40	40 – 50	50 – 60	60 – 70	70 – 80	80 – 90
Students	p	15	25	20	q	8	10

17. The following table gives the distribution of the life time of 400 neon lamps. Find the average life time of a lamp.

Life time (in hours)	1500 – 2000	2000 – 2500	2500 – 3000	3000 – 3500	3500 – 4000	4000 – 4500	4500 – 5000
No. of lamps	14	56	60	86	74	62	48

18. Find the mode of the data whose mean is 20 and median is 22.

CHAPTER - 14

PROBABILITY

A card is selected at random from a well shuffled deck of 52 cards. The probability of its being a red face card is

- (a) $\frac{3}{26}$ (b) $\frac{3}{13}$ (c) $\frac{2}{13}$ (d) $\frac{1}{2}$

2. If $P(E) = 0.05$, what will be the probability of 'not E'?

- (a) 0.55 (b) 0.59 (c) 0.95 (d) 0.095

3. What is the probability of getting 53 Mondays in a leap year?

- (a) $\frac{1}{7}$ (b) $\frac{53}{366}$ (c) $\frac{2}{7}$ (d) $\frac{7}{366}$

4. A coin is tossed 3 times. The total number of possible outcomes is ____
 (a) 3 (b) 6 (c) 8 (d) 9
5. A box contains 50 apples of which 5 are rotten. An apple is picked from the box at random. The probability of getting a good apple
 (a) $\frac{1}{5}$ (b) $\frac{3}{5}$ (c) $\frac{7}{5}$ (d) $\frac{9}{10}$
6. A card is drawn from a well shuffled deck of 52 cards. Find the probability of getting a non –face card is
 (a) $\frac{10}{13}$ (b) $\frac{9}{13}$ (c) $\frac{3}{13}$ (d) $\frac{1}{13}$
7. Two coins are tossed simultaneously. What is the probability of getting
 (i) At least one head? (ii) At most one tail?
8. A number is selected at random from first 50 natural numbers. Then find the probability that it is a (i) multiple of 3. (ii) multiple of both 3 and 4 .
9. Two dice are thrown at the same time. What is the probability that the sum of the two numbers appearing on the top of the dice is
 (i) 8? (ii) 13? (iii) less than or equal to 12?
10. A card is drawn from a well shuffled deck of 52 cards. Find the probability of getting
 (i) a king of red suit (ii) an ace card (c) a number card
11. A bag contains 5 red balls 10 blue balls and 10 green balls. A ball is drawn from it at random. What is the probability that ball drawn is a
 (i) red ball (ii) a green ball (iii) a white ball
12. A fair die is rolled once. Find the probability of getting (i) a number less than 7
 (ii) a number more than 6

ANSWERS

CH 1 REAL NUMBERS

REAL NUMBERS

- | | | |
|-----------------------------|----------------------------------|--|
| 1. HCF = 6 & LCM = 360 | 2. HCF = 4 & LCM = 9696 | 3(i) HCF = 13 & LCM = 182 |
| 3(ii) HCF = 6 & LCM = 3024 | 4(i) HCF = 3 & LCM = 420 | 4(ii) HCF = 1 & LCM = 11339 |
| 4(iii) HCF = 1 & LCM = 1800 | 5. It has more than two factors | 6. The prime factorisation of 6 does not contain 5 |
| 7. LCM = 22337 | 8. HCF = xy^2 & LCM = x^3y^3 | 9. HCF = 16 |
| 10. HCF = 64 | 11. HCF(850 , 680) = 170 | 12. LCM = 12240 cm |
| 13. LCM + 7 = 151 | 14. HCF = 75 cm | |

CH 2 POLYNOMIALS

- | | | |
|-------------------------------|-----------------------------|-----------------------|
| 1. $-\frac{q}{p}$ | 2. -10 | 3. At most n zeroes |
| 4. $x^2 - 3x - 10$ | 5. a | 6. $-\frac{3}{5}$ |
| 7. $x^2 - 5x - 6$ | 8. $(x - 3)(x - 4)$ | 9. 2 |
| 10. $k = \frac{2}{3}$ | 11. $\frac{b^2 - 2ca}{a^2}$ | 12. -3, -2 |
| 13. (i)0 (ii)1 (iii) 3 (iv) 2 | 14. Infinitely many | 15. 2, 3 and parabola |

CH 3 LINEAR EQUATIONS IN TWO VARIABLES

- | | | |
|-----------------------------------|--|--|
| 1. $x = \frac{4}{3}$ and $y = -5$ | 2. Graph | 3. $2x - y = 0$, $x = 60$, $y = 120$ |
| 4. $c = 1$ | 5. $c = 6$ | 6. $x = 15$ and $y = 10$ |
| 7. $x = 1$ and $y = 0$ | 8. Cost of 1 bat = Rs.3000 cost of 1 ball = Rs.500 | |
| 9. $k \neq -4$ | 10. (3, 4) | 11. $-\frac{10}{3}$ |
| 12. $k = 4$ | 13. 36 | 14. No |
| 15. (2, 2) | 16. Father = 36 yrs, son = 6 yrs. | |

CH 4 QUADRATIC EQUATIONS

- | | | |
|----------------------------|-----------------------------|--------------------------------|
| 1. $k = 2$ | 2. $k = 0$ | 3. $-\sqrt{2}, -5/\sqrt{2}$ |
| 4. $p = 15$ | 5. 35 or 53 | 6. $(2\sqrt{3})/3, -4\sqrt{3}$ |
| 7. $-\sqrt{6}/3, \sqrt{6}$ | 8. 36 or 63 | 9. 4 km/hr |
| 10. 8 and 9 | 11. Real and distinct roots | 12. $k = -14$ |

CH 5 ARITHMETIC PROGRESSION

- | | | |
|---|----------------------------|-------------|
| 1. (i)Rs.55000 (ii) 7th (iii)20 OR 10th | 2. 47 | 3. 35 |
| 4. 16 | 5. 30 | 6. 128 |
| | 7. 60 | 8. 178 |
| 9. 64 | 10. 5 | 11. 54th |
| | 12. AP: 4, 10, 16, 22, ... | |
| 13. -13, -8, -3, 2, ... | 14. 6, 11, 16, 21, ... | 15. $n = 1$ |

CH 6 TRIANGLES

- | | | | |
|----------------------------------|--------------------|----------------------------|-----------------------|
| (b) $\Delta PQR \sim \Delta ABC$ | 2. (d) RHS | 3. (d) 6 | 4. (c) Always similar |
| 5. (b) Triangle ABC | 6. $AE/ED = BF/FC$ | 7. $\angle ABC = 48^\circ$ | 8. $BF/FE = BE/EC$ |

CH 7 COORDINATE GEOMETRY

1. $d = 2\sqrt{(a^2 + b^2)}$ 2. $AB = \sqrt{74}$ $BC = \sqrt{122}$ $AC = 4\sqrt{2}$ 3. (3, -10) 4. (1, -7, 0) 5. (-7, 0) 6. $3x + y - 5 = 0$ 7. Side = $\sqrt{34}$, diagonals = $\sqrt{68}$ 8. $[\frac{-3}{2}, 0]$ 9. $a=1, b=1$ 10. $[0, \frac{23}{5}]$

CH 8 TRIGONOMETRY

1. $3(\frac{1-\sqrt{3}}{2})$ 3. $\frac{10}{3}$
4. : $\sin \theta = \frac{4}{5}$ $\operatorname{Cosec} \theta = \frac{5}{4}$ $\cos \theta = \frac{3}{5}$ $\sec \theta = \frac{5}{3}$ $\cot \theta = \frac{3}{4}$
5. $\angle A = 45^\circ$ and $\angle B = 15^\circ$ 9. $\theta = 15^\circ$ 10. $x:y = 2:1$

CH 9 SOME APPLICATIONS OF TRIGONOMETRY

- (1) 5 m (2) $10\sqrt{3}$ m (3) 94.6 m
- (4) 8 m (5) $75(\sqrt{3}-1)$ m (6) 6 m
- (7) (i) 100.46 m (ii) 3.35m (or) $BC = 150\sqrt{3}$ feet
- (8) (i) $PA = 12\sqrt{3}$ m (ii) $PB = 36$ m (iii) $AB = 24\sqrt{3}$ m (or) $QD = 36$ m
- (9) (i) $\angle APD = 45^\circ$ (ii) alternate interior angles (iii) $PD = 100$ m (or) $QD = 100\sqrt{3}$ m
- (10) (i) $\tan 45^\circ = \frac{CD}{BC}$ (ii) $\tan 30^\circ = \frac{CD}{AB+BC}$ (iii) height of the balloon = $BC = 25(\sqrt{3}+1)$ and $CD = 25(\sqrt{3}+1)$ (or) $AC = 75 + 25\sqrt{3}$ m

CH 10 CIRCLES

- 1.(b) 70° 2. (c) 140° 3. (b) 60° 4.(c) 2
- 5.(c) Right angle Radius = 3 cm 7. $PC = 12$ cm 13. $\angle AOB = 90^\circ$ 14. 8 cm

CH 11 AREA RELATED TO CIRCLES

1. $6\pi = 18.84 \text{ cm}^2$ 2. $r = 14$ cm, Area = 154 cm^2
3. area of minor sector = $\frac{75}{2}\pi \text{ cm}^2$, area of major sector = $187.5\pi \text{ cm}^2$
4. $\frac{25}{4}\pi \text{ cm}^2$ 5. (i) 22cm (ii) 231 cm^2
6. $\frac{154}{3} \text{ cm}^2$ 7. 220cm
8. 693 cm^2 9. $\frac{77}{3} \text{ cm}^2$

CH 12 SURFACE AREAS AND VOLUMES

- 1(D) 150 cm^2 2 (B) 523.6 cm^3 3 (D) 494 cm^2
- 4(A) 13 cm 5 (B) 27 cm 6 (D)

- 7(A) 8. Volume = 716.67 cm^3 9. 90 cm^2
 10. 451 ins 11. 10 cm 12. 38400 cm^3
 13. 10.5 minutes 14. 3380 cm^3
 15 Volume : 201.06 cm^3 Difference : 310.94 cm^3 TSA : 171.55 cm^2
 16. Diameter : 6.4 cm

CH 13 STATISTICS

1. (b) 30 2. (a) 18.5 3. (d) 35 4. (a) 25
 5. (b) 140 6. (b) 36.5 7. (d) $60 - 80$ 8. $x + y = 15$
 9. $x = 11$ 10. Mode = 66.67 (approx) 11. Median = 44.17, Mode = 44.29 (approx)
 12. Mode = 105 13. $x = 10, y = 5$ 14. $x = 12, y = 19$ 15. $f = 20$
 16. $p = 12, q = 10$, Mode = 47.5 17. Average lifetime = 3400 hours 18. Mode = 26

CH 14 PROBABILITY

1. (a) $\frac{3}{26}$ 2. (c) 0.95 3. (c) $\frac{2}{7}$ 4. (c) 8
 5. (d) $\frac{9}{10}$ 6. (a) $\frac{10}{13}$ 7. (i) $\frac{3}{4}$ (ii) $\frac{3}{4}$ 8. (i) $\frac{16}{50}$ or $\frac{8}{25}$
 8(ii) $\frac{4}{40}$ or $\frac{2}{25}$ 9.(i) $\frac{5}{36}$ (ii) 0 (iii) 1 10.(i) $\frac{1}{26}$ (ii) $\frac{1}{13}$ (iii) $\frac{9}{13}$
 11.(i) $\frac{1}{5}$ (ii) $\frac{2}{5}$ (iii) 0 12. (i) 1 (ii) 0