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MATHMISSION

FOR X

MATHEMATICS
(Standard & Basic)

O.P. GUPTA

MATHS (H.), E & C ENGINEERING
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THE O.P. GUPTA ADVANCED MATH CLASSES
1st Floor of 1625 D 4/A, Opp. HP Petrol Pump, Thana
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First Edition

Latest 2024-25 Edition Based on New Pattern

Monday; July 01, 2024

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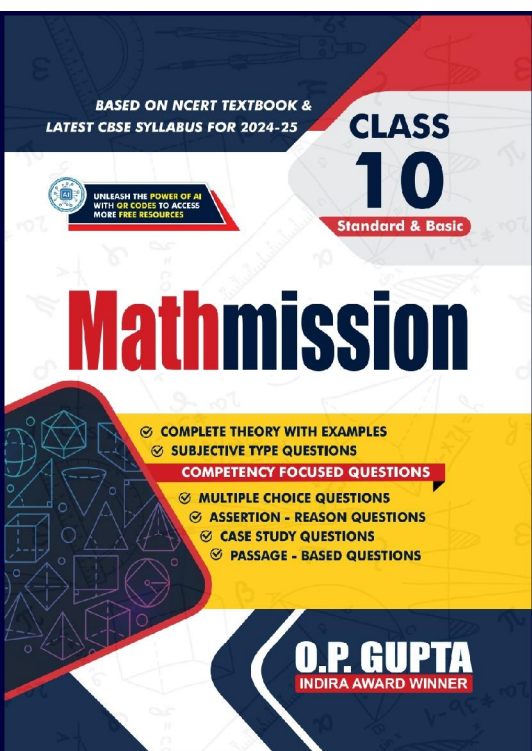
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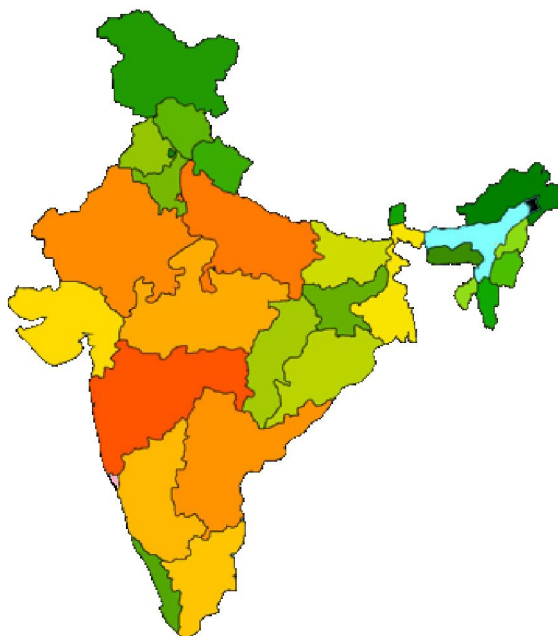
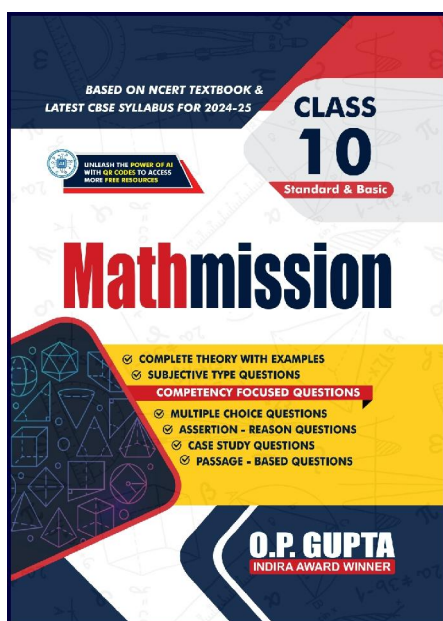
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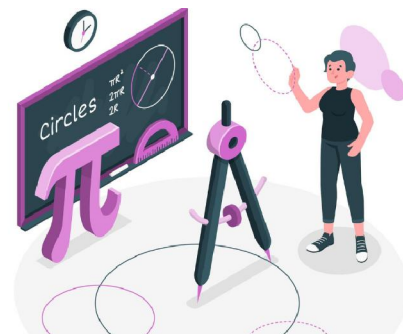
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SYLLABUS

Mathematics • Class X

*Weightage assigned to different units :

Sr. No.	Topic	Marks
01.	Unit - I (Number Systems)	06
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03.	Unit - III (Coordinate Geometry)	06
04.	Unit - IV (Geometry)	15
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Total marks (Theory exam.)		80
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* This weightage is as per the Curriculum for 2024-25 Exams (issued by CBSE in March, 2024).

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POLYNOMIALS

In the world of mathematics, polynomials are the bridge between simple arithmetic and complex equations.

INTRODUCTION

We have studied about polynomials in one variable, their factors and degrees in the previous class. We learnt about linear, quadratic and cubic polynomials. Also we got through monomial, binomial and trinomial etc. We studied about zeroes of a polynomial and factorization of algebraic expressions using various identities as well. Now we shall study about **geometrical interpretation of zeroes of a polynomial**. We shall learn how to **find zeroes of a quadratic polynomial** and we shall also establish **relationship between its coefficients and the zeroes**.

IMPORTANT TERMS & DEFINITIONS

01. Polynomial

An algebraic expression involving some constants and the variable terms is known as a polynomial.

If x be a variable, n be a positive integer and $a_0, a_1, a_2, \dots, a_n$ be the constants (real numbers), then the expression of the form $a_n x^n + a_{n-1} x^{n-1} + \dots + a_2 x^2 + a_1 x + a_0$ is known as a polynomial in variable x with degree n (where $a_n \neq 0$).

A polynomial in x is generally denoted by $p(x), q(x), f(x), g(x)$ or $h(x)$.

◇ A polynomial of degree n can have at the most $(n+1)$ terms.

02. Degree of a polynomial

It is the exponent (power) of the highest degree term in a polynomial. That is, the highest power of variable x (say) in a polynomial is called its degree. For example, $2x^3 + 9x^2 - 7x + 5$ is a degree 3 polynomial.

03. Value of a polynomial

If $p(x)$ is a polynomial in x and $x = a$ is a real number, then the value of $p(x)$ which is obtained by putting $x = a$ in $p(x)$, is called the value of $p(x)$ at $x = a$ and it is denoted by $p(a)$.

04. Type of polynomials

(a) Constant polynomial

A polynomial of degree **zero** is called a constant polynomial. For example, $p(x) = a$ i.e., $p(x) = a x^0$, where a is any real number. For example, $p(x) = -5, f(x) = 2$.

(b) Linear polynomial

It is a polynomial of degree **one**. The general notation for a linear polynomial is given as $p(x) = ax + b$, $a \neq 0$, where a and b are constants. For example, $p(x) = 3x - 8, f(x) = x + \sqrt{2}$.

(c) Quadratic polynomial

A polynomial of degree **two** is called as quadratic polynomial. The general notation for a quadratic polynomial is given as $p(x) = ax^2 + bx + c$, $a \neq 0$, where a, b and c are constants.

For example, $p(x) = x^2 - 3x + 5, f(x) = 7x^2 + 4$.

◇ Just ponder if, $g(x) = 0x^2 + 7x + 4$ and $h(x) = x^2$ are quadratic polynomials or not.

(d) Cubic polynomial

A polynomial of degree **three** is called as cubic polynomial. The general notation for a cubic polynomial is given as $p(x) = ax^3 + bx^2 + cx + d$, $a \neq 0$, where a , b , c and d are constants. For example, $p(x) = x^3 - 3x^2 + 5$, $f(x) = 4x^3 + 7x^2 - 2x + 4$.

(e) Bi-quadratic polynomial

It is a polynomial of degree **four**. The general notation for a bi-quadratic polynomial is given as $p(x) = ax^4 + bx^3 + cx^2 + dx + e$, $a \neq 0$, where a , b , c , d and e are constants.

For example, $p(x) = x^4 - 2x^3 + 3x^2 + 5$, $f(x) = 6x^4 + 4x^3 - 7x^2 - 2x + 3$.

Also a polynomial of degree *four* with *integral coefficients* is called a quartic polynomial.

05. Zeroes of a polynomial

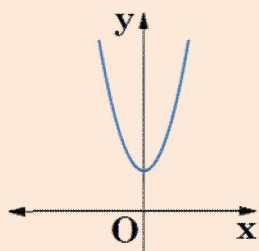
The values of x for which the polynomial $p(x)$ becomes zero are called the zeroes of the polynomial.

In other words, if $p(x)$ is a polynomial, then the zeroes of polynomial $p(x)$ are the solutions to the equation $p(x) = 0$. Mathematically, if $p(a) = 0$, then ' a ' is a zero of the polynomial $p(x)$.

- A polynomial of degree n has at the most n **real** zeroes. Also, the polynomial of degree n has exactly n zeroes (real or imaginary zeroes).
- A quadratic polynomial has at the most two **real** zeroes. Also, it has exactly two zeroes (real or imaginary zeroes).
- Geometrically, zeroes of a polynomial $p(x)$ are the x -coordinates of the points where the graph of $y = p(x)$ intersects the x -axis. Further, if a polynomial is of the form $x = p(y)$, then geometrically, its zeroes are y -coordinates of the points where the graph of $x = p(y)$ intersects the y -axis.

Let's draw clarity about above discussions.

Take a polynomial $p(x) = x^2 + 9$. We know its degree is 2, so it can have **at most 2 real zeroes**. We do **not** have any real values of x , for which $p(x) = x^2 + 9 = 0$. That is, for $p(x) = x^2 + 9$ we have **no real zeroes**; that's why the graph of polynomial $p(x) = x^2 + 9$ does not intersect x -axis at any point. Refer the figure.



However $p(x) = x^2 + 9$ surely has 2 zeroes which are $x = \pm 3i$, we shall study about **imaginary zeroes** in higher classes.

Therefore in class X, we conclude that $p(x) = x^2 + 9$ has **no zeroes** (keep in your mind that, we have not studied about the imaginary zeroes yet).

06. Relationship between zeroes of a Quadratic polynomial and Coefficients

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

$$\text{Sum of Zeroes } (\alpha + \beta) = -\frac{b}{a} \text{ and, Product of Zeroes } (\alpha\beta) = \frac{c}{a}.$$

$$\text{i.e., } \alpha + \beta = -\frac{\text{coefficient of } x}{\text{coefficient of } x^2} \text{ and, } \alpha\beta = \frac{\text{constant term}}{\text{coefficient of } x^2}.$$

*07. Relationship between zeroes of a Cubic polynomial and Coefficients

If α , β and γ are the zeroes of cubic polynomial $p(x) = ax^3 + bx^2 + cx + d$, $a \neq 0$, then

$$\alpha + \beta + \gamma = -\frac{b}{a}, \alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a} \text{ and, } \alpha\beta\gamma = -\frac{d}{a}.$$

08. To find a Quadratic polynomial if its zeroes are given

If α and β are the zeroes of quadratic polynomial say $p(x)$, then the polynomial is given as,

$$p(x) = x^2 - Sx + P \text{ or, } k(x^2 - Sx + P)$$

where $S = \alpha + \beta$, $P = \alpha\beta$ and k is any non-zero real number.

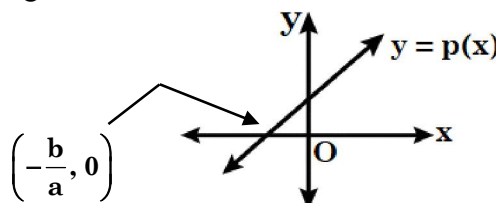
◇ Note that here S and P represent the sum of zeroes and product of zeroes of $p(x)$ respectively.

09. Graph of polynomials

(a) Linear polynomial

For a linear polynomial $p(x) = ax + b$, $a \neq 0$, the graph is a straight line and it intersects x -axis at exactly one point $\left(-\frac{b}{a}, 0\right)$. The zero of polynomial $p(x)$ is $x = -\frac{b}{a}$.

To make the graph, we take $y = p(x)$ i.e., $y = ax + b$.

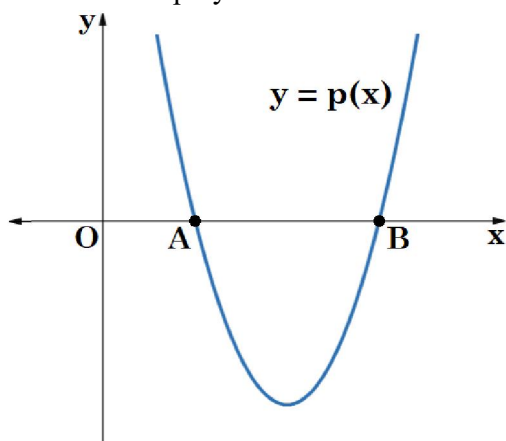


(b) Quadratic polynomial

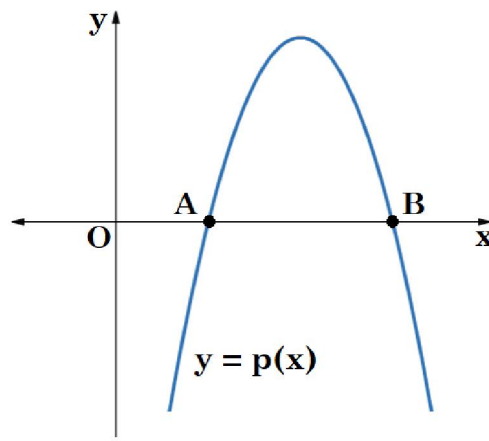
For a quadratic polynomial $p(x) = ax^2 + bx + c$, $a \neq 0$, the graph is a parabola; which is open either upwards ($\cup$) or downwards ($\cap$).

If $a > 0$, then shape is upward and; if $a < 0$, then the shape is downward.

Case I. In both the graphs of quadratic polynomial shown below, the curves cut x -axis at two distinct points A and B . Therefore, the quadratic polynomial has **two zeroes**. The x -coordinates of points A and B are the two zeroes of the polynomial.

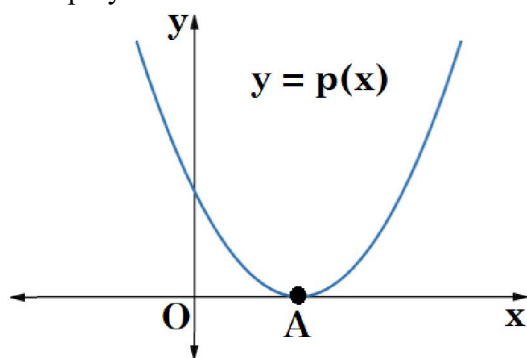


$$(a > 0, b^2 - 4ac > 0)$$

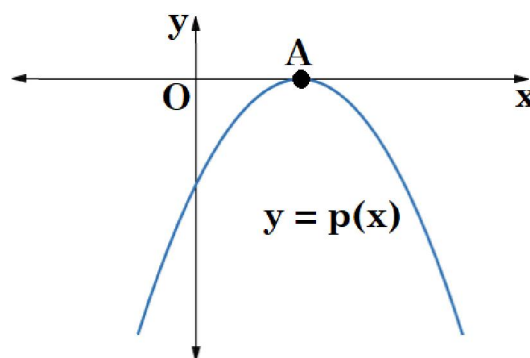


$$(a < 0, b^2 - 4ac > 0)$$

Case II. In both the graphs of quadratic polynomial shown below, the curves cut x -axis at **exactly one point A** i.e., at **two coincident points**. The two points A and B in **Case I** coincide here to become one point A . Therefore, the quadratic polynomial has **only one zero**. The x -coordinate of point A is the **only one zero** of the polynomial.

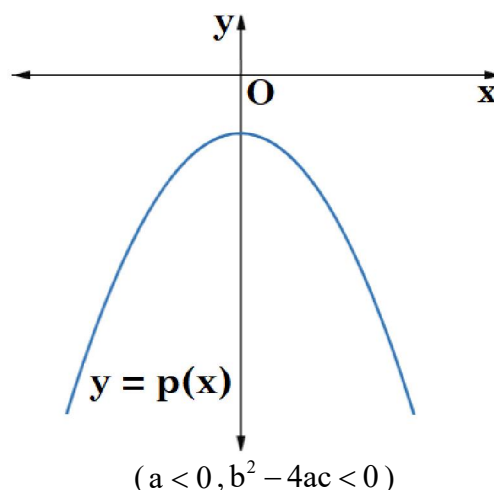
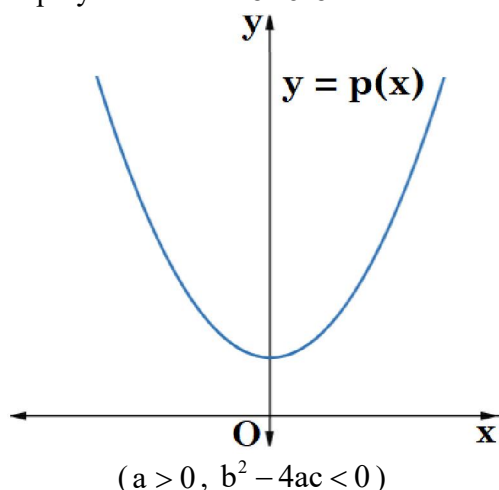


$$(a > 0, b^2 - 4ac = 0)$$



$$(a < 0, b^2 - 4ac = 0)$$

Case III. In both the graphs of quadratic polynomial shown below, the curves are either completely above the x-axis or completely below the x-axis. So, it does not cut the x-axis at **any point**. Therefore, the quadratic polynomial has **no zero**.



Note that, to make the graph we take $y = p(x)$ i.e., $y = ax^2 + bx + c$.

Remark The graph of quadratic polynomial intersects x-axis at maximum two points. Geometrically a quadratic polynomial can have either **two distinct zeroes** (when $b^2 - 4ac > 0$) or **two equal zeroes i.e., one zero** (when $b^2 - 4ac = 0$), or **no zero** (when $b^2 - 4ac < 0$). This also means that a polynomial of degree 2 has **at most two zeroes**.

*It is important to note that the concept of **imaginary zeroes** is not taught in class X. So, in case of declaring **zeroes of a polynomial of degree n**, we usually say that we have **at most n zeroes** (which should be otherwise, **exactly n zeroes** or, **at most n real zeros** in higher classes).*

10. Algebraic Identities

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

(b) $(a - b)^2 = a^2 - 2ab + b^2$

(c) $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

(d) $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

(e) $a^2 - b^2 = (a + b)(a - b)$

(f) $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

(g) $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

(h) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$

(i) $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - ab - bc - ca)$.

WORKED OUT ILLUSTRATIVE EXAMPLES

Ex01. Find the zeroes of $\sqrt{3}x^2 - 8x + 4\sqrt{3}$ and verify the relationship between its zeroes and coefficients.

Sol. We have, $\sqrt{3}x^2 - 8x + 4\sqrt{3}$

$$\Rightarrow = \sqrt{3}x^2 - 6x - 2x + 4\sqrt{3}$$

$$\Rightarrow = \sqrt{3}x(x - 2\sqrt{3}) - 2(x - 2\sqrt{3})$$

$$\Rightarrow = (x - 2\sqrt{3})(\sqrt{3}x - 2)$$

So, the value of $\sqrt{3}x^2 - 8x + 4\sqrt{3}$ is zero when $(x - 2\sqrt{3}) = 0$ or $(\sqrt{3}x - 2) = 0$ i.e., when

$$x = 2\sqrt{3} \text{ or } x = \frac{2}{\sqrt{3}}.$$

Therefore, the zeroes of $\sqrt{3}x^2 - 8x + 4\sqrt{3}$ are $x = 2\sqrt{3}$ and $x = \frac{2}{\sqrt{3}}$.

Now, sum of zeroes $= 2\sqrt{3} + \frac{2}{\sqrt{3}} = \frac{8}{\sqrt{3}} = -\left(-\frac{8}{\sqrt{3}}\right) = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$

and, product of zeroes $= (2\sqrt{3}) \times \left(\frac{2}{\sqrt{3}}\right) = 4 = \frac{4\sqrt{3}}{\sqrt{3}} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$.

Ex02. Find the zeroes of the polynomial $p(x) = 2x^2 - 7x - 15$ and verify the relationship between its coefficients and zeroes.

Sol. We have, $p(x) = 2x^2 - 7x - 15$

$$\Rightarrow p(x) = 2x^2 - 10x + 3x - 15$$

$$\Rightarrow p(x) = 2x(x - 5) + 3(x - 5)$$

$$\Rightarrow p(x) = (x - 5)(2x + 3)$$

For $p(x) = 0$, we have either $(x - 5) = 0$ or $(2x + 3) = 0$

That is, either $x = 5$ or $x = -\frac{3}{2}$.

Therefore, the zeroes of $p(x) = 2x^2 - 7x - 15$ are $x = 5$ and $x = -\frac{3}{2}$.

Now, sum of zeroes $= 5 + \left(-\frac{3}{2}\right) = \frac{10 - 3}{2} = \frac{7}{2} = -\left(-\frac{7}{2}\right) = -\frac{\text{Coefficient of } x}{\text{Coefficient of } x^2}$

and, product of zeroes $= (5) \times \left(-\frac{3}{2}\right) = \frac{-15}{2} = \frac{\text{Constant term}}{\text{Coefficient of } x^2}$.

Ex03. Find a quadratic polynomial whose zeroes are $\frac{1}{4}$ and -1 .

Sol. Let the required quadratic polynomial be $p(x) = ax^2 + bx + c$, $a \neq 0$, and its zeroes be denoted by α and β .

We have, sum of zeroes $= S = \alpha + \beta = \frac{1}{4} + (-1) = -\frac{3}{4}$

and, product of zeroes $= P = \alpha\beta = \frac{1}{4} \times (-1) = -\frac{1}{4}$.

So, the required quadratic polynomial is $p(x) = x^2 - Sx + P$ or $k(x^2 - Sx + P)$.

$\therefore p(x) = x^2 - \left(-\frac{3}{4}\right)x + \left(-\frac{1}{4}\right) = x^2 + \frac{3}{4}x - \frac{1}{4}$ or, $k(4x^2 + 3x - 1)$ where k is any non-zero real no.

Ex04. If α and β are the zeroes of quadratic polynomial $x^2 + 3x + 2$, then find a quadratic polynomial whose zeroes are $\alpha + 1$ and $\beta + 1$.

Sol. For the polynomial $x^2 + 3x + 2$, $\alpha + \beta = -3$ and $\alpha\beta = 2$.

The sum of zeroes of required quadratic polynomial whose zeroes are $\alpha + 1$ and $\beta + 1$
 $= (\alpha + 1) + (\beta + 1) = \alpha + \beta + 2 = -3 + 2 = -1$

Also, the product of zeroes of required quadratic polynomial
 $= (\alpha + 1)(\beta + 1) = \alpha\beta + (\alpha + \beta) + 1 = 2 + (-3) + 1 = 0$

Hence, the required polynomial is $x^2 - (-1)x + 0$ i.e., $x^2 + x$ or, $k(x^2 + x)$; $k \neq 0$.

Ex05. Find the value of 'k' such that the polynomial $p(x) = 3x^2 + 2kx + x - k - 5$ has the sum of zeroes equal to half of their product.

Sol. Rewriting the polynomial, we get $p(x) = 3x^2 + (2k + 1)x + (-k - 5)$.

So, for the polynomial $p(x)$, the sum of zeroes is $-\frac{2k+1}{3}$ and the product of zeroes is $-\frac{k+5}{3}$.

Now according to the given condition, $-\frac{2k+1}{3} = \frac{1}{2} \times \left(-\frac{k+5}{3}\right)$ i.e., $2k+1 = \frac{k+5}{2}$

$$\Rightarrow 4k+2 = k+5 \quad \Rightarrow 4k-k = 5-2$$

$$\therefore k = 1.$$

Ex06. Find the zeroes of $p(x) = (x+4)^2 - (x-4)^2$.

Sol. We have $p(x) = (x+4)^2 - (x-4)^2$

$$\Rightarrow p(x) = (x^2 + 8x + 16) - (x^2 - 8x + 16)$$

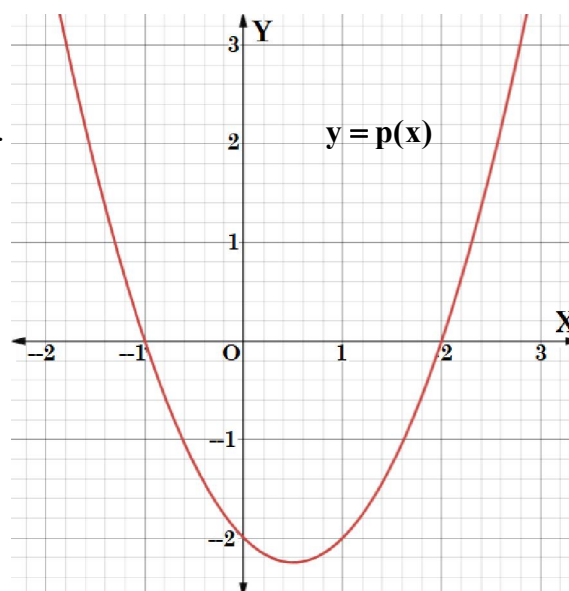
$$\Rightarrow p(x) = 16x$$

For $p(x) = 0$, we have $16x = 0 \therefore x = 0$.

Therefore, the zero of given polynomial $p(x)$ is 0.

Ex07. Consider the graph of a polynomial $p(x)$.

- Find how many zeroes it can have.
- Write the zeroes of polynomial $p(x)$ if possible.
- Write the polynomial $p(x)$.



Sol. (i) Since the graph of polynomial cuts x-axis at two points. Therefore, it has two zeroes.

(ii) The points at which the graph cuts x-axis are $(-1, 0)$ and $(2, 0)$.

The corresponding x-coordinates are -1 and 2 .

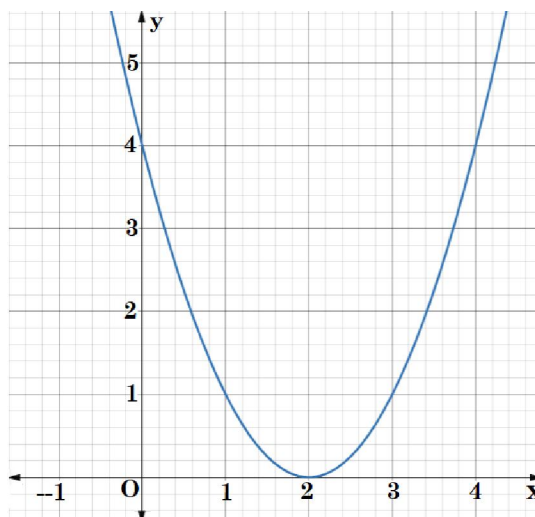
Therefore, the zeroes of $p(x)$ are -1 and 2 .

$$(iii) p(x) = x^2 - (-1+2)x + (-1)(2)$$

That is, $p(x) = x^2 - x - 2$ or $k(x^2 - x - 2)$; where k is any non-zero real constant.

Ex08. The graph of polynomial $p(x) = (x-2)^2$ is shown in the figure given below.

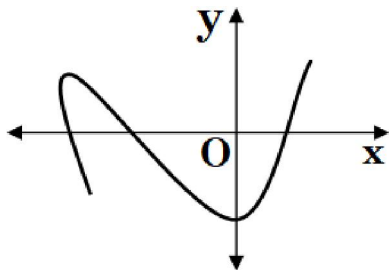
- Write the degree of polynomial $p(x)$.
- Write the number of zeroes of $p(x)$, as per the degree of given polynomial.
- Analyzing the graph shown, how many zeroes are there for $p(x)$? Write the zeroes.



- Sol.** (i) Degree : 2, as the highest exponent of variable x in $p(x) = (x-2)^2 = x^2 - 4x + 4$ is 2.
(ii) As the degree of $p(x)$ is 2 so, there are **exactly two zeroes**.
However the **polynomial will have repeated zeroes (i.e., two equal zeroes)**, as there is a multiplicity of 2. Note that in polynomial $p(x) = (x-2)^2$, the factor $(x-2)$ appears twice, so there is multiplicity of 2 for the polynomial.
(iii) Note that the polynomial touches the x -axis at only **one** point i.e., at $x = 2$. So, the polynomial $p(x)$ has Single (**only one**) real zeroes. Also, the zero of polynomial $p(x)$ is 2.

Exercise 2.1

- Q01. Which of the followings are **not** polynomials?
(a) $3x^3 + x^2 + x^{-2} + 7$ (b) $x^2 + px + q$
(c) $x^2 + \frac{1}{x^2} + 8$ (d) $2x^3 + 3x^2 - 5x - 6$.
Q02. What do you understand by the value of a polynomial at a given point?
Q03. If $p(x) = 3x^3 - 2x^2 + 6x - 5$, find $p(2)$.
Q04. Given a linear polynomial in x , state how many zeroes it can have and why? Illustrate with the help of an example.
Q05. Write a quadratic polynomial whose zeroes are given as α and β .
Q06. The graph of polynomial $p(x)$ is shown in figure.



Write the number of zeroes of $p(x)$.

Exercise 2.2

- Q01. Find the zeroes of the polynomial $mx^2 + (m+n)x + n$.
Q02. Show that the quadratic polynomial $x^2 + 4x + 5$ has no real zeroes.
Q03. Find the zeroes of $x^2 - 2$ and verify the relationship between the zeroes and the coefficients.
Q04. Find the zeroes of $f(m) = 4m^2 + 8m$ and hence verify the relationship between the zeroes and its coefficient.
Q05. Find the zeroes of the quadratic polynomial $f(x) = 6x^2 - x - 15$ and establish a relationship between the zeroes and its coefficients.
Q06. Find the zeroes of $f(x) = 4\sqrt{3}x^2 + 5x - 2\sqrt{3}$ and verify the relationship between the zeroes and its coefficients.
Q07. The sum of the zeroes of the quadratic polynomial $f(y) = ky^2 + 2y + 3k$ is same as their product, determine the value of k .
Q08. If 1 is a zero of the polynomial $f(u) = au^2 - 3(a-1)u - 1$ then, find the value of a .
Q09. For what value of k , -4 is a zero of the polynomial $x^2 - x - (2k + 2)$?
Q10. If one zero of polynomial $(k^2 + 9)x^2 + 13x + 6k$ is reciprocal of the other, find the value of k .
Q11. If one zero of $4x^2 - 9 - 8kx$ is negative of the other, determine the value of k .

- Q12. Find the value of k such that the polynomial $3x^2 + 2kx + x - k - 5$ has the sum of its zeroes as half of their product.
- Q13. If -5 is one of the zeroes of $2x^2 + px - 15$ and quadratic polynomial $p(x^2 + x) + m$ has both of its zeroes equal to each other, then find the value of m .
- Q14. The difference between the squares of the zeroes of $x^2 + px + 45$ is 216, find the value of p .
- Q15. Find the zeroes of the polynomial $2x^2 - 7x + 3$ and hence find the sum and product of its zeroes.
- Q16. Form a quadratic polynomial whose zeroes are the squares of the zeroes of $x^2 - 2x - 5$.
- Q17. Form a quadratic polynomial whose zeroes are 2 and -6 . Verify the relation between the coefficients and zeroes of the polynomial.
- Q18. Form a quadratic polynomial whose sum and product of zeroes are $\sqrt{2}$ and $\frac{1}{3}$.
- Q19. Find a quadratic polynomial whose sum and product of zeroes are $\sqrt{2}$ and 3 respectively.
- Q20. Find the quadratic polynomial whose one zero is $2 + \sqrt{3}$.
- Q21. Find a quadratic polynomial whose zeroes are -5 and 7.
- Q22. If α and β are the zeroes of polynomial $ax^2 + bx + c$, $a \neq 0$, then evaluate:
- (a) $\alpha^2 + \beta^2$

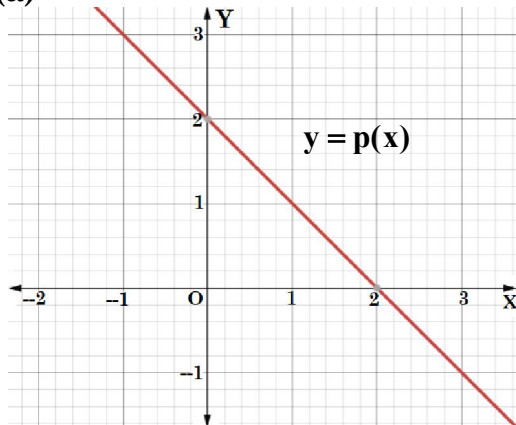
(c) $\left(\frac{\alpha}{\beta}\right)^2 + \left(\frac{\beta}{\alpha}\right)^2$

(b) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$

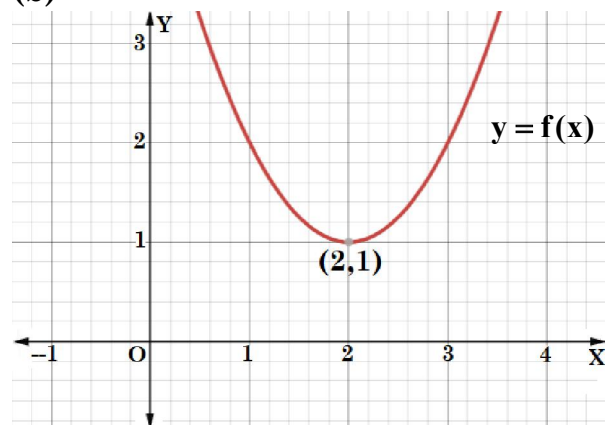
(d) $\frac{1}{\alpha^3} + \frac{1}{\beta^3}$
- Q23. If sum of the squares of zeroes of $f(x) = x^2 - 8x - \lambda$ is 40, then find the value of λ .
- Q24. If α and β are the zeroes of polynomial $f(x) = 2x^2 + 5x + m$ satisfying the relation $\alpha^2 + \beta^2 + \alpha\beta = \frac{21}{4}$, then find the value of m .
- Q25. If α and β are the zeroes of polynomial $f(x) = x^2 - x - 2$, then find a polynomial whose zeroes are $2\alpha + 1$ and $2\beta + 1$.
- Q26. If α and β are the zeroes of polynomial $f(x) = x^2 - 5x + k$ such that $\alpha - \beta = 1$, then find the value of k .
- Q27. If α and β are the zeroes of $2x^2 + 7x - 3$, then find the sum of the reciprocal of its zeroes.
- Q28. If m and n are zeroes of $3x^2 + 11x - 4$, then find the value of $\frac{m}{n} + \frac{n}{m}$.
- Q29. If p and q are zeroes of polynomial $t^2 - 4t + 3$, then show that $\frac{1}{p} + \frac{1}{q} - 2pq + \frac{14}{3} = 0$.
- Q30. If $(x - 6)$ is a factor of $x^3 + ax^2 + bx = 0$ and $a - b = 7$, then find the values of a and b .
- Q31. For what value of k , the polynomial $x^4 + 10x^3 + 25x^2 + 15x + k$ is exactly divisible by $x + 7$.
- Q32. The coefficient of x in the quadratic polynomial $f(x) = x^2 + px + q$ was wrongly written as 17 in place of 13 and the zeroes thus found were -2 and -15 . Find the zeroes of correct polynomial.
- Q33. Find the sum and product of the zeroes of $p^2x^2 + (p^2 - q^2)x - q^2$, also cite the relationship between the zeroes and the coefficients.
- Q34. If α and β are zeroes of $2x^2 + 7x - 3$ then, find the sum of reciprocal of the zeroes.
- Q35. If sum of the zeroes of $kx^2 + 3k + 2x$ is equal to their product then, write the value of k .
- Q36. If the zeroes of $x^2 + (a + 1)x + b$ are 2 and -3 , then find the values of a and b .
- Q37. If one zero of polynomial $(k^2 + 9)x^2 + 13x + 6k$ is reciprocal of the other, find the value of k .

- Q38. If a and b are zeroes of the polynomial $x^2 - x - 6$ then, find a quadratic polynomial whose zeroes are $3a + 2b$ and $2a + 3b$.
- Q39. Find the number of zeroes and values of zeroes (if possible) in the following graphs.

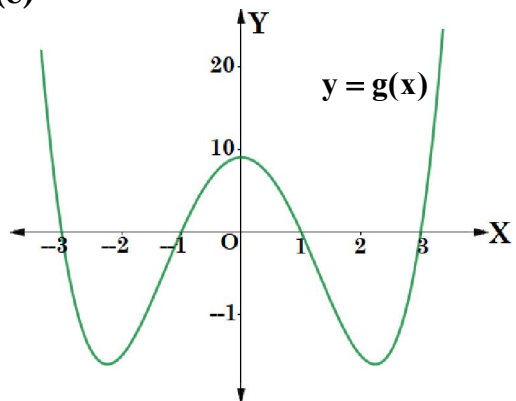
(a)



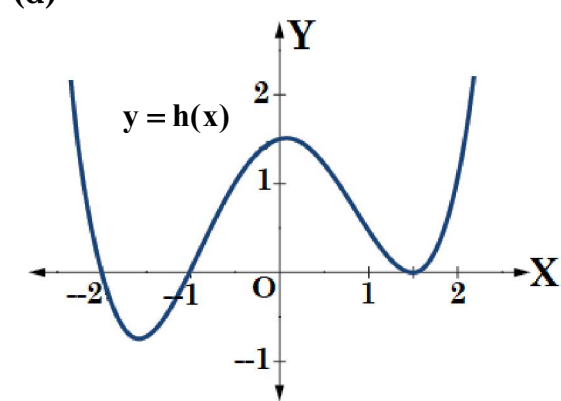
(b)



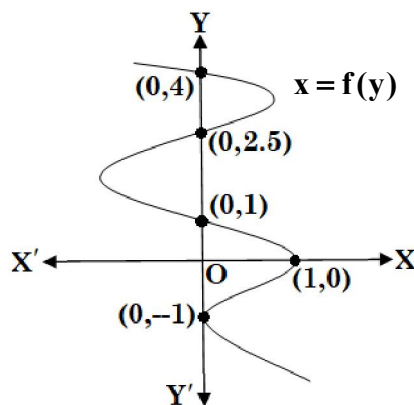
(c)



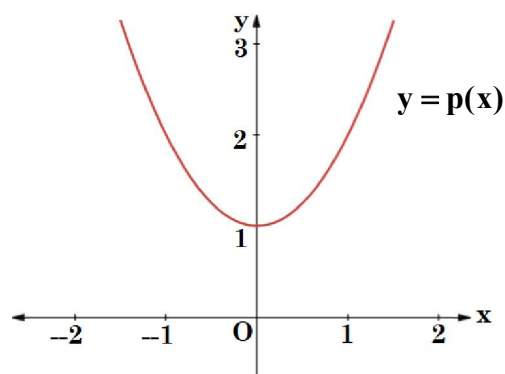
(d)



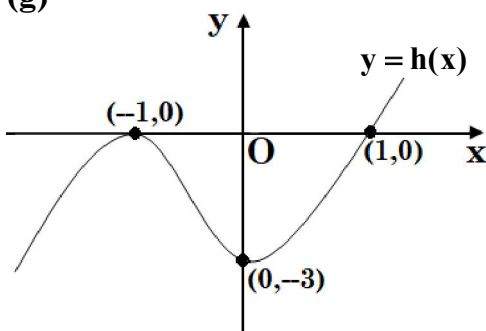
(e)



(f)



(g)

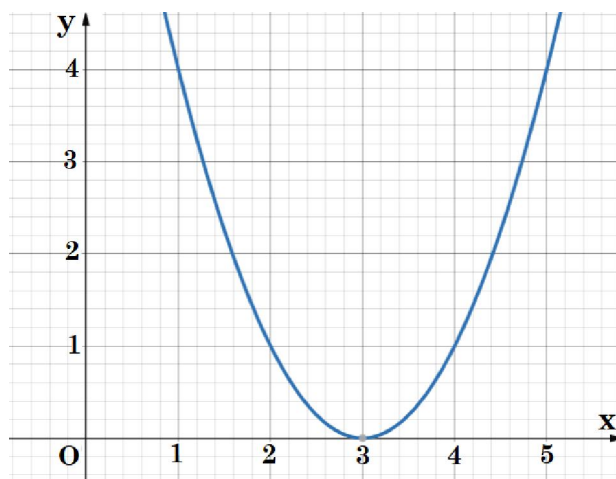


 This is only a Demo sample file of **MATHMISSION FOR X** (2024-25).

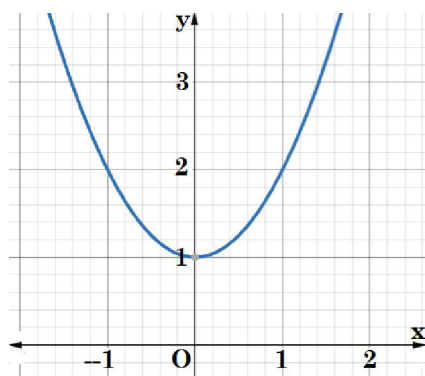
The contents shown here are just glimpses of what we have provided in the Printed book.

- Q40. If α and β are the zeroes of the polynomial $f(x) = ax^2 + bx + c$, then find $\frac{1}{a\alpha + b} + \frac{1}{a\beta + b}$.
- Q41. If α and β are the zeroes of the quadratic polynomial $p(x) = x^2 - ax + b$, then find the value of $\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2} - \frac{a^4}{b^2} + \frac{4a^2}{b}$.
- Q42. If α and β are the zeroes of the quadratic polynomial $f(x) = 3x^2 - 4x + 1$, then find a quadratic polynomial whose zeroes are $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$.
- Q43. If 1 is a zero of the polynomials $at^2 + at + 3$ and $t^2 + t + b$, then find the value of (ab) .
- Q44. If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 - 4x + 3$, then find the value of $\alpha^4\beta^3 + \alpha^3\beta^4$.
- Q45. If one zero of the quadratic polynomial $x^2 + 3kx + 8k$ is 2, then find the value of k and the other zero of the polynomial.
- Q46. Is $7x^2 - \sqrt{x} + 2$ a polynomial? If yes, write its degree. Justify your answer.
- Q47. Write the zeroes of the polynomial $p(x) = x^2 - \sqrt{3}x - \sqrt{2}x + \sqrt{6}$. Also write another polynomial whose zeroes are square of the zeroes of $p(x)$.
- Q48. The graph of polynomial $p(x) = (x - 3)^2$ is shown in figure.

- (i) Write the degree of polynomial $p(x)$.
- (ii) Write the number of zeroes of polynomial $p(x)$, as per the degree.
- (iii) Analyzing the graph shown above, how many zeroes are there for $p(x)$, write the zeroes.



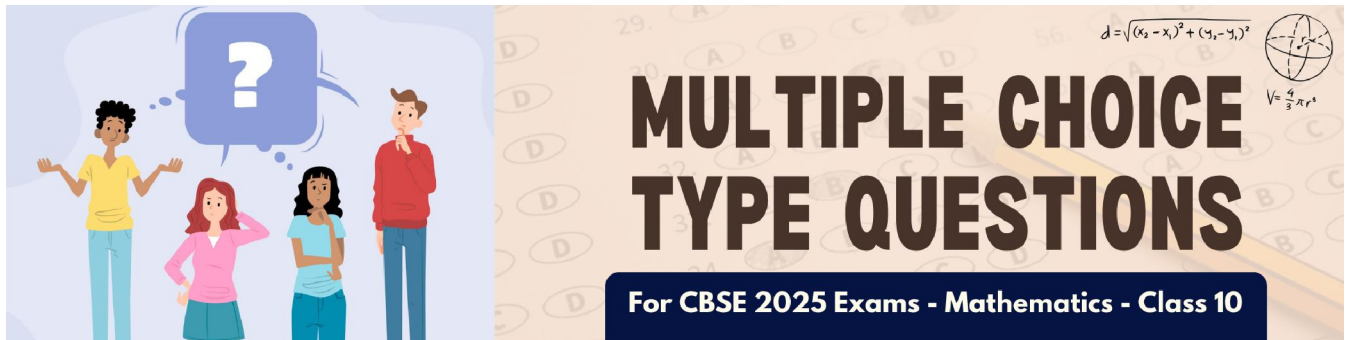
- Q49. The graph of polynomial $p(x) = x^2 + 1$ is shown in figure.



- (i) Write the degree of polynomial $p(x)$.
- (ii) Write the number of zeroes of polynomial $p(x)$, as per the degree.
- (iii) Analyzing the graph shown above, how many real zeroes are there for $p(x)$?



A more general insight for no. of zeroes of polynomials (no. of roots of equations) can be read by scanning the QR-Code given here!



Chapter 01 - Real Numbers

- Q01. The smallest prime number is
 (a) 0 (b) 1 (c) 2 (d) 3
- Q02. The sum of first five prime numbers is
 (a) 26 (b) 15 (c) 39 (d) 28
- Q03. Total prime numbers between 1 and 100 are
 (a) 31 (b) 25 (c) 22 (d) 20
- Q04. The unit's digit obtained on simplifying $207 \times 781 \times 39 \times 94$ is
 (a) 9 (b) 1 (c) 7 (d) 2
- Q05. The number $\sqrt{3}$ is a/an
 (a) integer (b) rational no. (c) irrational no. (d) None of these
- Q06. The HCF and LCM of 6, 72 and 120 is, respectively
 (a) 8, 360 (b) 6, 340 (c) 6, 360 (d) None of these
- Q07. The total number of even prime numbers is
 (a) 0 (b) 1 (c) 2 (d) infinite
- Q08. $\frac{22}{7}$ is a
 (a) prime no. (b) an integer (c) a rational no. (d) an irrational no.
- Q09. The sum of two numbers is 37 and their product is 342. The numbers are
 (a) 18, 19 (b) 23, 14 (c) 24, 13 (d) 28, 9
- Q10. A number is as bigger than 22 as much it is smaller than 72. The number is
 (a) 92 (b) 47 (c) 24 (d) None of these
- Q11. If HCF and LCM of two numbers are 4 and 9696, then the product of two numbers is
 (a) 9696 (b) 24242 (c) 38784 (d) 4848
- Q12. $5 + \sqrt{2} + \sqrt{3}$ is
 (a) a natural no. (b) an integer (c) a rational no. (d) an irrational no.
- Q13. If $\left(\frac{9}{7}\right)^3 \times \left(\frac{49}{81}\right)^{2x-6} = \left(\frac{7}{9}\right)^9$, then the value of x is
 (a) 12 (b) 9 (c) 8 (d) 6
- Q14. The number .211 2111 21111 211111... is a
 (a) terminating decimal
 (b) non-terminating repeating decimal
 (c) non-terminating decimal which is non-repeating
 (d) None of these
- Q15. If $m^n = 32$, where m and n are positive integers, then the value of n^{m^n} is
 (a) 32 (b) 25 (c) 5^{10} (d) 5^{25}

- Q16. Prime factorization of 64 is
 (a) 2^5 (b) 2^6 (c) 8×8 (d) 64×1
- Q17. If p is a prime number and p divides k^2 , then p divides
 (a) $2k^2$ (b) k (c) $3k$ (d) None of these
- Q18. If the HCF of 85 and 153 is expressible in the form of $85n - 153$, then the value of n is
 (a) 3 (b) 2 (c) 4 (d) 1
- Q19. Given that $\text{LCM}(91, 26) = 182$, then $\text{HCF}(91, 26)$ is
 (a) 13 (b) 26 (c) 7 (d) 9
- Q20. Out of the four numbers (i) $\left(\sqrt{5} - \frac{1}{\sqrt{5}}\right)^3$ (ii) $2.1231\overline{23}$ (iii) $2.123123\dots$
 (iv) $(2\sqrt{3} - \sqrt{2})(2\sqrt{3} + \sqrt{2})$, the irrational number is
 (a) i (b) ii (c) iii (d) iv
- Q21. $7 \times 11 \times 13 + 6$ is
 (a) a prime number (b) a composite number
 (c) an even number (d) None of these
- Q22. If $p^n = (a \times 5)^n$, for p^n to end with the digit zero $a = \underline{\hspace{2cm}}$ for any natural number n .
 (a) any natural no. (b) an odd no. (c) any even no. (d) None of these
- Q23. HCF is always
 (a) multiple of LCM (b) factor of LCM
 (c) divisible by LCM (d) Option a and c both
- Q24. $\text{HCF}(47, 61) =$
 (a) 2867 (b) 1 (c) 47 (d) 61
- Q25. $\text{LCM}(47, 61) =$
 (a) 2867 (b) 1 (c) 47 (d) 61

Chapter 02 - Polynomials

- Q01. The quadratic polynomials with the sum and the products of its zeroes as $\frac{1}{4}$ and -1 respectively, is
 (a) $4x^2 + x + 1$ (b) $4x^2 + x + 4$ (c) $4x^2 + x - 1$ (d) $4x^2 - x - 4$
- Q02. If $x^2 + \frac{1}{x^2} = 102$, then the value of $x - \frac{1}{x}$ is
 (a) 8 (b) 10 (c) 12 (d) 13
- Q03. The polynomial $p(x) = x^2 + 2x + 5x^3 - 3$ is
 (a) linear polynomial (b) cubic polynomial
 (c) constant polynomial (d) quadratic polynomial
- Q04. The quadratic polynomial, the sum and product of whose zeroes are -1 and 1 respectively, is
 (a) $x^2 - 1$ (b) $x^2 + 1$ (c) $x^2 + x$ (d) $x^2 - x$
- Q05. The zeroes of quadratic polynomial $t^2 - 15$ are
 (a) $-\sqrt{15}, \sqrt{15}$ (b) $\sqrt{15}, \sqrt{12}$ (c) $\sqrt{15}, -\sqrt{12}$ (d) $\sqrt{15}, -15$
- Q06. A quadratic polynomials, the sum and product of whose zeroes are $-\frac{1}{4}$ and $\frac{1}{4}$ respectively, is

- (a) $4x^2 + x + 1$ (b) $x^2 - 3x + 2$ (c) $x^2 + 3x - 2$ (d) None of these
- Q07. If $\left(x + \frac{1}{x}\right) = 3$, then $x^2 + \frac{1}{x^2}$ is equal to
 (a) $\frac{82}{9}$ (b) $\frac{10}{3}$ (c) 7 (d) 11
- Q08. If $x^{1/3} + y^{1/3} + z^{1/3} = 0$, then
 (a) $x + y + z = 0$ (b) $x + y + z = 3xyz$
 (c) $(x + y + z)^3 = 27xyz$ (d) $x^3 + y^3 + z^3 = 0$
- Q09. If $p(x) = 3x^2 - 5x$, then $p(2) =$ _____ :
 (a) 2 (b) 3 (c) 0 (d) None of these
- Q10. The quadratic polynomials whose zeroes are $\frac{3}{5}$ and $-\frac{1}{2}$, is
 (a) $10x^2 - x - 3$ (b) $10x^2 + x - 3$ (c) $10x^2 - x + 3$ (d) None of these

Chapter 03 - Pair of Linear Equations in two Variables

- Q01. The solutions of the equation $2x - y - 5 = 0$ are
 (a) $x = 2, y = -1$ (b) $x = 2, y = 1$ (c) $x = 1, y = -1$ (d) $x = -2, y = 1$
- Q02. The sum of digits of a two digit number is 9. Also, 9 times this number is twice the number obtained by reversing the order of the digits. The number is
 (a) 20 (b) 16 (c) 18 (d) None of these
- Q03. The system of equations $kx - y = 2$ and $6x - 2y = 3$ has a unique solution when
 (a) $k = 0$ (b) $k \neq 0$ (c) $k = 3$ (d) $k \neq 3$
- Q04. A boat can row 1 km with stream in 10 minutes and 1 km against the stream in 20 minutes. The speed of the boat in still water is
 (a) 1.5 km/hr (b) 3 km/hr (c) 3.4 km/hr (d) 4.5 km/hr
- Q05. A boat goes 24 km upstream and 28 km downstream in 6 hours. It goes 30 km upstream and 21 km downstream in 6 hours and 30 minutes. The speed of the boat in still water is
 (a) 4 km/hr (b) 6 km/hr (c) 10 km/hr (d) 14 km/hr
- Q06. Point (4, 3) lies on the line
 (a) $3x + 7y = 27$ (b) $7x + 2y = 47$ (c) $3x + 4y = 24$ (d) $5x - 4y = 1$
- Q07. The speed of train 150 m long is 50 km/hr. The time it will take to cross a platform 600 m long is
 (a) 50 sec (b) 54 sec (c) 60 sec (d) None of these
- Q08. The graph of an equation $y = -3$ is a line which will be
 (a) parallel to x-axis (b) parallel to y-axis
 (c) passing through origin (d) on x-axis
- Q09. The value of k for which $kx + 2y = 5$ and $3x + y = 1$ have unique solution, is
 (a) $k = -1$ (b) $k \neq 6$ (c) $k = 6$ (d) $k = 2$
- Q10. The graph of the equation $x - y = 0$ is
 (a) parallel to x-axis (b) parallel to y-axis
 (c) passing through origin (d) None of these

Chapter 04 - Quadratic Equations

- Q01. The general form of a quadratic equation is
 (a) $ax^2 + bx + c$ (b) $ax^2 + bx + c = 0$ (c) $a^2x + b$ (d) $ax^2 + bx + c = 0, a \neq 0$

- Q02. The number of possible solutions of a quadratic equation are
 (a) exactly two (b) at most two (c) at least two (d) None of these
- Q03. The discriminant of the equation $bx^2 + ax + c = 0$, $b \neq 0$ is given by
 (a) $\sqrt{b^2 - 4ac}$ (b) $\sqrt{a^2 + 4bc}$ (c) $\sqrt{a^2 - 4bc}$ (d) $\sqrt{b^2 + 4ac}$
- Q04. If the roots of a quadratic equation are equal, then the discriminant is
 (a) 1 (b) 0 (c) greater than 0 (d) less than 0
- Q05. The roots of $3x^2 - 7x + 4 = 0$ are
 (a) rationals (b) irrationals (c) positive integers (d) negative integers
- Q06. The roots of equation $x + \frac{16}{x} = 10$ are
 (a) 4, 6 (b) 4, 4 (c) 4, 5 (d) 2, 8
- Q07. If α, β are the roots of $x^2 + px + q = 0$, then the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ is
 (a) $\frac{p^2 - 2q}{q}$ (b) $\frac{2q - p^2}{q}$ (c) $\frac{p^2 + 2q}{q}$ (d) None of these
- Q08. If the roots of $ax^2 + bx + c = 0$ be equal, then the value of c is
 (a) $-\frac{b}{2a}$ (b) $\frac{b}{2a}$ (c) $-\frac{b^2}{4a}$ (d) $\frac{b^2}{4a}$
- Q09. If the sum of the roots of an equation is 6 and one root is $3 - \sqrt{5}$, then the equation is
 (a) $x^2 - 6x + 4 = 0$ (b) $x^2 - 4x + 6 = 0$ (c) $x^2 - 6x + 5 = 0$ (d) None of these
- Q10. If α, β be the roots of $ax^2 + bx + c = 0$, then the value of $\alpha^2 + \beta^2$ is
 (a) $\frac{b^2 - 2ac}{2a}$ (b) $\frac{b^2 - 4ac}{2a}$ (c) $\frac{b^2 - 2ac}{a^2}$ (d) $\frac{b^2 + 4ac}{2ac}$

Chapter 05 - Arithmetic Progression

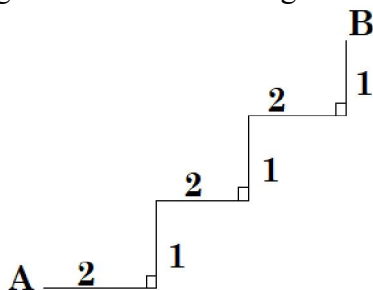
- Q01. If a, b, c are in A.P., then
 (a) $a + c = 2b$ (b) $b + a = 2c$ (c) $c = \frac{a+b}{2}$ (d) $a + c = b$
- Q02. Next term of the A.P. 9, 11, 13, 15, ... is
 (a) 20 (b) 17 (c) 18 (d) 19
- Q03. The sum of 6th and 7th terms of an A.P. is 39 and the common difference is 3, then the first term of A.P. is
 (a) 2 (b) -3 (c) 4 (d) 3
- Q04. The sum of three numbers in A.P. is 30. If the greatest is 13, then its common difference is
 (a) 2 (b) 4 (c) 5 (d) 3
- Q05. The 9th term from the end of the A.P. 7, 11, 15, ..., 147 is
 (a) 135 (b) 125 (c) 115 (d) 110
- Q06. The sum of first 10 natural numbers is
 (a) 50 (b) 60 (c) 55 (d) 65
- Q07. The common difference of the A.P. $8\frac{1}{8}, 8\frac{2}{8}, 8\frac{3}{8}, \dots$ is
 (a) $\frac{1}{8}$ (b) $1\frac{1}{8}$ (c) $8\frac{1}{8}$ (d) 1
- Q08. How many natural numbers up to 300 are divisible by 17?
 (a) 13 (b) 15 (c) 17 (d) 19
- Q09. The sum of first n natural number is

- (a) $0.5n(n+1)$ (b) $\frac{n^2}{2}$ (c) $n+2$ (d) $0.5+(n+1)$

- Q10. The fifteenth term of the arithmetic progression $-23, -19, -15, \dots$ is
 (a) 30 (b) 31 (c) 32 (d) 33

Chapter 06 - Triangles

- Q01. Given that $\triangle ABC \sim \triangle DEF$. If $DE = 2AB$ and $BC = 3$ cm, then EF is equal to
 (a) 12 cm (b) 2 cm (c) 1.5 cm (d) 6 cm
- Q02. See the figure given below. The straight line distance between A and B is



- (a) $5\sqrt{3}$ (b) 5 (c) $3\sqrt{5}$ (d) $5\sqrt{2}$
- Q03. In a triangle ABC, $\angle A = 25^\circ$ and $\angle B = 35^\circ$; $AB = 16$ units.
 In another triangle PQR, $\angle P = 25^\circ$ and $\angle Q = 35^\circ$; $PQ = 4$ units.
 Which of the following is true?
 (a) $\triangle ABC = \triangle PQR$ (b) $\triangle ABC \approx \triangle PQR$ (c) $\triangle ABC \cong \triangle PQR$ (d) $\triangle ABC \sim \triangle PQR$
- Q04. The altitude of an equilateral triangle, having the length of its side as 12 cm, is
 (a) $6\sqrt{2}$ cm (b) 6 cm (c) 8.5 cm (d) $6\sqrt{3}$ cm
- Q05. The triangles are similar, if
 (a) their corresponding angles are equal (b) their corresponding sides are proportional
 (c) Options 'a' and 'b' both are correct (d) there is at least one angle of 90°
- Q06. If in two triangles $\triangle DEF$ and $\triangle PQR$, $\angle D = \angle Q$ and $\angle R = \angle E$, then which of the following is **not** true?
 (a) $\frac{DE}{QR} = \frac{DF}{PQ}$ (b) $\frac{DE}{PQ} = \frac{EF}{RP}$ (c) $\frac{EF}{PR} = \frac{DF}{PQ}$ (d) $\frac{EF}{RP} = \frac{DE}{QR}$
- Q07. All the equilateral triangles are always _____.
 (a) Similar (b) Congruent (c) both (a) and (b) (d) None of these
- Q08. In $\triangle ABC$, D and E are points on the sides AB and AC respectively such that $DE \parallel BC$.
 If $\frac{AD}{DB} = \frac{2}{3}$ and $AC = 18$ cm, then AE is equal to
 (a) 5.2 cm (b) 6.2 cm (c) 7.2 cm (d) 8.2 cm
- Q09. In a right triangle ABC right angled at C, $AC = BC$. Then $AB^2 = \frac{\quad}{\quad} \times AC^2$.
 (a) 1 (b) 2 (c) 4 (d) None of these
- Q10. If the three sides of a triangle are a , $\sqrt{3}a$ and $\sqrt{2}a$, then the measure of the angle opposite to the longest side is
 (a) 60° (b) 90° (c) 45° (d) 30°

Chapter 07 - Coordinate Geometry

- Q01. P is a point on x-axis at a distance of 3 units from y-axis to its left. The coordinates of P are
 (a) (3, 0) (b) (0, 3) (c) $(-3, 0)$ (d) $(0, -3)$

- Q02. The coordinates of the point where the line $\frac{x}{a} + \frac{y}{b} = 7$ intersects y-axis are
 (a) (a, 0) (b) (0, b) (c) (0, 7b) (d) (7a, 0)
- Q03. The area of the triangle OAB, the coordinates of the points A(4, 0), B(0, -7) and O is origin, is
 (a) 11 sq.units (b) 18 sq.units (c) 28 sq.units (d) None of these
- Q04. The line $\frac{x}{2} + \frac{y}{4} = 1$ intersects the axes at P and Q, the coordinates of the midpoint of PQ are
 (a) (1, 2) (b) (2, 0) (c) (0, 4) (d) (2, 1)
- Q05. The distance between the lines $2x + 4 = 0$ and $x - 5 = 0$, is
 (a) 9 units (b) 1 unit (c) 5 units (d) 7 units
- Q06. The distance between the points $(5 \cos 35^\circ, 0)$ and $(0, 5 \cos 55^\circ)$ is
 (a) 10 units (b) 1 unit (c) 5 units (d) 2 units
- Q07. If 'a' is any positive integer such that the distance between the points P(a, 2) and Q(3, -6) is 10 units, then the value of 'a' is
 (a) -3 (b) 6 (c) 9 (d) 3
- Q08. The perimeter of triangle formed by the points (0, 0), (2, 0) and (0, 2) is
 (a) 4 units (b) 6 units (c) $6\sqrt{2}$ units (d) $4 + 2\sqrt{2}$ units
- Q09. The points (1, 2), (-5, 6) and (a, -2) are collinear only, if a =
 (a) -3 (b) 7 (c) 2 (d) 5
- Q10. The two points of line segment are (a, b) and (-a, -b), then the length of the line is
 (a) $\sqrt{a^2 + b^2}$ (b) $2\sqrt{a^2 + b^2}$ (c) $\frac{2}{3}\sqrt{a^2 + b^2}$ (d) None of these

Chapter 08 - Introduction to Trigonometry

- Q01. If $x = r \sin \theta$ and $y = r \cos \theta$, then the value of $x^2 + y^2$ is
 (a) r (b) r^2 (c) $\frac{1}{r}$ (d) 1
- Q02. The value of $\operatorname{cosec} 30^\circ - \sec 60^\circ$ is
 (a) 0 (b) 1 (c) 90° (d) 50°
- Q03. If $3 \sec \theta - 5 = 0$, then $\cot \theta$ is equal to
 (a) $\frac{5}{3}$ (b) $\frac{4}{5}$ (c) $\frac{3}{4}$ (d) $\frac{3}{5}$
- Q04. If $\theta = 45^\circ$, then $\sec \theta \cot \theta - \operatorname{cosec} \theta \tan \theta$ is
 (a) 0 (b) 1 (c) $2\sqrt{2}$ (d) $\sqrt{2}$
- Q05. If $\cos \theta \times \frac{1}{\sec \theta} = 1$ and θ is an acute angle, then θ is
 (a) 90° (b) 60° (c) 30° (d) 0°
- Q06. Triangle TRY is a right angled isosceles triangle, then $\cos T + \cos R + \cos Y$ is
 (a) $\sqrt{2}$ (b) $2\sqrt{2}$ (c) $1 + 2\sqrt{2}$ (d) $1 + \frac{1}{\sqrt{2}}$
- Q07. If triangles ABC and PRT are similar such that $\angle C = \angle R = 90^\circ$ and $\frac{AC}{AB} = \frac{3}{5}$, then $\sin T$ is
 (a) $\frac{3}{5}$ (b) $\frac{5}{3}$ (c) $\frac{4}{5}$ (d) $\frac{5}{4}$
- Q08. If $k + 7 \sec^2 62^\circ - 7 \tan^2 62^\circ = 7$, then the value of k is

- (a) 1 (b) 0 (c) 7 (d) $\frac{1}{7}$

Q09. The value of $\cot^2 \theta - \left(\frac{1}{\sin \theta} \times \operatorname{cosec} \theta \right)$ is

- (a) 1 (b) 0 (c) 2 (d) -1

Q10. $\frac{\sin \theta}{\sqrt{1 - \sin^2 \theta}}$ can also be written as

- (a) $\cot \theta$ (b) $\sqrt{\sin \theta}$ (c) $\frac{\sin \theta}{\sqrt{\cos \theta}}$ (d) $\tan \theta$

Q11. If $\sin 30^\circ \tan 45^\circ = \frac{\sec 60^\circ}{k}$, then the value of k is

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

Q12. $1 + \tan^2 \theta$ equals

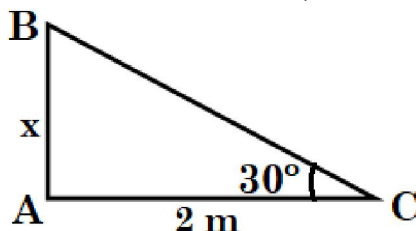
- (a) $\sec \theta$ (b) $\sec^2 \theta$ (c) $\sec 2\theta$ (d) $\cot^2 \theta$

Q13. If $\operatorname{cosec} \theta = \frac{13}{12}$, then

- (a) $\tan \theta = \frac{12}{5}$ (b) $\tan \theta = -\frac{5}{12}$ (c) $\tan \theta = \frac{12}{25}$ (d) $\tan \theta = \pm \frac{12}{25}$

Chapter 09 - Applications of Trigonometry

Q01. In the figure given below, if $AC = 2$ m and $BA = x$, then x equals



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

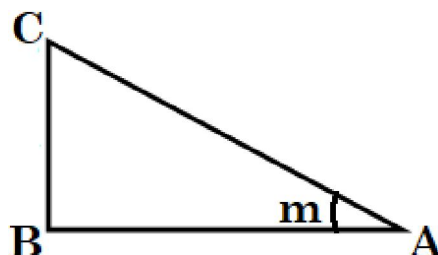
Q02. The angle of elevation of the top of a tower from the points at a distance of 4 m and 9 m from the base of the land in the same straight line with it, are complementary. Then the height of the tower is

- (a) 4 m (b) 7 m (c) 12 m (d) 6 m

Q03. The angle of elevation of the top of a tower from two points at distances 'a' and 'b' from the base and on the same straight line with it are complimentary. The height of the tower is

- (a) ab (b) $\sqrt{ab}$ (c) $(ab)^2$ (d) $\frac{a}{b}$

Q04. In the figure given below, $\tan m = \frac{3}{4}$. If $AB = 12$ cm, then BC is

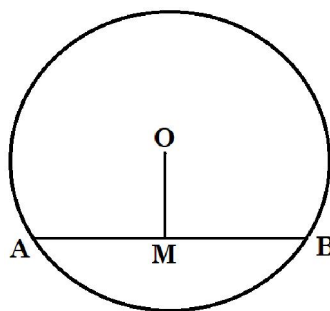


- (a) 8 cm (b) 12 cm
(c) 10 cm (d) 9 cm

- Q05. A tower stands vertically on the ground, from a point on the ground, which is 15 m away from the foot of the tower, the angle of elevation of the top of the tower is found to be 60° . The height of tower is
- (a) 3 m (b) $15\sqrt{3}$ m (c) 15 m (d) $3\sqrt{15}$ m

Chapter 10 - Circles

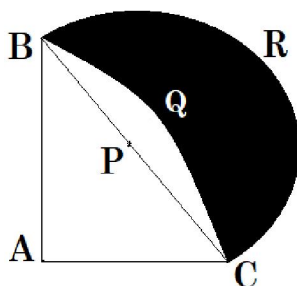
- Q01. The complement of 63° is
(a) 118° (b) 28° (c) 38° (d) None of these
- Q02. The supplement of 60° is
(a) 30° (b) 40° (c) 120° (d) None of these
- Q03. An angle which is greater than 180° but less than 360° is called
(a) an acute angle (b) an obtuse angle (c) an adjacent angle (d) a reflex angle
- Q04. In the following figure, O is the centre of a circle and AB is chord of circle, whose length is 24 cm. If the length of the perpendicular OM on AB is 5 cm, the radius of the circle is



- (a) 10 cm (b) 12 cm
(c) 13 cm (d) 14.5 cm
- Q05. A tangent PQ at a point P of a circle of radius 5 cm meets a line through the centre O at a point Q so that $OQ = 12$ cm. Length PQ is
(a) 12 cm (b) 13 cm (c) 8.5 cm (d) $\sqrt{119}$ cm
- Q06. If the radius of the circle is 13 cm and the chord is 10 cm, then the length of the perpendicular drawn from the centre to the chord is
(a) 12 cm (b) 13 cm (c) 8 cm (d) None of these

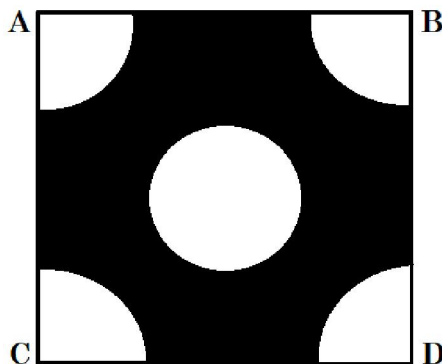
Chapter 11 - Areas Related to Circles

- Q01. In the given figure, ABC is quadrant of radius 14 cm and a semicircle is drawn taking BC as the diameter. The area of the shaded region is



- (a) 102 cm^2 (b) 98 cm^2 (c) 89 cm^2 (d) 201 cm^2
- Q02. If the biggest hand of a clock is 15 cm long, then the distance covered by it in 40 minutes will be
(a) 31.5 cm (b) 72.8 cm (c) 24.1 cm (d) None of these
- Q03. The area of a triangle whose sides are respectively 3, 4 and 5 (in cm) is
(a) 6 cm^2 (b) 60 cm^2 (c) 30 cm^2 (d) 10 cm^2
- Q04. The radius of circle is increased by 1 cm, then the ratio of the new circumference to the diameter is (if diameter of new circle is considered)

- (a) $\pi : 2$ (b) $\pi + 1$ (c) $\pi : 1$ (d) None of these
- Q05. A square and an equilateral triangle have equal perimeters. If the diagonal of the square is $6\sqrt{2}$ cm, then the area of the triangle is
 (a) $16\sqrt{2}$ cm² (b) $16\sqrt{3}$ cm² (c) $12\sqrt{2}$ cm² (d) None of these
- Q06. The area of a circle inscribed in an equilateral triangle is 48π sq.units. Then the perimeter of triangle (in units) is given as
 (a) $72\sqrt{3}$ (b) 72 (c) $48\sqrt{3}$ (d) 36
- Q07. The minute hand of a clock is $\sqrt{21}$ cm long. The area described by minute hand on the face of the clock between 7:00 am to 7:05 am is
 (a) 4.5 cm² (b) 6.6 cm² (c) 5.5 cm² (d) Can't be determined
- Q08. If the minute hands of two clocks are of length 3 cm and 4 cm respectively. The ratio of the areas in two clocks covered by the minute hands in $\frac{1}{2}$ hour will be
 (a) 9:16 (b) 4:9 (c) 16:9 (d) None of these
- Q09. From each corner of a square of sides 4 cm a quadrant of a circle of a radius 1 cm is cut and also a circle of a diameter 2 cm is cut. The area of the remaining portion of the square is (see the figure)



- (a) 10.25 cm² (b) 9.72 cm² (c) 11.52 cm² (d) None of these

Chapter 12 - Surface Areas and Volumes

- Q01. The curved surface area (in sq. units) of a cylinder with the diameter 2 units and height of 1 unit is
 (a) π (b) 2π (c) 3π (d) 4π
- Q02. The volume (in cubic units) of cylinder of radius and height both of 1 unit is given by
 (a) π (b) 2π (c) 3π (d) 4π
- Q03. The volume (in cubic units) of cone of radius and height both of 1 unit is given by
 (a) π (b) 2π (c) $\frac{\pi}{3}$ (d) 3π
- Q04. The area of an equilateral triangle is $\sqrt{3}$ m², then its side is
 (a) $3\sqrt{3}$ m (b) $\frac{3\sqrt{3}}{4}$ m (c) 2 m (d) 4 m
- Q05. Volume of the cubes is in the ratio of 8:125. The ratio of their surface areas is
 (a) 8:125 (b) 2:5 (c) 4:25 (d) 16:25
- Q06. Volume (in cubic units) of a sphere of radius 3 units is given by
 (a) 18π (b) 36π (c) 36 (d) 54π
- Q07. Diameter of a sphere is 6 cm. It is melted and drawn into a wire of radius 0.2 cm. Then the length of the wire is

- (a) 6 cm (b) 700 cm (c) 900 cm (d) None of these
- Q08. The surface area of the walls of a cuboidal room is
(a) $2(l + b + h)$ (b) $l b h$ (c) $2(l b + b h + l h)$ (d) $2(l + b) h$
- Q09. If a right circular cone of vertical height 12 cm has a volume of 616 cm^3 , then the radius of its base is
(a) 6 cm (b) 7 cm (c) 8 cm (d) 9 cm
- Q10. If all the sides of a cube are doubled, then its area will become
(a) 2 times (b) 3 times (c) 4 times (d) 8 times

Chapter 13 - Statistics

- Q01. Weight of 40 eggs were recorded as given below.

Weights (in gm)	85-89	90-94	95-99	100-104	105-109
No. of eggs	10	12	12	4	2

- The lower limit of the median class is
(a) 90 (b) 95 (c) 94.5 (d) 89.5
- Q02. Mode is the value of the variable which has
(a) maximum frequency (b) minimum frequency
(c) mean frequency (d) middle-most frequency
- Q03. The relationship between mean, median and mode for a moderately skewed distribution is
(a) mode = median – 2 mean (b) mode = 3 median – 2 mean
(c) mode = 2 median – 3 mean (d) mode = median – mean
- Q04. What is the mode if mean and median are 10.5 and 9.6 respectively?
(a) 7 (b) 7.8 (c) 8 (d) 8.4
- Q05. Mode and mean of a data are 12k and 15k respectively. Then the median of the data is
(a) 16k (b) 15k (c) 12k (d) 14k

Chapter 14 - Probability

- Q01. If E is an event, then the value of $P(E) + P(\bar{E})$ is
(a) 0 (b) 1 (c) 2 (d) None of these
- Q02. If P(E) is 38% for an event E, then the probability of failure of this event is
(a) 12% (b) 62% (c) 100% (d) 0
- Q03. In a survey, it is found that every fifth person possess a vehicle. The probability of a person 'not possessing the vehicle' is
(a) $\frac{1}{5}$ (b) $\frac{4}{5}$ (c) $\frac{3}{5}$ (d) 1
- Q04. Which of the following can't be the probability of an event?
(a) $\frac{2}{3}$ (b) $-\frac{1}{5}$ (c) 15 % (d) 0.7
- Q05. If 'p' is the probability of an impossible event, then p =
(a) $\frac{2}{3}$ (b) 0.1 (c) 1 (d) 0
- Q06. The probability of a sure event is
(a) 0 (b) 1 (c) 2 (d) None of these
- Q07. What is the probability that an ordinary year has 53 Sundays?
(a) $\frac{6}{13}$ (b) $\frac{1}{7}$ (c) $\frac{2}{7}$ (d) $\frac{3}{8}$

- Q08. A bag contains 9 red, 7 white and 4 black balls. A ball is drawn randomly. The probability that the 'ball drawn is not red' is
 (a) $\frac{9}{20}$ (b) $\frac{9}{11}$ (c) $\frac{2}{11}$ (d) $\frac{11}{20}$
- Q09. If a die is thrown, and the probability of getting a number less than 5 is given by p, then which of the following is true for p?
 (a) 1 (b) 0 (c) $0 < p < 1$ (d) $p > 1$
- Q10. If red face cards are removed from the deck of 52 playing cards, then the probability of getting a black jack is
 (a) $\frac{2}{46}$ (b) $\frac{2}{52}$ (c) $\frac{4}{48}$ (d) $\frac{2}{23}$



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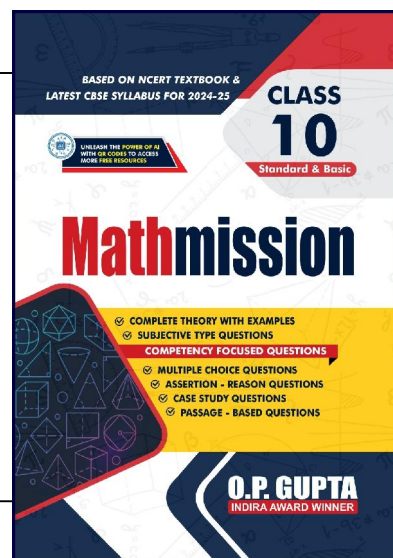
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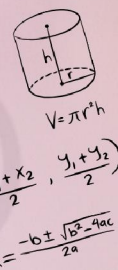
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ASSERTION REASON TYPE QUESTIONS

For CBSE 2025 Exams - Mathematics - Class 10

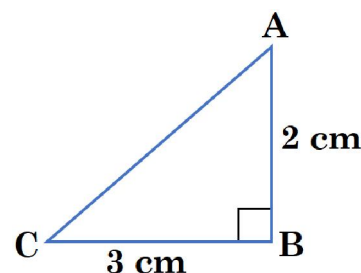


In the following questions, a statement of **Assertion (A)** is followed by a statement of **Reason (R)**. Choose the correct answer out of the following choices.

- (a) Both A and R are true and R is the correct explanation of A.
- (b) Both A and R are true and R is not the correct explanation of A.
- (c) A is true but R is false.
- (d) A is false but R is true.

◆ Chapter-01 Real Numbers

- Q01. **Assertion (A)** : The perimeter of $\triangle ABC$ is a rational number.
Reason (R) : The sum of the squares of two rational numbers is always rational.



- Q02. **Assertion (A)** : The number 5^n cannot end with the digit 0, where n is a natural number.
Reason (R) : Prime factorisation of 5 has only two factors, 1 and 5.
- Q03. **Assertion (A)** : $\sqrt{2}(5 - \sqrt{2})$ is an irrational number.
Reason (R) : Product of two irrational numbers is always irrational.
- Q04. **Assertion (A)** : The HCF of two numbers is 5 and their product is 150. Then their LCM is 40.
Reason (R) : For any two positive integers a and b , $\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$.

◆ Chapter-02 Polynomials

- Q01. **Assertion (A)** : The polynomial $p(x) = x^2 + 3x + 3$ has two real zeroes.
Reason (R) : A quadratic polynomial can have at most two real zeroes.
- Q02. **Assertion (A)** : Polynomial $x^2 + 4x$ has two real zeroes.
Reason (R) : Zeroes of the polynomial $x^2 + ax$ ($a \neq 0$) are 0 and a .
- Q03. **Assertion (A)** : If one zero of the quadratic polynomial $4x^2 - 10x + (k - 4)$ is reciprocal of the other, then value of k is 8.
Reason (R) : Zeroes of the quadratic polynomial $x^2 - 2x + 1$ are real and equal.
- Q04. **Assertion (A)** : If $5 + \sqrt{7}$ and $5 - \sqrt{7}$ are zeroes of a quadratic polynomial, then the polynomial is given by $x^2 - 10x + 18$.
Reason (R) : If α and β are the zeroes of a quadratic polynomial, then the polynomial is given by $x^2 - (\alpha + \beta)x + \alpha\beta$.

◆ Chapter-03 Pair of Linear Equations in Two Variables

- Q01. **Assertion (A)** : The system of linear equations $3x + 5y - 4 = 0$ and $15x + 25y - 25 = 0$ is inconsistent.

Reason (R) : The pair of linear equations given by $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ is inconsistent if $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$.

Q02. **Assertion (A) :** Point P(0, 2) is the point of intersection of y-axis with the line $3x + 2y = 4$.

Reason (R) : The distance of point P(0, 2) from x-axis is 2 units.

Q03. **Assertion (A) :** The pair of linear equations $5x + 2y + 6 = 0$ and $7x + 6y + 18 = 0$ have infinitely many solutions.

Reason (R) : The pair of linear equations given by $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ have infinitely many solutions, if $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$.

Q04. **Assertion (A) :** The two lines given by $2x + 3y = 7$ and $4x + 6y = 14$ intersect at infinite points.

Reason (R) : When $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$, then the system of linear equations $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2y + c_2 = 0$ has infinite no. of solutions.

◆ Chapter-04 Quadratic Equations

Q01. **Assertion (A) :** Equation $2x^2 + 3x + 4 = 0$ has no real roots.

Reason (R) : When discriminant of a quadratic equation is zero, then the equation has real and distinct roots.

Q02. **Assertion (A) :** If one root of the quadratic equation $4x^2 - 10x + (k - 4) = 0$ is reciprocal of the other, then value of k is 8.

Reason (R) : Roots of the quadratic equation $x^2 - x + 1 = 0$ are real.

Q03. **Assertion (A) :** If $5 + \sqrt{7}$ is a root of a quadratic equation with rational coefficients, then its other root is $5 - \sqrt{7}$.

Reason (R) : Surd roots of a quadratic equation with rational coefficients occur in conjugate pairs.

Q04. **Assertion (A) :** The equation $x^2 + 6x + 9 = 0$ has real and equal roots.

Reason (R) : When discriminant $b^2 - 4ac$ of a quadratic equation $ax^2 + bx + c = 0$; $a \neq 0$ is zero, then the equation has real and equal roots.

◆ Chapter-05 Arithmetic Progression

Q01. **Assertion (A) :** a, b, c are in A.P. if and only if $2b = a + c$.

Reason (R) : The sum of first n odd natural numbers is n^2 .

Q02. **Assertion (A) :** Common difference of the A.P. 5, 1, -3, -7, ... is 4.

Reason (R) : Common difference of the A.P. $a_1, a_2, a_3, \dots, a_n$ is obtained by $d = a_n - a_{n-1}$.

Q03. **Assertion (A) :** $-5, -\frac{5}{2}, 0, \frac{5}{2}, \dots$ is in arithmetic progression.

Reason (R) : The terms of an Arithmetic Progression cannot have both positive and negative rational numbers.

Q04. **Assertion (A) :** Sum of n terms of an AP is always a quadratic polynomial.

Reason (R) : General term of an AP is always a quadratic polynomial.

◆ Chapter-06 Triangles

Q01. **Assertion (A) :** If two triangles are similar, their corresponding angles are equal.

Reason (R) : Any two equilateral triangles are always similar.

Q02. **Assertion (A) :** If $\Delta_1 \sim \Delta_2$ and $\Delta_2 \sim \Delta_3$, then $\Delta_1 \sim \Delta_3$.

Reason (R) : If one polygon is similar to another polygon and this second polygon is similar to a third polygon, then the first polygon is similar to the third polygon.

Q03. **Assertion (A) :** If two triangles are similar, their corresponding medians are in the same ratio as their corresponding sides.

Reason (R) : Similar triangles have corresponding sides that are proportional.

Q04. **Assertion (A) :** All circles are similar.

Reason (R) : All squares are congruent.

◆ Chapter-07 Coordinate Geometry

Q01. **Assertion (A) :** The point (0, 4) lies on y-axis.

Reason (R) : The x-coordinate of a point, lying on y-axis, is zero.

Q02. **Assertion (A) :** If the points A(4, 3) and B(x, 5) lie on a circle with centre O(2, 3), then the value of x is 2.

Reason (R) : Centre of a circle is the mid-point of each chord of the circle.

Q03. **Assertion (A) :** Mid-point of a line segment divides the line segment in the ratio 1:1.

Reason (R) : The ratio in which the point (-3, k) divides the line segment joining the points (-5, 4) and (-2, 3) is 1:2.

Q04. **Assertion (A) :** The point which divides the line segment joining the points A(1, 2) and B(-1, 1) internally in the ratio 1:2 is $\left(-\frac{1}{3}, \frac{5}{3}\right)$.

Reason (R) : The coordinates of the point which divides the line segment joining the points A(x_1, y_1) and B(x_2, y_2) in the ratio $m_1 : m_2$ are $\left(\frac{m_1 x_2 + m_2 x_1}{m_1 + m_2}, \frac{m_1 y_2 + m_2 y_1}{m_1 + m_2}\right)$.

◆ Chapter-08 Introduction to Trigonometry

Q01. **Assertion (A) :** For $0^\circ < \theta \leq 90^\circ$, $\operatorname{cosec} \theta - \cot \theta$ and $\operatorname{cosec} \theta + \cot \theta$ are the reciprocal of each other.

Reason (R) : $\cot^2 \theta - \operatorname{cosec}^2 \theta = 1$.

Q02. **Assertion (A) :** If $\sin A = \frac{1}{3}$, ($0^\circ < A < 90^\circ$), then the value of $\cos A$ is $\frac{2\sqrt{2}}{3}$.

Reason (R) : For every angle θ , $\sin^2 \theta + \cos^2 \theta = 1$.

Q03. **Assertion (A) :** Maximum value of $\frac{1}{\sec \theta} + \frac{1}{\operatorname{cosec} \theta}$ is 1.

Reason (R) : Maximum value of both $\sin \theta$ and $\cos \theta$ is 1.

Q04. **Assertion (A) :** Value of $\sin \theta$ can never be $\frac{21}{22}$.

Reason (R) : Maximum value of $\sin \theta$ is 1.

Q05. **Assertion (A) :** Value of $\cos \theta$ can never be $\frac{22}{21}$.

Reason (R) : Maximum value of $\cos \theta$ is 1.

Q06. **Assertion (A) :** Value of $\tan 60^\circ$ is less than the value of $\tan 45^\circ$.

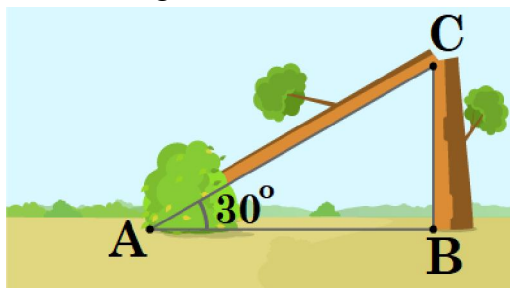
Reason (R) : When $0^\circ < \theta < 90^\circ$, the value of $\tan \theta$ increases as θ increases.

Q07. **Assertion (A) :** If $\sin x = \frac{1}{2}$, then the value of $\cos 2x$ is also $\frac{1}{2}$.

Reason (R) : If $\tan y = 1$, then $y = 45^\circ$.

◆ Chapter-09 Applications of Trigonometry

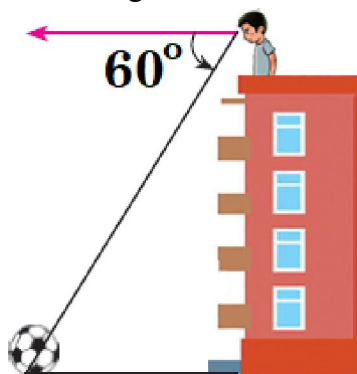
Q01. Refer the diagram shown below.



Assertion (A) : Angle of elevation is 30° .

Reason (R) : An angle of elevation is the angle formed between the line of sight and the horizontal line when looking upward from a point.

Q02. Refer the diagram shown below.



Assertion (A) : Angle of depression is 60° .

Reason (R) : The angle of depression is the angle formed between the line of sight and the horizontal line when looking downward from a point.

◆ Chapter-10 Circles

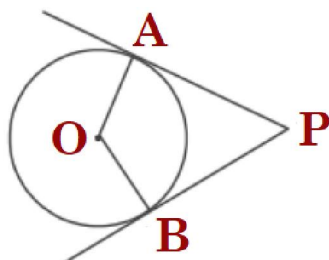
Q01. **Assertion (A) :** A tangent to a circle is perpendicular to the radius through the point of contact.

Reason (R) : The lengths of tangents drawn from the external point to a circle are equal.

Q02. **Assertion (A) :** The tangents drawn at the end points of a diameter of a circle, are parallel.

Reason (R) : Diameter of a circle is the longest chord.

Q03.



Assertion (A) : If the PA and PB are tangents drawn to a circle with centre O from an external point P, then the quadrilateral OAPB is a cyclic quadrilateral.

Reason (R) : In a cyclic quadrilateral, opposite angles are equal.

◆ Chapter-11 Areas Related to Circles

Q01. **Assertion (A) :** The area of the sector of a circle of radius 14 cm and central angle 90° is 154 cm^2 .

Reason (R) : The area of the sector of a circle of radius r and central angle θ is $\pi r^2 \times \frac{\theta}{360}$.

Q02. **Assertion (A) :** If the circumference of a circle is 176 cm, then its radius is 28 cm.

Reason (R) : Circumference = $2\pi \times$ radius of a circle.

- Q03. **Assertion (A)** : The length of the minute hand of a clock is 7 cm. Then the area swept by minute hand in 5 minute is $\frac{53}{6} \text{ cm}^2$.

Reason (R) : The length of an arc of a sector of angle and radius r is given by $l = \frac{\theta}{360^\circ} \times 2\pi r$.

- Q04. **Assertion (A)** : In a circle of radius 6 cm, the angle of a sector 60° . Then the area of the sector is $18\frac{6}{7} \text{ cm}^2$.

Reason (R) : Area of the circle with radius r is πr^2 .

◆ Chapter-12 Surface Areas and Volumes

- Q01. **Assertion (A)** : The surface area of largest sphere that can be inscribed in a hollow cube of side 'a' cm is $\pi a^2 \text{ cm}^2$.

Reason (R) : The surface area of a sphere of radius 'r' is $\frac{4}{3} \pi r^3$.

- Q02. **Assertion (A)** : The diameter of a sphere, whose surface area is 616 cm^2 , is 7 cm.

Reason (R) : The surface area of a sphere of radius r is $4\pi r^2$.

- Q03. **Assertion (A)** : Two cubes each of edge length 10 cm are joined together. The total surface area of newly formed cuboid is 1200 cm^2 .

Reason (R) : Area of each surface of a cube of side 10 cm is 100 cm^2 .

- Q04. **Assertion (A)** : Total surface area of the top is the sum of curved surface area of the hemisphere and the curved surface area of the cone.



Reason (R) : Top is obtained by fixing the plane surface of the hemisphere and cone together.

◆ Chapter-13 Statistics

- Q01. **Assertion (A)** : If the Mean and the Median of a distribution are 169 and 170 respectively, then its Mode is 172.

Reason (R) : The relation between Mean, Median and Mode is $\text{Mode} = 3\text{Median} - 2\text{Mean}$.

- Q02. **Assertion (A)** : Mean is the average of all the observations.

Reason (R) : If each observation is increased by 10, mean will also be increased by 10.

◆ Chapter-14 Probability

- Q01. **Assertion (A)** : Two players, Sania and Ashnam play a tennis match. The probability of Sania winning the match is 0.79 and that of Ashnam winning the match is 0.21.

Reason (R) : The sum of probabilities of two complementary events is 1.

- Q02. **Assertion (A)** : A fair die is thrown once. The probability of getting a prime number is $\frac{1}{2}$.

Reason (R) : A natural number is a prime number if it has only two factors.

- Q03. **Assertion (A)** : The probability of getting a prime number, when a die is thrown once, is $\frac{2}{3}$.

Reason (R) : On the faces of a die, prime numbers are 2, 3, and 5.

- Q04. **Assertion (A)** : When two coins are tossed together, the probability of getting no tail is $\frac{1}{4}$.

Reason (R) : The probability $P(E)$ of an event E satisfies $0 \leq P(E) \leq 1$.

Q05. **Assertion (A) :** The probability that a leap year has 53 Sundays is $\frac{2}{7}$.

Reason (R) : The probability that a non-leap year has 53 Sundays is $\frac{1}{7}$.

Q06. **Assertion (A) :** The probability of randomly drawing a card with an even number from a box containing cards numbered 1 to 100 is $\frac{1}{2}$.

Reason (R) : $P(\text{event}) = \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}}$.



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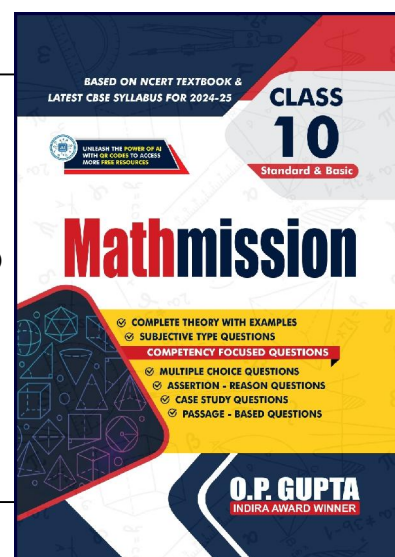
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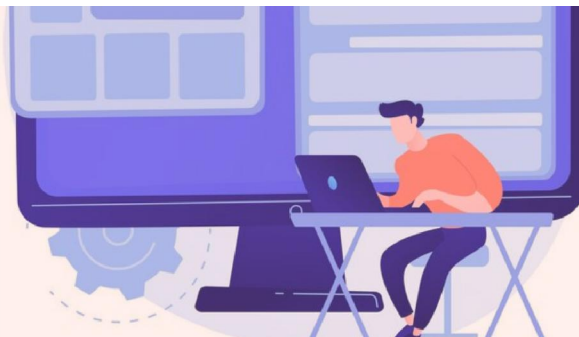
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CASE STUDY QUESTIONS

For CBSE 2025 Exams Class 10 - Mathematics



Chapter-01 Real Numbers

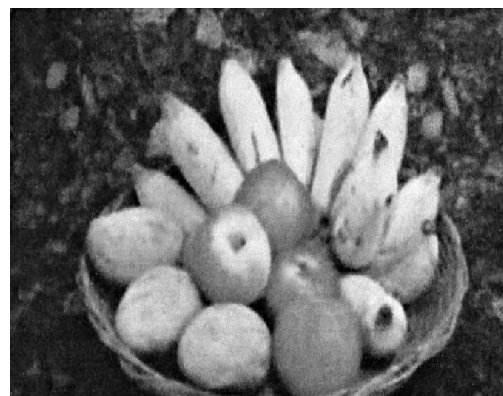
Q01. Khushi wants to organize her birthday party. Being health conscious, she decided to serve only fruits in her birthday party. She bought 36 apples and 60 bananas and decided to distribute fruits equally among all.

Based on the above information, answer the following questions.

- (i) How many guests Khushi can invite at the most?
- (ii) How many apples and bananas will each guest get?
- (iii) If Khushi decides to add 42 mangoes, how many guests Khushi can invite at the most?

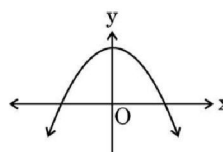
OR

- (iii) If the cost of 1 dozen of bananas is ₹60, the cost of 1 apple is ₹15 and cost of 1 mango is ₹20, find the total amount spent on 60 bananas, 36 apples and 42 mangoes.



Chapter-02 Polynomials

Q01. Rainbow is an arch of colours that is visible in the sky after rain or when water droplets are present in the atmosphere. The colours of the rainbow are generally red, orange, yellow, green, blue, indigo and violet. Each colour of the rainbow makes a parabola. We know that any quadratic polynomial $p(x) = ax^2 + bx + c$, ($a \neq 0$) represents a parabola on the graph paper.



Based on the above, answer the following questions.

- (i) The graph of $y = f(x)$ is shown in the figure. Write the number of zeroes of the curve.
- (ii) If the graph of a rainbow does not intersect the x-axis but intersects y-axis at one point, then how many zeroes will it have?
- (iii) If a rainbow is represented by the quadratic polynomial $p(x) = x^2 + (a+1)x + b$, whose zeroes are 2 and -3, find the value of a and b.

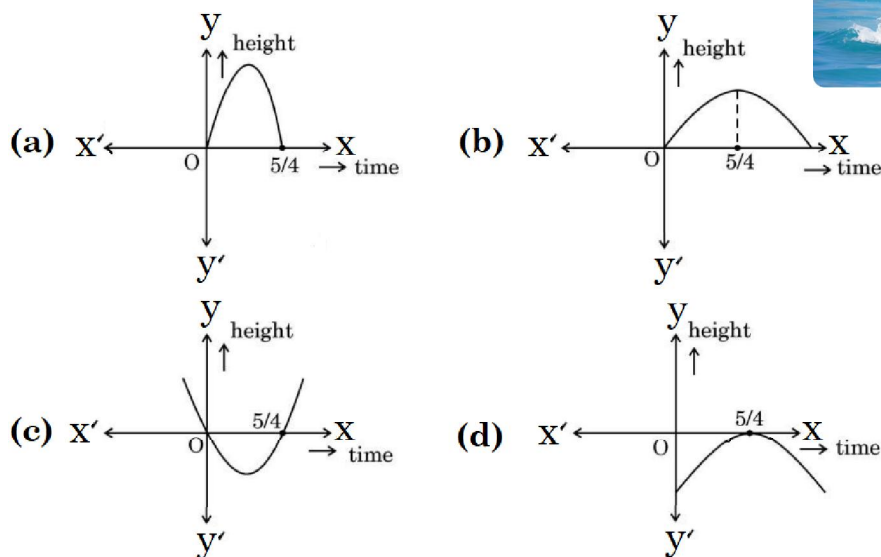
OR

- (iii) The polynomial $x^2 - 2x - (7p+3)$ represents a rainbow. If -4 is a zero of it, find the value of p.

Q02. In a pool at an aquarium, a dolphin jumps out of the water travelling at 20 cm per second. Its height above water level after t seconds is given by $h = 20t - 16t^2$.

Based on above information, answer the following questions.

- (i) Find zeroes of polynomial $p(t) = 20t - 16t^2$.
- (ii) Which of the following types of graph represents $p(t)$?



- (iii) What would be the value of h at $t = \frac{3}{2}$? Interpret the result.

OR

- (iii) How much distance has the dolphin covered before hitting the water level again?

Chapter-03 Pair of Linear Equations in Two Variables

- Q01. Lokesh, a production manager in Mumbai, hires a taxi everyday to go to his office. The taxi charges in Mumbai consists of a fixed charges together with the charges for the distance covered. His office is at a distance of 10 km from his home. For a distance of 10 km to his office, Lokesh paid ₹105. While coming back home, he took another route. He covered a distance of 15 km and the charges paid by him were ₹155.

Based on the above information, answer the following questions.

- (i) What are the fixed charges?
- (ii) What are the charges per km?
- (iii) If fixed charges are ₹20 and charges per km are ₹10, then how much Lokesh have to pay for travelling a distance of 10 km?

OR

- (iii) Find the total amount paid by Lokesh for travelling 10 km from home to office and 25 km from office to home. [Fixed charges and charges per km are as in (i) & (ii)].



- Q02. A coaching institute of Mathematics conducts classes in two batches I and II and fees for rich and poor children are different. In batch I, there are 20 poor and 5 rich children, whereas in batch II, there are 5 poor and 25 rich children. The total monthly collection of fees from batch I is ₹9000 and from batch II is ₹26000. Assume that each poor child pays ₹ x per month and each rich child pays ₹ y per month.

Based on the above information, answer the following questions.



(i) Represent the information given above in terms of x and y .

(ii) Find the monthly fee paid by a poor child.

OR

(ii) Find the difference in the monthly fee paid by a poor child and a rich child.

(iii) If there are 10 poor and 20 rich children in batch II, what is the total monthly collection of fees from batch II?

- Q03. Two schools 'P' and 'Q' decided to award prizes to their students for two games of Hockey ₹ x per student and Cricket ₹ y per student. School 'P' decided to award a total of ₹9500 for the two games to 5 and 4 students respectively; while school 'Q' decided to award ₹7370 for the two games to 4 and 3 students respectively.

Based on the above information, answer the questions given below.

(i) Represent the given information algebraically (in terms of x and y).

(ii) What is the prize amount for hockey?

OR

(ii) Prize amount on which game is more and by how much?

(iii) What will be the total prize amount if there are 2 students each from two games?



Chapter-04 Quadratic Equations

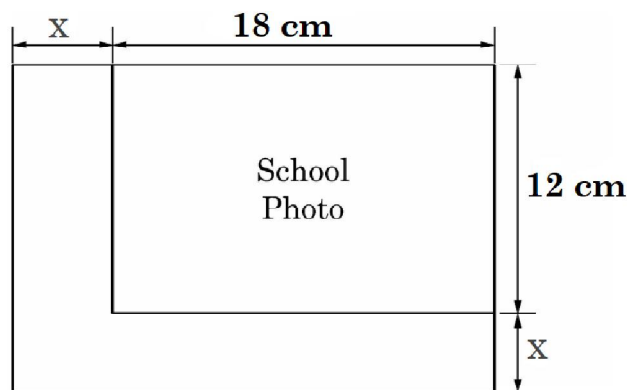
- Q01. While designing the school year book, a teacher asked the student that the length and width of a particular photo is increased by x units each to double the area of the photo. The original photo is 18 cm long and 12 cm wide.

Based on the above information, answer the following questions.

(i) Write an algebraic equation depicting the above information.

(ii) Write the corresponding quadratic equation in standard form.

(iii) What should be the new dimensions of the enlarged photo?



OR

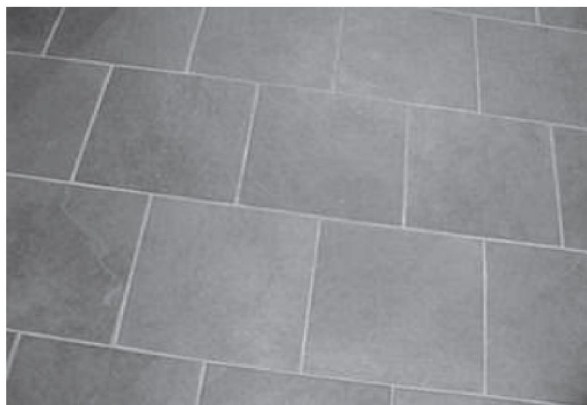
(iii) Can any rational value of x make the new area equal to 220 cm^2 .

- Q02. A rectangular floor area can be completely tiled with 200 square tiles. If the side length of each tile is increased by 1 unit, it would take only 128 tiles to cover the floor.

- (i) Assuming the original length of each side of a tile be x units, make a quadratic equation from the above information.
- (ii) Write the corresponding quadratic equation in standard form.
- (iii) Find the value of x , the length of side of a tile by factorisation.

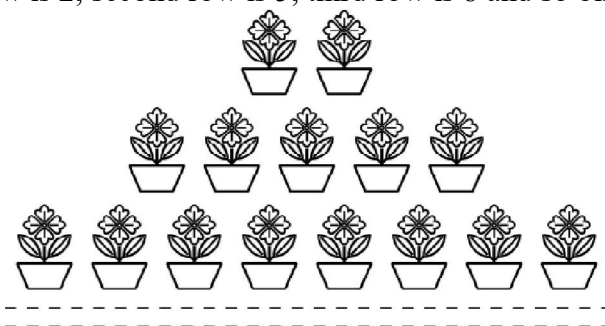
OR

- (iii) Solve the quadratic equation for x , using quadratic formula.



Chapter-05 Arithmetic Progression

- Q01. Aahana being a plant lover decides to convert her balcony into beautiful garden full of plants. She bought few plants with pots for her balcony. She placed the pots in such a way that number of pots in the first row is 2, second row is 5, third row is 8 and so on.



Based on the above information, answer the following questions.

- (i) Find the number of pots placed in the 10th row.
- (ii) Find the difference in the number of pots placed in 5th row and 2nd row.
- (iii) If Aahana wants to place 100 pots in total, then find the total number of rows formed in the arrangement.

OR

- (iii) If Aahana has sufficient space for 12 rows, then how many total number of pots are placed by her with the same arrangement?

- Q03. Treasure Hunt is an exciting and adventurous game where participants follow a series of clues / numbers / maps to discover hidden treasures. Players engage in a thrilling quest, solving puzzle and riddles to unveil the location of the coveted prize.

While playing a treasure hunt game, some clues (numbers) are hidden in various spots collectively forming an A.P. If the number on the n^{th} spot is $20 + 4n$, then answer the following questions to help the players in spotting the clues.

- (i) Which number is on first spot?
 - (ii) Which spot is numbered as 112?
- OR**
- (ii) What is the sum of all the numbers on the first 10 spots?
 - (iii) Which number is on the $(n - 2)^{\text{th}}$ spot?



- Q04. Saving money is a good habit and it should be inculcated in children right from the beginning. Rehan's mother brought a piggy bank for Rehan and puts one ₹5 coin of her savings in the piggy bank on the first day. She increases his savings by one ₹5 coin daily.



Based on the above information, answer the following questions.

- How many coins were added to the piggy bank on 8th day?
- How much money will be there in the piggy bank after 8 days?
- If the piggy bank can hold one hundred twenty ₹5 coins in all, find the number of days she can contribute to put ₹5 coins into it.

OR

- Find the total money saved, when the piggy bank is full.

- Q05. While preparing for a competitive examination, Akbar came across a match-stick pattern based question. The pattern is given below.

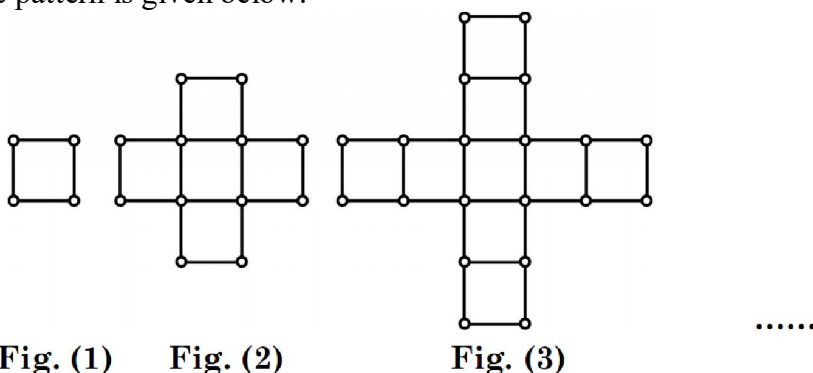


Fig. (1)

Fig. (2)

Fig. (3)

Based on the above information, answer the following questions.

- Write first term and common difference of the A.P. formed by number of squares in each figure.
- Write first term and common difference of the A.P. formed by number of sticks used in each figure.
- How many squares are there in Fig. (10)? Also write the number of sticks used in Fig. (10).

OR

- If 88 sticks are used to make m^{th} figure [Fig. (m)], find the value of m. How many squares are formed in this figure?

- Q21. In the month of September to October 2022, the exports of electric bike from India increased by 25% in the corresponding quarter of 2021-22, as per a newspaper report. A bike manufacturing company planned to produce 1000 bikes in fifth year and 1800 bikes in ninth year. Assume that the production increases uniformly by a fixed number every year.

- Find the production in the first year.
- Find the production in the tenth year.
- Find the total production in first ten years.

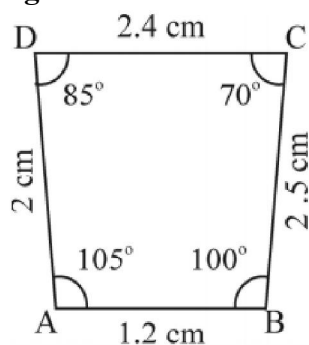
OR

- In how many years will the total production reach 27200 bikes?

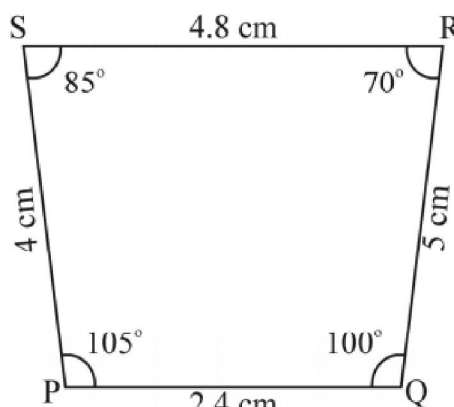


Chapter-06 Triangles

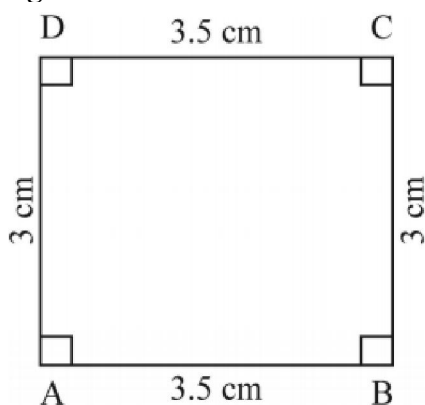
Q01. Observe the figures given below carefully and answer the questions.

Figure A

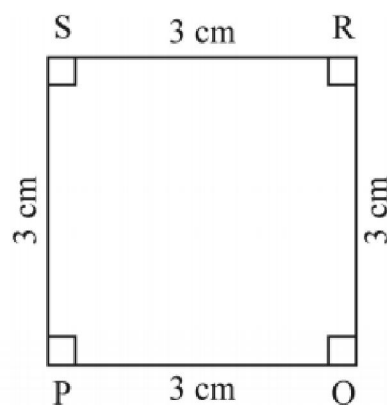
A (i)



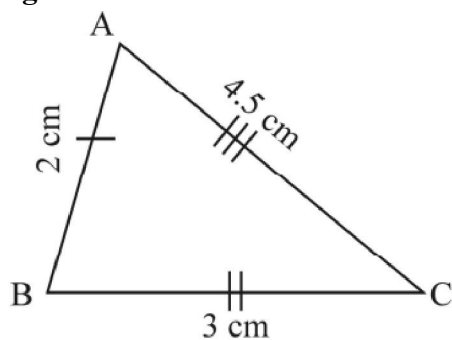
A (ii)

Figure B

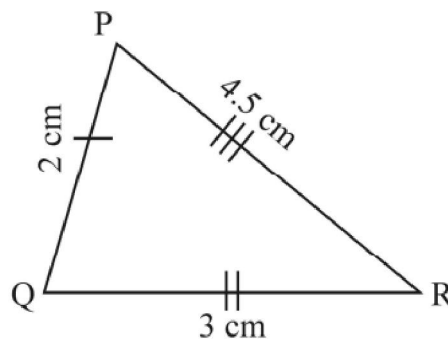
B (iii)



B (iv)

Figure C

C (v)



C (vi)

- (i) Name the figure (s) wherein two figures are similar.
- (ii) Name the figure (s) wherein the figures are congruent.
- (iii) Prove that congruent triangles are also similar but not the converse.

OR

- (iii) What more is least needed for two similar triangles to be congruent?

Chapter-07 Coordinate Geometry

Q01. Use of mobile screen for long hours makes your eye sight weak and give you headaches. Children who are addicted to play "PUBG" can get easily stressed out. To raise social awareness about ill effects of playing PUBG, a school decided to start 'BAN PUBG' campaign,

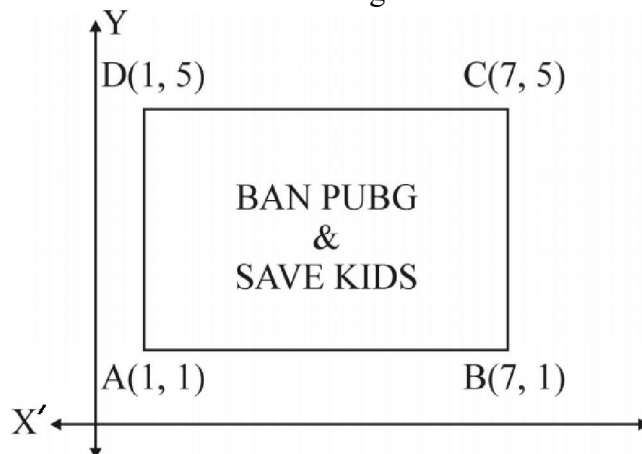
in which students are asked to prepare campaign board in the shape of a rectangle. One such campaign board made by class X student of the school is shown in the figure.

Based on the above information, answer the following questions.

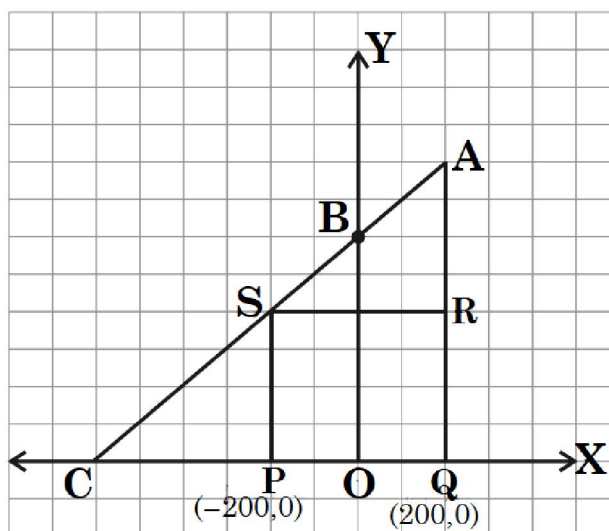
- Find the coordinates of the point of intersection of diagonals AC and BD.
- Find the length of the diagonal AC.
- Find the area of the campaign Board ABCD.

OR

- Find the ratio of the length of side AB to the length of the diagonal AC.



- Q03. Jagdish has a field which is in the shape of a right angled triangle AQC. He wants to leave a space in the form of a square PQRS inside the field for growing wheat and the remaining for growing vegetables (as shown in the figure). In the field, there is a pole marked as O.



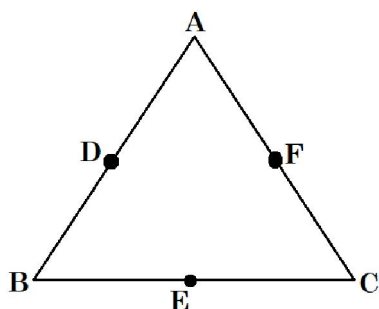
Based on the above information, answer the following questions.

- Taking O as origin, coordinates of P are $(-200, 0)$ and of Q are $(200, 0)$. PQRS being a square, what are the coordinates of R and S?
- What is the area of square PQRS?

OR

- What is the length of diagonal PR in square PQRS?
- If S divides CA in the ratio $K:1$, what is the value of K, where point A is $(200, 800)$?

- Q25. Three persons A, B and C are sitting at $(3, 2)$, $(5, 6)$ and $(8, 1)$ respectively. Persons D, E and F are sitting at midpoints of AB, BC and CA respectively.



- Find the distance between A and D.
- Find the distance between E and F.
- Find the coordinates of D, E and F.

OR

- Find the coordinates of point of intersection of AE, BF and CD.

Chapter-08 Introduction to Trigonometry

Q01. Mr Ajay helped his students learn about trigonometric ratios.

He asked his students to draw a right-angled $\triangle ABC$, with hypotenuse (h) = 17, base (b) = 8 and perpendicular (p) = 15.

Using the information given above, answer the following questions.

- Write the value of $\sin x$.
- Write the value of $\cos x$.
- Find the value of $\sec^2 x - \tan^2 x$.

OR

- Find the value of $\cot^2 x - \operatorname{cosec}^2 x$.

Chapter-09 Applications of Trigonometry

Q01. Radio towers are used for transmitting a range of communication services including radio and television. The tower will either act as an antenna itself or support one or more antennas on its structure. On a similar concept, a radio station tower was built in two Sections A and B. Tower is supported by wires from a point O.

Distance between the base of the tower and point O is 36 cm.

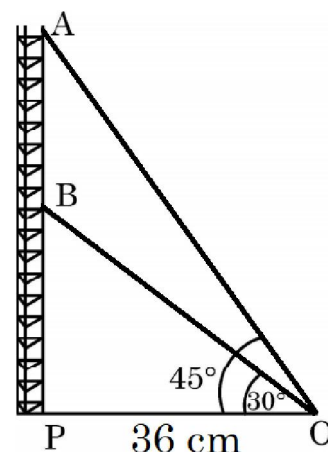
From point O, the angle of elevation of the top of the Section B is 30° and the angle of elevation of the top of Section A is 45° .

Based on the above information, answer the following questions.

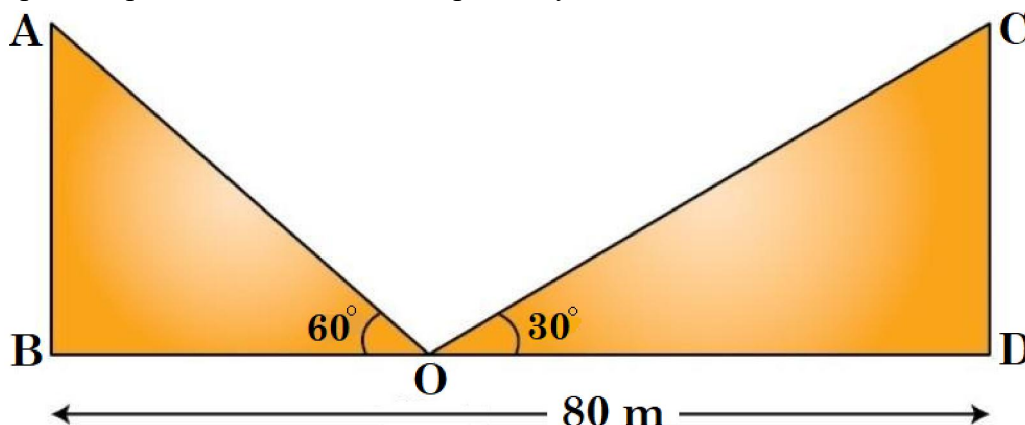
- Find the length of the wire from the point O to the top of Section B.
- Find the distance AB.

OR

- Find the area of $\triangle OPB$.
- Find the height of the Section A from the base of the tower.



Q19. Two poles (AB and CD) of equal heights are standing opposite each other on either side of the road, which is 80 m wide. From a point O between them on the road, the angles of elevation of the top of the poles are 60° and 30° , respectively.



Answer the following questions, using the information given above.

- Point O is closer to which pole?
- Find the distances of the point (O) from the poles.
- Find the height of each pole.

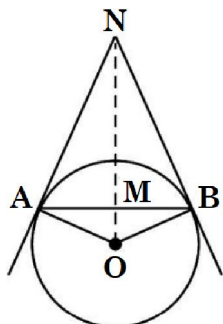
OR

- Find the ratio of height of pole to the distance of point from the closer pole.

Chapter-10 Circles

Q01. Circles play an important part in our life. When a circular object is hung on the wall with a cord at nail N, the cords NA and NB work like tangents. Observe the figure, given that $\angle ANO = 30^\circ$ and $OA = 5$ cm.

Based on the above information, answer the following questions.

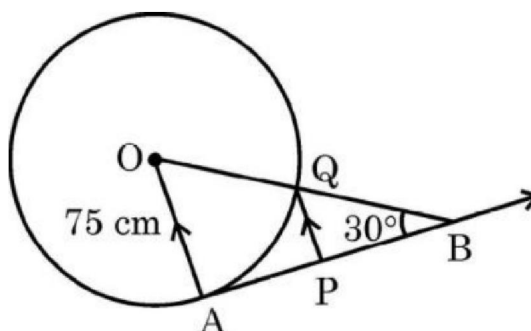
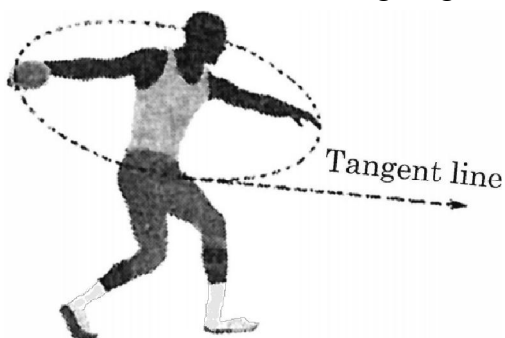


- (i) Find the distance AN.
- (ii) Find the measure of $\angle AOB$.
- (iii) Find the total length of cords NA, NB and the chord AB.

OR

- (iii) If $\angle ANO$ is 45° , then name the type of quadrilateral OANB. Justify your answer.

Q02. The discus throw is an event in which an athlete attempts to throw a discus. The athlete spins anti-clockwise around one and a half times through a circle, then releases the throw. When released, the discus travels along tangent to the circular spin orbit.



In the given figure, AB is one such tangent to a circle of radius 75 cm. Point O is centre of the circle and $\angle ABO = 30^\circ$. PQ is parallel to OA.

Based on the above information,

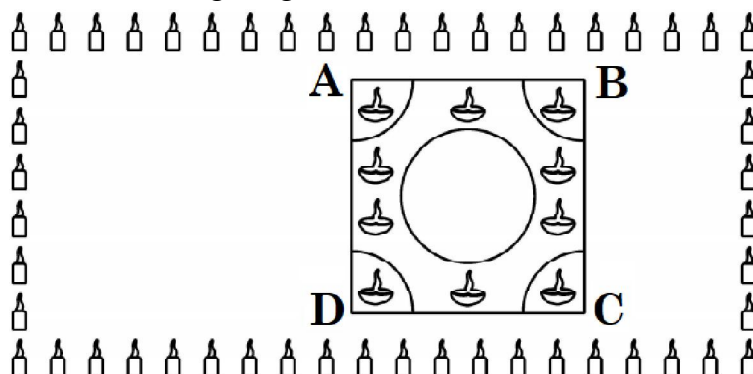
- (i) find the length of AB.
- (ii) find the length of OB.
- (iii) find the length of AP.

OR

- (iii) find the length of PQ.

Chapter-11 Areas Related to Circles

Q01. Interschool Rangoli Competition was organized by one of the reputed schools of Odissa. The theme of the Rangoli Competition was Diwali celebrations where students were supposed to make mathematical designs. Students from various schools participated and made beautiful Rangoli designs. One such design is given below.



Rangoli is in the shape of square marked as ABCD, side of square being 40 cm. At each corner of a square, a quadrant of circle of radius 10 cm is drawn (in which diyas are kept). Also a circle of diameter 20 cm is drawn inside the square.

(i) What is the area of square ABCD?

(ii) Find the area of the circle.

(iii) If the circle and the four quadrants are cut off from the square ABCD and removed, then find the area of remaining portion of square ABCD.

OR

(iii) Find the combined area of 4 quadrants and the circle, removed.

Q08. NSS (National Service Scheme) aims to connect the students to the community and to involve them in problem solving process.

NSS symbol is based on the 'Rath' wheel of the Konark Sun Temple situated in Odisha. The wheel signifies the progress cycle of life.

The diagrammatic representation of the symbol is given below.

Observe the figure given here.

The diameters of inner circle are equally placed.

Given that $OP = 21$ cm, $OS = 10$ cm.

Based on the above information, answer the following questions.

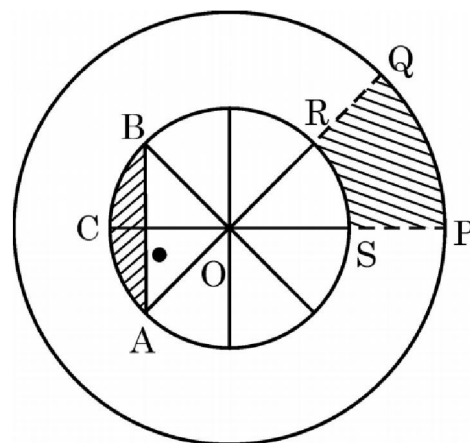
(i) Find $m\angle ROS$.

(ii) Find the perimeter of sector OPQ.

(iii) Find the area of shaded region PQRS.

OR

(iii) Find the area of the shaded region ACB i.e., the segment ACB.



Chapter-12 Surface Areas and Volumes

Q01. A wooden toy is shown in the picture. This is a cuboidal wooden block of dimensions $14\text{ cm} \times 17\text{ cm} \times 4\text{ cm}$. On its top there are seven cylindrical hollows for bees to fit in. Each cylindrical hollow is of height 3 cm and radius 2 cm.



Based on the above, answer the following questions.

(i) Find the volume of wood carved out to make one cylindrical hollow.

(ii) Find the lateral surface area of the cuboid to paint it with green colour.

(iii) Find the volume of wood in the remaining cuboid after carving out seven cylindrical hollows.

OR

(iii) Find the surface area of the top surface of the cuboid to be painted yellow.

Chapter-13 Statistics

Q01. India meteorological department observes seasonal and annual rainfall every year in different sub-divisions of our country.



It helps them to compare and analyse the results.

The table given below shows sub-division wise seasonal (monsoon) rainfall (mm) in 2018.

Rainfall (mm)	Number of Sub-divisions
200-400	2
400-600	4
600-800	7
800-1000	4
1000-1200	2
1200-1400	3
1400-1600	1
1600-1800	1

Based on the above information, answer the following questions.

- Write the modal class.
- Find the median of the given data.

OR

- Find the mean rainfall in this season.
- If sub-division having at least 1000 mm rainfall during monsoon season, is considered good rainfall sub-division, then how many sub-divisions had good rainfall?

Q06. **Mutual Fund** : A mutual fund is a type of investment vehicle that pools money from multiple investors to invest in securities like stocks, bonds or other securities. Mutual funds are operated by professional money managers, who allocate the fund's assets and attempt to produce capital gains or income for the fund's investors.

Net Asset Value (NAV) represents a fund's per share market value. It is the price at which the investors buy fund shares from a fund company and sell them to a fund company.



The following table shows the Net Asset Value (NAV) per unit of mutual fund of ICICI mutual funds.

NAV (in ₹)	0-5	5-10	10-15	15-20	20-25
Number of mutual funds	13	16	22	18	11

Based on the above information, answer the following questions.

- What is the upper limit of modal class of the data?
- What is the median class of the date?
- What is the mode NAV of mutual funds?

OR

- What is the median NAV of mutual funds?

Chapter-14 Probability

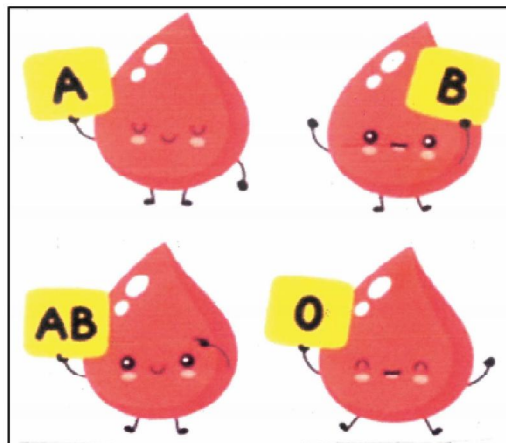
Q01. Blood group describes the type of blood a person has. It is a classification of blood based on the presence or absence of inherited antigenic substances on the surface of red blood cells. Blood types predict whether a serious reaction will occur in a blood transfusion. In a sample of 50 people, 21 had type O blood, 22 had type A, 5 had type B and rest had type AB blood group.

Based on the above, answer the following questions.

- What is the probability that a person chosen at random had type O blood?
- What is the probability that a person chosen at random had type AB blood group?
- What is the probability that a person chosen at random had neither type A nor type B blood group?

OR

- What is the probability that person chosen at random had either type A or type B or type O blood group?



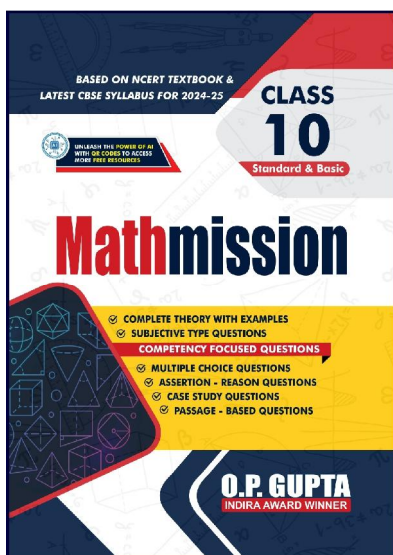
Q11. Rajat and Sejal are siblings. Rajat gifts Sejal a bag full of 8 red marbles, 4 black marbles and 3 yellow marbles. Sejal draws a marble from the bag at random.

Based on the above information, answer the following questions.

- Find the probability of getting white marble.
- Find the probability of getting black marble.
- Find the probability of getting non-white marble.

OR

- Find the probability of getting non-red marble.



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- K Sasi Rekha (PGT, Satchidananda Jothi Nikethan Intl. School, Tamilnadu)
- Yuvaraj S (PGT, Sairam Vidyalaya, Puducherry)
- Anuradha V (PGT, Vidya Peetam, Ranipet)
- SR Bakyalakshmi (PGT, Breeks Hr. Sec. School, Tamilnadu)
- B Hemamalini (PGT, RKN Gyan Jothi Public School, Tamilnadu)
- M Ganesh Babu (PGT, Velammal Vidhyashram, Surapet)
- I Surya Narayana (PGT, Sree Vijay Vidyashram, Tirupattur)
- M Latha Vijayaragavan (TGT, National Public School, Namakkal)
- Biby Abraham (PGT, Global Public School, Thiruvaniyoor)
- Silambarasan A (PGT, Vedanta Academy, Tirupur)
- M Ramesh (PGT, Velammal Vidhyashram, Chennai)
- P Shanthi (PGT, Devi Academy, Chennai)
- Hemavathi H (PGT, Little Kingdom School, Tirupur)
- Lilly Arul Selvi J (PGT, Saraswathi Vidyalaya Sr. Sec. School, Chennai)
- K Radha (PGT, DAV Public School, Velachery, Chennai)
- Surendran (PGT, Sri Chaitanya Techno School, Hosur)
- Sireesha VR (PGT, DAV School, Chennai)
- R Rajeswari (PGT, Srimathi Sundaravalli Memorial School, Chennai)
- Vidhya N (PGT, Vedavalli Vidyalaya Senior Secondary School, Walajapet)
- Radhakrishnan B (PGT, Montfort School, Trichy)
- Vaishaly Gupta (PGT, Hindustan International School, Padur, Chennai)
- Geetha G (PGT, Smt. Durgadevi Choudhary Vivekananda Vidyalaya Sr. Sec. School, Kolathur Chennai)
- Venkataraman KV (PGT, Velammal Vidhyashram, Surapet, Chennai)
- Devika (TGT, Swami Vivekananda Vidya Mandir Senior Sec. School, Madurai)
- Karthiga Balasundaram (PGT, Chandramari International School, Coimbatore)
- Tharani S (PGT, Smart Modern School, Tamilnadu)
- Shanbhagavalli (PGT, Padmashree School, Kolathur)
- Pandurangan R (PGT, Amrita Vidyalayam, Chennai)
- R Srinivasan (PGT, Sri National School, Erode, Tamilnadu)
- M Thulasi Rao (TGT, Billabong High International Sr. Sec. School, Kanchipuram)
- Bhavani (PGT, Sir Mutha School, Chennai)
- S Rajendran (HOD, AMM School, Kotturpuram, Chennai)
- Rajesh Kumar R (PGT, Kamala Niketan Montessori School, Trichy)
- Habisathu Rilha (PGT, Kannadivappa International School, Kanjirangudi, Ramanathapuram)
- M Gunaselvi (TGT, DAV School, Chennai)
- Khizar Husain M (PGT, Fathima Central Sr. Sec. School, Chennai)
- L Sridevi Berigai (PGT, Sri Sathya Sai Institute of Educare, Chennai)
- Jayalakshmi (PGT, Chettinad Vidyashram, Chennai)
- Thirunavukkarasu R (PGT, Kovai Vidyashram, Tirupur)
- Saran Kumar N (PGT, Prasan Vidya Mandir Senior Sec. School, Tamilnadu)
- Mathi M (PGT, Paavai Vidhyashram Senior Sec. School, Namakkal)
- Ramesh P (PGT, The PSBB Millenium School, Chennai)
- Balakumar CS (PGT, Milestone Academy, Vellore)

- Krishna Rao B (PGT, Bharat International CBSE School, Krishna Giri, Tamilnadu)
- Venkatakrishnana JS (PGT, Dr. GS Kalyanasundaram Memorial School, Tamilnadu)
- Nazeema Begam S (TGT, Velammal Vidhyashram, Maraimalai, Tamilnadu)
- R Priya Queeny (PGT, Dayasadan Agarwal Vidyalaya, Chennai)
- Dileep Kumar (PGT, Agaram Public School, Dharapuram)
- Jiyavuthin K (Principal, Velammal Vidhyashram, Maraimalai Nagar)
- Saravanan S (PGT, Kolaperumal Chetty Vaishnav Sr. Sec. School, Chennai)
- A Gowri (TGT, Durgadevi Choudhary Vivekananda Sr. Sec. School, Kolathur)
- Tamil Selvi R (PGT, Sowdambika Vidyalaya, Jayankondam)
- S Tamilselvi (PGT, Everwin Public School, Maduravoyal)
- KVB Annapurna (PGT, Velammal Vidyalaya, Avadi, Chennai)
- R Sangeetha (PGT, Ashirwad's International Schol, Gufiyatham)
- A. Anbarasan (Sriram Public School, Dharmapuri)
- V. Jayakumari (PGT, Vallaba Vidyalaya, Madurai)
- Karunakaran B (PGT, Vani Vidhyalaya CBSE School, Katpadi, Vellore)
- Subramanian P (PGT, Maharishi School of Excellence Sr. Secondary, Chennai)
- KLVVN Varakumar (PGT, Suguna International School, Coimbatore)
- Shanmugapriya K (PGT, Amrita Vidyalayam, Trichy)
- TR Balasubramanian (PGT, Smiles India Vidyashram, Vellore)
- Uma Saraswathy R (PGT, Dharani Vidhya Mandir Senior Sec. School, Mannargudi, Thiruvavur)
- M Bhuvaneswari (PGT, Chinmaya Vidyalaya Senior Secondary School, Anna Nagar)
- Saranya Devi N (PGT, Thangam World School, Salem)
- D Subash (PGT, Billabong High International Senior Sec. School, Tiruttani)
- V Balaji (PGT, Maharishi International Residential School, Sunguvarchathiram)
- Vanitha M (PGT, Cauvery Global Senior Secondary School, Trichy)
- B Jeyagowri (PGT, SBOA School and Junior College, Anna Nagar)
- Anandaraj T (PGT, Sri Chaitanya Techno School, Manapakkam)
- Sakunthala G (TGT, Padma Seshadri Bala Bhavan Senior Secondary School, Chennai)

- S Banupriya (PGT, Shrishti Vidyashram Senior Secondary School, Vellore)
- Bina Jonathan (SBOA School & Junior College, Chennai)
- P Hemalatha (HOD, AMM School, Kotturpuram, Chennai)
- Dr. T. Rakesh Kumar (PGT, Samadh Higher Secondary School, Trichy)
- Maheswari Gopi (TGT, Maharishi Vidya Mandir, Avigna Celeste, Chengalpattu)
- Kalaiyani R (PGT, Hayagriva Vidhyashram School, Sriperumbudur)
- Priyadarshini L (PGT, PSG Public School, Comibatore)
- Syed Ajas Ahmed (PGT, Edison G Agoram Memorial School, Chidambaram)
- Raghunadh Singh K (PGT, Springdays School, Vellore)
- B Radhakrishnan (PGT, Montfort School, Kattur)
- R Mala (PGT, AKV Public School, Tiruchengode)

Delhi

- Dinesh Kumar Chaudhary (Vice Principal, Air Force Bal Bharati School, Lodhi Road)
- Neeta M Phatak (TGT, Air Force Bal Bharati School, Lodhi Road)
- Pooja Chawla (HOD, Bal Bharati Public School, Sec-14, Rohini)
- Rekha Menon (PGT, New Delhi Public School, Vikas Puri)
- Neha Jain (TGT, N. C. Jindal Public School, Punjabi Bagh, Delhi)
- Nitin Hans (PGT, Kamal Model Sr. Sec. School, New Delhi)
- Neena Dhawan (PGT, Bhatnagar International School, Vasant Kunj)
- Abhilasha Tripathi (TGT, St. Paul's Diocesan School, Jungpura)
- Sushrita Sachdeva (Amity International School, Delhi)
- Neeru Vijn (Lecturer, Govt. Girls Sr. Sec. School, Vasundhara Enclave, Delhi)
- Rakhi Goel (TGT, Govt. Girls Sr. Sec. School, No.1, Ghonda, Delhi)
- Kanchan Wadhwa (Dr. Radhakrishnan International School, Defence Colony)
- Deepak Jain (PGT, Briliants Convent School, Pitam Pura, Delhi)
- Neetika Babbar (TGT, Bal Bharati Public School, Pitam Pura)
- Santosh Kumari (PGT, Hansraj Smarak Senior Secondary School, Dilshad Garden)
- Santosh Kumar Singh (Ignited Minds Classes, Delhi)
- Reeta (Sarvodaya Co-Ed. Vidyalaya, No.1, Shakti Nagar)
- Shivam Kumar (PGT, DOE, Delhi)

- Sudha V (TGT, Sanskriti School, Delhi)
- Monika Karnatac (PGT, Ahlcon Public School, Delhi)
- Tushar Bhola (Director, RSTB Coaching Classes, Geeta Colony, Delhi)
- Simranpreet Kaur (TGT, St. Lawrence Public School, Dilshad Garden, Delhi)
- Prabhjeet Kaur (PGT, Guru Harkrishan Public School, Hargobind Enclave, Delhi)
- Deepika Nagi (PGT, GD Goenka Public School, Model Town, Delhi)
- Jyoti Dahiya (PGT, Ganga International School, Sawda, Delhi)
- Bhawna Awasthy (PGT, Army Public School, Dhaula Kuan, Delhi)
- Pradeep Soni (TGT, St. Andrews Scots School, Jagatpuri)
- Veena K Vishnu (PGT, Vivekananda School, Anand Vihar, Delhi)
- Poonam Chopra (PGT, Notre Dame School, Badarpur, Delhi)
- Veena Dhingra (Lecturer, Smt S D Lakshmi Girls Sr. Sec. School, Khari Baoli, Delhi)
- Tanvi Gupta (TGT, Bal Bharati Public School, Dwarka)
- Sachin Chaudhary (PGT, Hira Lal Jain Sr. Sec. School, Sadar Bazaar, Delhi)
- Jaipal Singh (PGT, Kendriya Vidyalaya, No.3, Delhi Cantt.)
- Deepa Lal (Senior Maths Faculty, St. Cecilia's Public School, Vikas Puri)
- Anmol Sachdeva (PGT, Columbia Foundation Sr. Sec. School, Delhi)
- Kavita Grover (PGT, Arvind Gupta DAV Centenary Public School, Delhi)
- Hema Grover (PGT, Little Fairy Public School, G.T.B. Nagar)
- Pankaj Jain (Mathematics Point, Rohini)
- Raman Walia (TGT, Jain Bharati Mrigavati Vidyalaya, Alipur)
- Shiwali Bisht (TGT, Bal Bharati Public School, Dwarka)
- Tarun Verma (Mission Education, Rohini)
- Poonam Chopra (PGT, Notre Dame School, Badarpur, Delhi)
- Hardeep Kaur (PGT, Army Public School, Delhi Cantt.)
- Bindu Dutt (PGT, SLS DAV Public School, Mausam Vihar, Delhi)
- Kajal Khanna (TGT, Army Public School, Dhaula Kuan, Delhi)
- Manoj Vashisth (PGT, Jain Bharati Mrigavati Vidyalaya, Delhi)
- Annu Sharma (PGT, ITBP Public School, Dwarka, Delhi)
- Priya Madan (PGT, Bluebells School International, Delhi)

- Manish Kumar Ranjan (TGT, Kalka Public School, Delhi)
- Kanupreet Khanna (TGT, Sneh International School, Delhi)
- Kumar Gaurav (TGT, Directorate of Education, Delhi)
- Shalu Jain (HOD, Vishal Bharti Public School, Paschim Vihar)
- Hemanshi Kalra (TGT, Bhatnagar Intl. School, Paschim Vihar)
- Shweta Seth (HOD, St. Thomas's School, Dwarka)
- Laxmi Mittal (PGT, Bhai Parmanand Vidya Mandir School, Delhi)
- Priyanka Sethi (PGT, St. Francis De Sales Sr. Sec. School, Janak Puri)
- Sapna Makan (TGT, Bal Bharati Public School, Rohini)
- Sunil Nagpal (PGT, Govt. Boys Sr. Sec. School, Sec-16, Rohini)
- Poonam Mohindroo (Lecturer, Sarvodaya Kanya Vidyalaya, Rajouri Garden)
- Deep Singh Talwar (Maths Faculty, Akash Institute, Delhi)
- Minakshi Raheja (PGT, Vidya Bharati School, Rohini)
- Pooja Bhatia (PGT, Bal Bharati Public School, Dwarka)
- Ashwani Sharma (Vice Principal & HOD, St. Mary's Public School, Saket)
- Ritika Bountra (TGT, Indraprastha Intl. School, Dwarka)
- Rajni Bala (PGT, Happy Home Public School, Rohini)
- Rakhi Srivastava (PGT, Queen's Convent School, Rohini)
- Aparna K (PGT, BGS Intl. Public School, Dwarka)
- Pooja Chowdhary (TGT, Lancer's Convent School, Delhi)
- Harsh Mohan Rajvanshi (PGT, Rajkiya Pratibha Vikas Vidyalaya, Sec-11, Rohini)
- Manjul Shukla (HOD, Shanti Gyan Niketan Sr. Sec. School, Goyla)
- Meeta Hasija (PGT, Prudence School, Ashok Vihar)
- Dr. Rohitash Kumar (PGT, LPS Sr. Sec. School, Laxmi Nagar)
- Naina (PGT, St. Gregorios School, Dwarka)
- Harpreet Kaur (PGT, Army Public School, Dhaula Kuan)
- Naresh Chand Gupta (Director I.M.S., Janak Puri)
- Neelam (PGT, The Ultimate Education Centre, Dwarka)
- Nilesh Gulati (PGT, Vivekanand School, Anand Vihar)
- Rohit Nichaal (TGT, Rohit Coaching Classes, Delhi)
- Shalini Gupta (TGT, Govt. Girls Sr. Sec. School, Sec-24, Rohini)
- Bhavjeet Kaur (PGT, Guru Nanak Public School, Pushpanjali Enclave, Pitam Pura)

- Hema Mehndiratta (TGT, Sachdeva Public School, Pitam Pura)
- Shivanand Tiwari (TGT, Happy School, Daryaganj)
- Neeraj Gupta (TGT, Govt. Boys Sr. Sec. School, Shivaji Park, Shahdara)
- Shilpa Gupta (PGT, KIIT World School, Pitam Pura)
- Rajni Dhiman (TGT, Laxmi Public School, Karkardooma)
- Anjula (TGT, Govt. Girls Sr. Sec. School, Hastal, Delhi)
- Nisha Rani (Lecturer, Govt. Girls Sr. Sec. School, Vivek Vihar, Phase 2, Delhi)
- Kajal Khanna (TGT, Army Public School, Dhaula Kuan)
- Nirmaljit Kaur (PGT, Guru Harkrishan Public School, Nanak Piao)
- Vaishali Agrawal (PGT, Prabhu Dayal Public School, Shalimar Bagh)
- Rima Gogia (PGT, Carmel Convent School, Chanakyaपुरi)
- Neetu Chawla (PGT, Lovely Public Sr Sec School, Priya Darshini Vihar, Delhi)
- Manju Pandey (PGT, St Mary's Public School, Neb Sarai)
- Reena Sharma (PGT, Holy Child Auxilium School, Vasant Vihar)
- Pradeep Hooda (PGT, SBV, Pooth Kalan, DOE, Delhi)
- Jyoti Dhingra (TGT, Govt. Sarvodaya Vidyalaya, Sarawati Vihar, DOE, Delhi)
- Jyoti Nanda (TGT, Mother Mary's School, Mayur Vihar)
- Simran Kaur (TGT, Bhatnagar International School, Paschim Vihar)
- Gaurav Girdhar (PGT, St. Giri Sr. Sec. School, Sec-3, Rohini, Delhi)
- Jaskaran Singh (HOD, GD Goenka Public School, Vasant Kunj)
- Ramit Guglani (Scholar's Mind Academy, Delhi)

Uttar Pradesh

- Himanshu Srivastava (HOD, Tender Hearts School, Lucknow)
- Dr Meenkashi Mataray (PGT, Paras Public School, Greater Noida)
- Rakesh Kumar (TGT, Wisdom Public School, Aligarh)
- Ritu Arora (TGT, Delhi Public School, Greater Noida)
- Madhukar Tyagi (PGT, Satyakaam International School, Meerut)
- Vandana Rastogi (HOD, Delhi Public School, Eldeco, Lucknow)
- Mohammad Nadeem (TGT, Ayesha Tarin Modern Public School, Aligarh)
- Prashant Saraswat (Delhi Public School, Civil Lines, Aligarh)
- Dr. Ankit Maheshwari (PGT, Delhi Public School, Moradabad)

- Vinod Sharma (Lecturer, Govt. Inter College, Amethi)
- Anit Singh (PGT, St ABR Public School, Murdhava, Renukoot)
- Deepti Sati (TGT, Ralli International School, Indirapuram)
- Anu Jindal (PGT, Dehradun Public School, Sanjay Nagar, Ghaziabad)
- Amolak Singh (HOD, Pinewood School, Saharanpur)
- Yusrah Waqar (HOD, Delhi Public School, Unnao)
- Dr. Ruchi Bansal (PGT, Golden Gate Global School, Moradabad)
- Nitin Uniyal (PGT, Sunshine Public School, Thakurdwara, Moradabad)
- Preeti Mishra (TGT, Akal Academy, Kajri, Pilibhit)
- Rajesh Shukla (HOD, JMD World School, Kanpur)
- Alok Das (PGT, Silverline Prestige School, Ghaziabad)
- Neenu Handa (TGT, Seth Anandram Jaipuria School, Vasundhara)
- Alok Kumar (PGT, DAV Public School, Baghpat)
- Rani Kanchan Rana (HOD, St. Thomas School, Indirapuram)
- Durgesh Rastogi (PGT, Parvati Radhakishen Fomra School, Mathura)
- Ruchi Pokhriyal (TGT, JSS Public School, Noida)
- Satendra Dhama (PGT, Golden Gate Intl. School, Ghaziabad)
- Mayank Joshi (PGT, Sacred Heart School, Lucknow)
- Peiush Agarwal (PGT, Aditya Birla Public School, Jagdishpur)
- Lalit Verma (HOD, Khaitan Public School, Sahibabad, Ghaziabad)
- Anshu Grover (TGT, DLF Public School, Sahibabad, Ghaziabad)
- Atul Kumar (PGT, St. Francis Sr. Sec. School, Anpara, Sonbhadra)
- Pradeep Kumar Sharma (HOD, Jaypee Public School, Greater Noida)
- Nitin Bansal (PGT, Sach Coaching, Meerut)
- Santosh Kumar Sharma (PGT, Montfort Sr. Sec. School, Mandla)
- Shweta Agarwal (PGT, Mahamaya Balika Inter College, Sec-44, Noida)
- Manoj Kumar (PGT, M.C. Gopichand Inter College, Dadri, Greater Noida)
- Satya Prakash Sharma (PGT, Durgawati Hemraj Tah Saraswati Vidya Mandir, Nehru Nagar)
- Bijendra Singh Katariya (TGT, St. Mary's Convent School, Gajraula)
- Rakesh Jha (PGT, Billabong High International School, Noida)
- Manjeet Kashyap (PGT, Delhi Public School, Eldeco, Lucknow)
- Nitin Kumar (TGT, KL International School, Meerut)

- Ashiwani Kumar Sharma (PGT, DAV Public School, Raebareli)
- Ankit Bansal (PGT, Blue Birds Intl. School, Dhanaura, Amroha)
- Rishi Maheshwari (PGT, Seth Anand Ram Jaipuria School, Ghaziabad)
- Manita Bansal (PGT, Jawahar Navodaya Vidyalaya, Shamli)
- Aman Sharma (PGT, Meerut Public School, Meerut)
- Pooja Kaushal (TGT, St. Francis School, Indirapuram, Ghaziabad)
- Bhawna Sharma (Vice Principal & HOD, Delhi Public School, Firozabad)
- Vikas Kumar Gupta (PGT, Silver Line Prestige School, Ghaziabad)
- Bhawana Bahuguna (PGT, Mayoer School, Noida)
- Preeti Gakhar (PGT, KR Mangalam World School, Vaishali)
- Subodh Upadhyay (HOD, Three Dots Sewamarg Public School, Aligarh)
- Shuaib Idrees (TGT, Aligarh Public School, Aligarh)
- Shalini Rani (HOD, Brilliant Public School, Aligarh)
- Arun Kumar (PGT, Kendriya Vidyalaya, Baroda)
- Manish Saxena (PGT, Shivalik Cambridge School, Agra)
- Neeraj Kumar (PGT, M.G. Public School, Muzaffarnagar)
- Archana Chauhan (PGT, Greater Noida World School, Uttar Pradesh)
- Manoj Chaudhary (PGT, KK Public School, Muzaffarnagar)
- Santosh Kumar (PGT, Ch. Chhabil Das Public School, Ghaziabad)
- Pooja Sawhney (TGT, Delhi Public School, Agra)
- Paras Sharma (PGT, Sun Intl. School, Ghaziabad)
- Ashiwani Kumar Sharma (PGT, DAV Public School, Raebareli)
- Naveen Pandey (PGT, St. Joseph Inter College, Lucknow)
- Alok Kumar Malik (PGT, The Khaitan School, Noida)
- Shazia Khan (PGT, The Manthan School, Greater Noida)
- Ashish Kumar Shrivastav (PGT, Spring Dales Public School, Meerut)
- Priti Agarwal (PGT, Maths Study Point, Ghaziabad)
- Binod Kumar Sharma (PGT, Delhi Public School, Aligarh)
- Sameer Sharma (PGT, Sunbeam Suncity School, Varanasi)
- Sunil Kumar Chauhan (HOD, L.K. International School, Ghaziabad)
- Vinay Kumar Pandey (PGT, St. Patrick's Sr. Sec. School, Jaunpur)
- Kapil Kumar Sharma (TGT, Spring Dales Public School, Meerut)
- Poonam Sood (PGT, Indirapuram Public School, Indirapuram)

- Rajeev Kumar Bhatt (PGT, Handa Public School, Bareilly)
- Deepak Kumar Sharma (PGT, Alma Mater Day Boarding School, Bareilly)
- Satya Narayan Gaur (TGT, Kendriya Vidyalaya, Kamla Nehru Nagar, Ghaziabad)
- Amit Kumar Sharma (PGT, PSSVM Inter College, Jahangirabad)
- Rahul Kumar Vikas (PGT, Police Modern Senior Secondary School, 8th Bn PAC, Bareilly)
- Reeta Oze (Maths Faculty, Noida)
- Pawan Vashisht (PGT, Cambridge School, Indirapuram)
- Pushpendra Rathi (HOD, Allenhouse Public School, Vasundhara, Ghaziabad)
- Misreyar Khan (PGT, Bishop Conrad Senior Secondary School, Dohna, Bareilly)
- Jyoti Gupta (JKG International School, Indirapuram)
- Santosh Kumar Gupta (HOD, Shri Ram School, Mawana, Meerut)
- Pradeep Kumar Garg (TGT, Cambridge School, Indirapuram, Ghaziabad)
- Shivani Tyagi (PGT, St. Xavier's World School, Ghaziabad)

Haryana

- Dr Sanjana Jaisinghani (PGT, Salwan Public School, Gurugram)
- Manisha Srivastava (PGT, Suncity School, Gurugram)
- Anjana Puri (Little Angels School, Sonipat)
- Milind Manohar Khachane (PGT, DAV Public School, Sec-14, Gurugram)
- Taruni Soin (Senior Faculty, Delhi Public School, Sushant Lok)
- Kshama Tandon (Suncity School, Sec-54, Gurugram)
- Rajeev Chaturvedi (PGT, Delhi Public School, Maruti Kunj)
- Uma Chugh (HOD, St. Joseph's International School, Hisar)
- Jitender (PGT, Truveni Memorial Sr. Sec. School, Bahadurgarh)
- Manju Verma (St. John's School, Sec-49, Faridabad)
- Ruchi Jain (PGT, Shri S.N. Sidheshwar Sr. Sec. School, Gurugram)
- Vineeta Loomba (HOD, Shalom Hills Intl. School, Gurugram)
- Sonia Dua (PGT, DAV Public School, Ambala Cantt.)
- Rekha Malik (PGT, Bal Vikas Progressive School, Panipat)
- Ravinder Singh (PGT, Raj International School, Rewari)
- Shalini Kumar (TGT, Rotary Public School, Sec-22, Gurugram)
- Pankaj Mahajan (HOD, Red Roses Public School, Palam Vihar)

- Himanshu Verma (PGT, SDVM City School, Panipat)
- Dayanand Sharma (TGT, Pranavananda International School, Sec-92, Gurugram)
- Bharti Wahi (TGT, St. Xavier's High School, Sec-89, Gurugram)
- Neetu Rajpal (TGT, Shalom Hills International School, Gurugram)
- Kamlesh Chugh (HOD, Raman Munjal Vidya Mandir, Gurugram)
- Meet Khurana (PGT, Blue Bells Public School, Gurugram)
- Poonam Mehla (HOD, Presidium School, Gurugram)
- Anju Makhija (PGT, Delhi Public School, Gurugram)
- Priya Kochhar (PGT, Suncity School, Sec-54, Gurugram)
- Manoj Kumar (PGT, Dynasty Intl. School, Faridabad)
- Anupama Sharma (TGT, DAV Public School, Sector 49, Gurugram)
- Kousalya Seshadri (TGT, GD Goenka Public School, Sector 48, Gurugram)
- Indu Khurana (PGT, Amity Intl. School, Gurugram)
- Devender Singh (PGT, Blue Bells Model School, Gurugram)
- Rohit Yadav (PGT, Suraj School, Sec-75, Gurugram)
- Heena Arya (PGT, Dynasty Intl. School, Faridabad)
- Deepak Rana (TGT, Manav Rachna International School, Eros Garden Charmwood)
- Raghvendra Sharma (PGT, Quantum Institute, Gurugram)
- Meenakshi (PGT, Delhi Public School, Sushant Lok, Gurugram)
- Purnima Kumar (PGT, Darshan Academy, Hisar)
- Aradhana Kaushik (HOD, The Millenium School, Kurukshetra)
- Gagan Chopra (TGT, Gyan Devi Sr. Sec. School, Sec-10, Gurugram)
- Sabina Anand (PGT, Kunsapsskolan International School, Gurugram)
- Rohit Yadav (HOD, Suaj School, Gurugram)
- Dr Shalini Verma (Subject Coordinator, Delhi Public School, Dwarka Expressway, Gurugram)
- Deeksha Sharma (Director, Understanding Mathematics, Gurugram)
- Saravjeet Kaur (PGT, Dyal Singh Public School, Karnal)
- Amita Batra (TGT, Pratap Public School, Karnal)
- Shubham (HOD, S Karam Singh Public School, Cheeka, Kaithal)
- Sumit Sindhvani (PGT, The Milestone Sr. Sec. School, Kaithal)
- Rajkishan Rohilla (PGT, M.S. Public School, Karnal)

- Harish Arora (PGT, GHS Lalupura, Karnal)
- Suman Ratra (PGT, Dyal Singh Public School, Karnal)
- Ravinder Singh (TGT, KCM World School, Palwal)
- Pooja Guliani (TGT, Gurugram Global Heights School, Gurugram)
- Bhavna Arora (TGT, Lotus Valley Intl. School, Sec-50, Gurugram)
- Preeti Pahwa (TGT, Bohra Public School, Ballabgarh, Faridabad)
- Tripta (PGT, Gyan Devi Sr. Sec. School, Sec-10, Gurugram)
- Yogita (TGT, Narayana E Techno School, Gurugram)

Rajasthan

- Varsha Maheshwari (PGT, LBS School, Kota)
- Mukta Jethwani (PGT, Mittal International School, Kota)
- Ramendra Kumar Sharma (TGT, The Aditya Birla Public School, Adityapuram, Chittorgarh)
- Manoj Jain (PGT, St. Anselm's North City School, Jhotwara, Jaipur)
- Barkha Bhatia (PGT, MPS International School, Jaipur)
- Ravinder Kaur Kohli (TGT, Modern School, Jaipur)
- Harsh Grover (TGT, Guru Harkrishan Public School, Sri Ganganagar)
- Karan Singh (PGT, St. Joseph Convent School, Jaipur)
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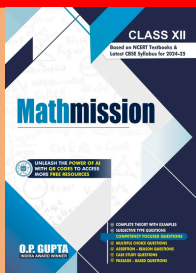
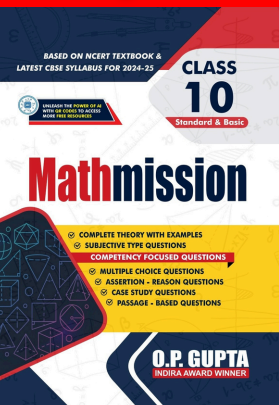
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O.P. GUPTA having taught math passionately over a decade, has devoted himself to this subject. Every book, study material or practice sheets, tests he has written, tries to teach serious math in a way that allows the students to learn math without being afraid. Undoubtedly his mathematics books are best sellers on Amazon and Flipkart. His resources have helped students and teachers for a long time across the country. He has contributed in CBSE Question Bank (issued in April 2021). Mr Gupta has been invited by many educational institutions for hosting sessions for the students of senior classes. Being qualified as an electronics & communications engineer, he has pursued his graduation later on with mathematics from University of Delhi due to his passion towards mathematics. He has been honored with the prestigious INDIRA AWARD by the Govt. of Delhi for excellence in education.

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