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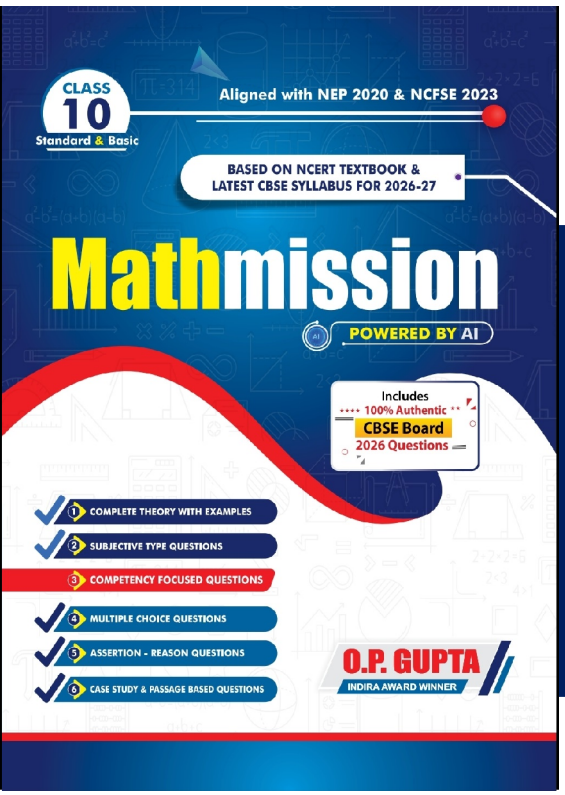

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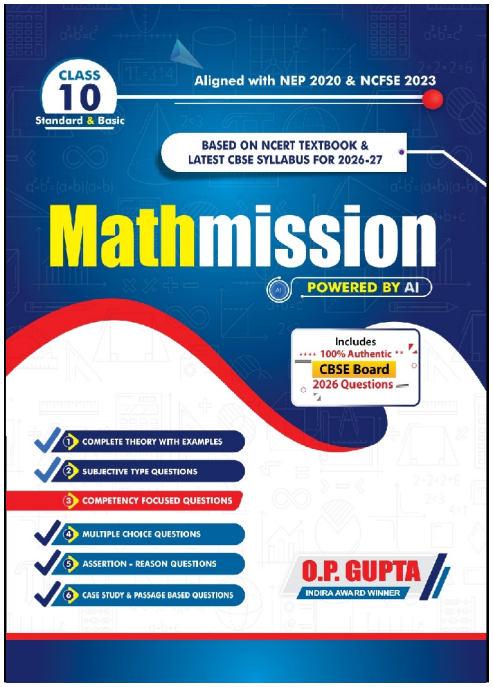

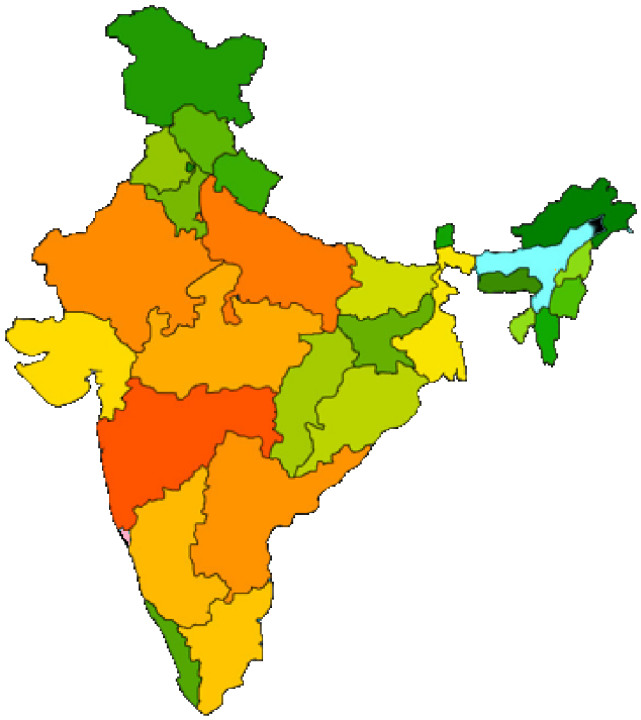

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Mathematics • Class X

*Weightage assigned to different units :

Sr. No.	Topic	Marks
01.	Unit - I (Number Systems)	06
02.	Unit - II (Algebra)	20
03.	Unit - III (Coordinate Geometry)	06
04.	Unit - IV (Geometry)	15
05.	Unit - V (Trigonometry)	12
06.	Unit - VI (Mensuration)	10
07.	Unit - VII (Statistics & Probability)	11
Total marks (Theory exam.)		**80**
Internal assessment marks (Periodic tests & activities)		**20**

* This weightage is as per the **latest Curriculum for the Board Exams (issued by CBSE)**.

CHAPTER 02

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 $a_0, a_1, a_2, ..., a_n$ be the constants (real numbers), then the expression of the form $\mathbf{a_n x^n + a_{n-1} x^{n-1} + ... + a_2 x^2 + a_1 x + a_0}$ 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

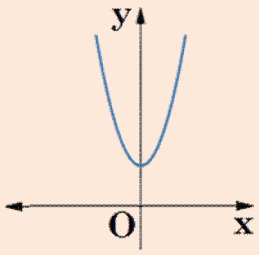
The values of x for which the polynomial $p(x)$ becomes zero are called the zeroes of the polynomial.

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.** 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).
- **b.** A quadratic polynomial has at the most two **real** zeroes. Also, it has exactly two zeroes (real or imaginary zeroes).
- **c.** 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

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

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

***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

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

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,

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

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

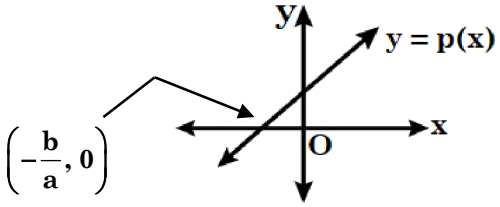
◈ Note that here S and P represent the sum of zeroes and product of zeroes of $p(x)$ respectively.

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., $y = ax + b$.

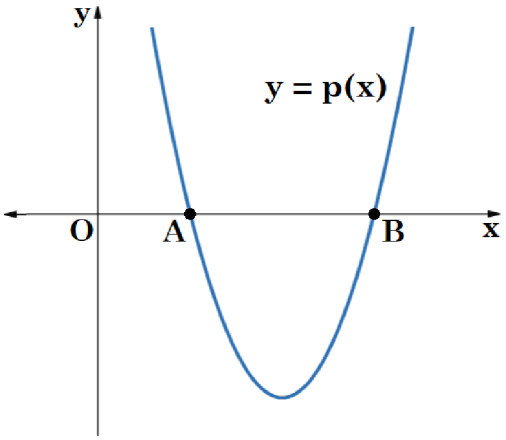


(b) Quadratic polynomial

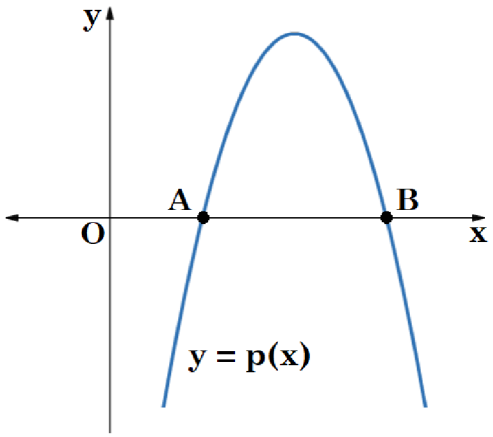
For a quadratic polynomial $p(x) = ax^2 + bx + c$, $a \neq 0$, the graph is a parabola; which is open either upwards ($\cup$) or downwards ($\cap$).

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.

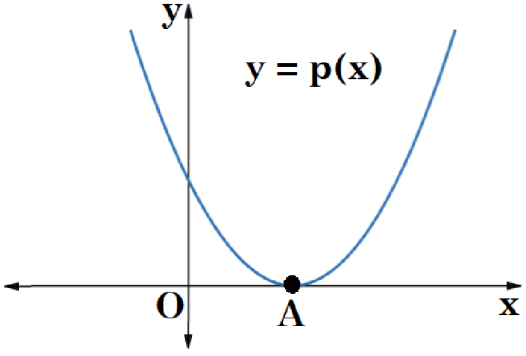


$(a > 0,\ b^2 - 4ac > 0)$

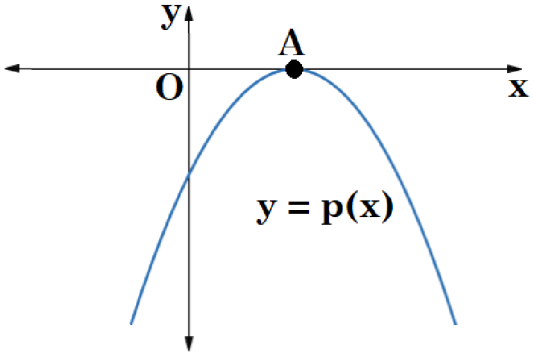


$(a < 0,\ b^2 - 4ac > 0)$

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.

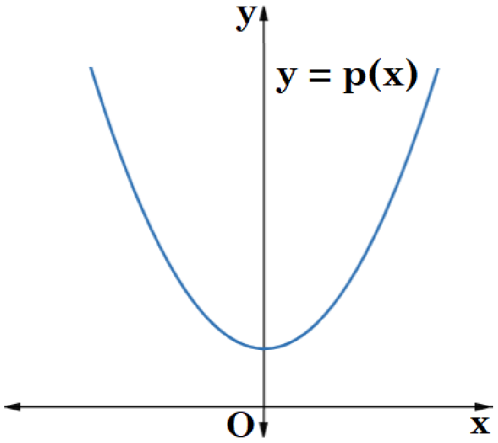


$(a > 0,\ b^2 - 4ac = 0)$

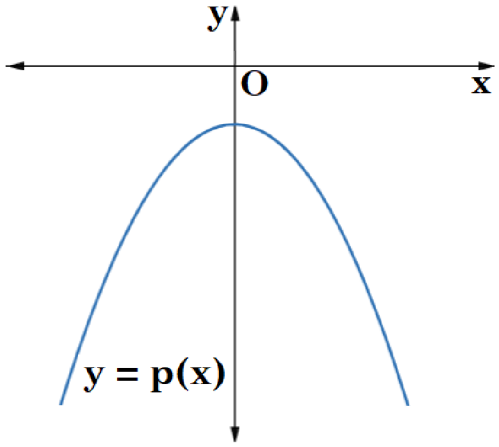


$(a < 0, b^2 - 4ac = 0)$

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**.



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



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

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, $\sqrt{3}x^2 - 8x + 4\sqrt{3}$

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

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

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

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

$x = 2\sqrt{3}$ or $x = \dfrac{2}{\sqrt{3}}$.

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 quadratic 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 $k(x^2 - Sx + P)$, where $k \neq 0$.

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

Ex04. Write a quadratic polynomial whose zeroes are reciprocal of the zeroes of the quadratic polynomial $p(x) = ax^2 + bx + c,\ a \neq 0,\ c \neq 0$.

Sol. Let α and β be the zeroes of $p(x) = ax^2 + bx + c$.

Then $\alpha + \beta = -\frac{b}{a},\ \alpha\beta = \frac{c}{a}$.

For the required quadratic polynomial, the zeroes will be $\frac{1}{\alpha}$ and $\frac{1}{\beta}$.

So, for the required polynomial, $S = \frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha+\beta}{\alpha\beta} = \frac{\frac{-b}{a}}{\frac{c}{a}} = -\frac{b}{c};\ P = \frac{1}{\alpha} \times \frac{1}{\beta} = \frac{1}{\alpha\beta} = \frac{1}{\frac{c}{a}} = \frac{a}{c}$.

Therefore, the required polynomial is $x^2 - Sx + P$ or $k(x^2 - Sx + P)$, where $k \neq 0$

That is, $x^2 - \left(-\frac{b}{c}\right)x + \frac{a}{c}$ or $k\left[x^2 - \left(-\frac{b}{c}\right)x + \frac{a}{c}\right]$, where $k \neq 0$

Hence, the polynomial is $x^2 + \frac{b}{c}x + \frac{a}{c}$ or $\frac{k}{c}\left[cx^2 + bx + a\right]$, where $k \neq 0$.

$\therefore$ The required polynomial is $x^2 + \frac{b}{c}x + \frac{a}{c}$ or $\lambda\left[cx^2 + bx + a\right]$, where $\lambda = \frac{k}{c}$; $\lambda \neq 0$.

Ex05. 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 ploynomial $x^2 + 3x + 2$, $\alpha + \beta = -3$ 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, $k(x^2 + x)$; $k \neq 0$.

Ex06. If α and β are the zeroes of quadratic polynomial $x^2 - ax - b$, then find a quadratic polynomial whose zeroes are $3\alpha + 1$ and $3\beta + 1$.

Sol. For the ploynomial $x^2 - ax - b$, $\alpha + \beta = -\left(\frac{-a}{1}\right) = a$ and $\alpha\beta = \frac{-b}{1} = -b$.

The sum of zeroes of required quadratic polynomial whose zeroes are $3\alpha + 1$ and $3\beta + 1$

$$= (3\alpha + 1) + (3\beta + 1) = 3(\alpha + \beta) + 2 = 3a + 2$$

Also, the product of zeroes of required quadratic polynomial

$$= (3\alpha + 1).(3\beta + 1) = 9(\alpha\beta) + 3(\alpha + \beta) + 1 = -9b + 3a + 1$$

Hence, the required polynomial is given as $x^2 - (3a + 2)x + (3a - 9b + 1)$

Note that, the required polynomial can also be taken as $k\left[x^2 - (3a + 2)x + (3a - 9b + 1)\right]$; $k \neq 0$.

Ex07. If α and β are the zeroes of the polynomial $p(x) = x^2 - 3x - 1$, then find the value of $\frac{1}{\alpha} + \frac{1}{\beta}$.

Sol. For $p(x) = x^2 - 3x - 1$, we have $\alpha + \beta = -\left(\frac{-3}{1}\right) = 3$, $\alpha\beta = \frac{-1}{1} = -1$.

Now $\frac{1}{\alpha} + \frac{1}{\beta} = \frac{\alpha + \beta}{\alpha\beta} = \frac{3}{-1} = -3$.

Ex08. α and β are the zeroes of the polynomial $5x^2 - 16x - 10$. Find the value of $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$.

Sol. For $5x^2 - 16x - 10$, we have $\alpha + \beta = -\left(\frac{-16}{5}\right) = \frac{16}{5}$, $\alpha\beta = \frac{-10}{5} = -2$.

Now $\frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\alpha^2 + \beta^2}{\alpha\beta} = \frac{(\alpha + \beta)^2 - 2\alpha\beta}{\alpha\beta}$

$$\Rightarrow \frac{\alpha}{\beta} + \frac{\beta}{\alpha} = \frac{\left(\frac{16}{5}\right)^2 - 2(-2)}{-2} = \frac{\frac{256}{25} + 4}{-2} = -\frac{128}{25} - 2 = -\frac{128 + 50}{25} = -\frac{178}{25}.$$

Ex09. If α and β are the zeroes of $f(y) = y^2 - 5y + 3$, then find the value of $\alpha^4\beta^3 + \alpha^3\beta^4$.

Sol. For $f(y) = y^2 - 5y + 3$, we have $\alpha + \beta = -\left(\frac{-5}{1}\right) = 5$, $\alpha\beta = \frac{3}{1} = 3$.

Now $\alpha^4\beta^3 + \alpha^3\beta^4 = \alpha^3\beta^3(\alpha+\beta) = (\alpha\beta)^3(\alpha+\beta) = (3)^3(5) = 27\times 5$

$\therefore \alpha^4\beta^3 + \alpha^3\beta^4 = 135$.

Ex10. If p and q are zeroes of the polynomial $p(y) = 21y^2 - y - 2$, then find the value of $(1-p)(1-q)$.

Sol. For the polynomial $p(y) = 21y^2 - y - 2$, we have $p + q = -\left(\frac{-1}{21}\right) = \frac{1}{21}$, $pq = \frac{-2}{21}$.

Now $(1-p)(1-q) = 1 - p - q + pq = 1 - (p+q) + pq$

$$= 1 - \frac{1}{21} + \left(-\frac{2}{21}\right) = \frac{21-1-2}{21} = \frac{18}{21} = \frac{6}{7}.$$

Ex11. If the zeroes of the polynomial $x^2 + ax + b$ are in the ratio $3:4$, then prove that $12a^2 = 49b$.

Sol. Assume that the zeroes of $x^2 + ax + b$ are 3α and 4α.

Then the sum of the zeroes is $3\alpha + 4\alpha = -\left(\frac{a}{1}\right) \quad \Rightarrow 7\alpha = -a$ …(i)

Also the product of the zeroes is $3\alpha \times 4\alpha = \frac{b}{1} \Rightarrow 12\alpha^2 = b$ …(ii)

By (i) and (ii), we get $12\left(-\frac{a}{7}\right)^2 = b$

$\Rightarrow 12\times\frac{a^2}{49} = b$

$\therefore 12a^2 = 49b$.

Ex12. If one zero of the polynomial $p(x) = 6x^2 + 37x - k + 2$ is reciprocal of the other, find the value of k.

Sol. Let α and β be the zeroes of $p(x) = 6x^2 + 37x + (-k+2)$ such that $\alpha = \frac{1}{\beta}$.

Clearly, $\alpha\beta = 1$ …(i)

Now taking the 'product of zeroes' of polynomial, we get $\alpha\beta = \frac{-k+2}{6}$

By (i), $\alpha\beta = \frac{-k+2}{6} = 1$

$\Rightarrow -k + 2 = 6$

$\Rightarrow -k = 6 - 2$

$\therefore k = -4$.

Ex13. 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., $2k+1 = \frac{k+5}{2}$

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

$\therefore k = 1$.

Ex14. Find the zeroes of $p(x) = (x+4)^2 - (x-4)^2$.

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

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

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

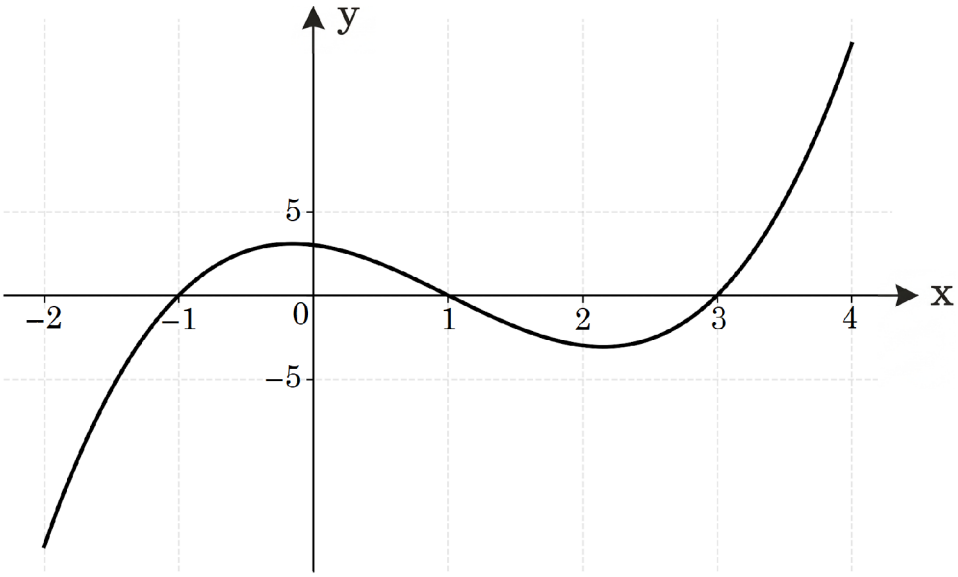
$\Rightarrow p(x)=16x$

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

$\therefore x=0$.

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

Ex15. The graph of polynomial p(x) is shown in figure. Write the number of zeroes.

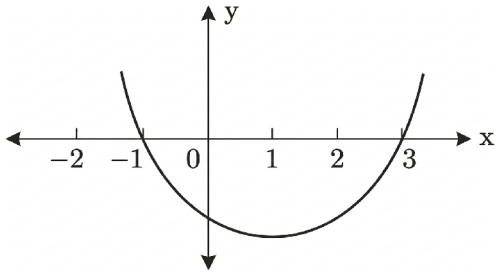


Sol. To find the number of zeroes of a polynomial from its graph, we look at the number of times the graph intersects the x-axis. Each point where the graph touches or crosses the x-axis represents a zero of the polynomial.

The given curve crosses the x-axis at 3 distinct points.

Hence, the number of zeroes of the polynomial p(x) is 3.

Ex16. The graph of a quadratic polynomial $p(x)$ is shown in the figure.



Answer the questions on the basis of shown graph.

(i) How many zeroes polynomial $p(x)$ has?

(ii) Find the zeroes of $p(x)$.

(iii) Write the sum and product of zeroes of $p(x)$.

(iv) Write the polynomial $p(x)$.

Sol. The graph is of a quadratic polynomial.

(i) Since the zeroes of a polynomial are the x-coordinates where the graph intersects the x-axis. Looking at the graph, we observe that graph of $p(x)$ cuts x-axis at two points.

So, $p(x)$ has two zeroes.

(ii) The first intersection is at $x=-1$ and the second intersection is at $x=3$.

So, the zeroes are –1 and 3.

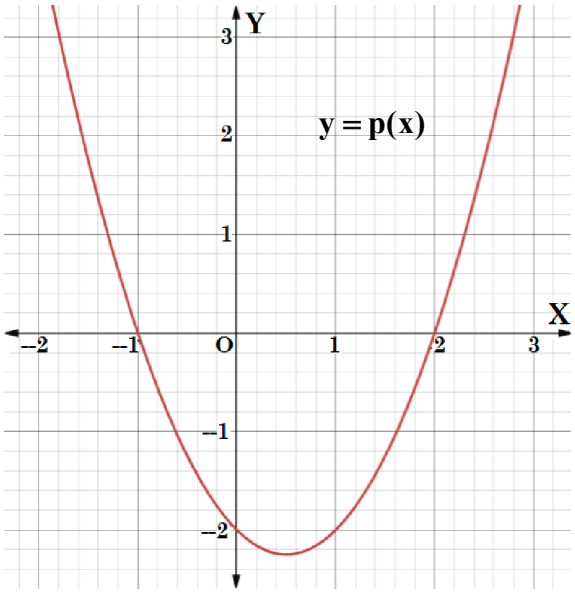
(iii) Sum of the zeroes $=(-1)+3=2$; and the Product of the zeroes $=(-1)(3)=-3$.

(iv) $\because$ Sum of the zeroes $(S)=2$; and the Product of the zeroes $(P)=-3$.

So, the required quadratic polynomial $p(x)$ is x^2-Sx+P or $k(x^2-Sx+P)$, where $k\neq 0$

That is, x^2-2x-3 or $k(x^2-2x-3)$, where $k\neq 0$.

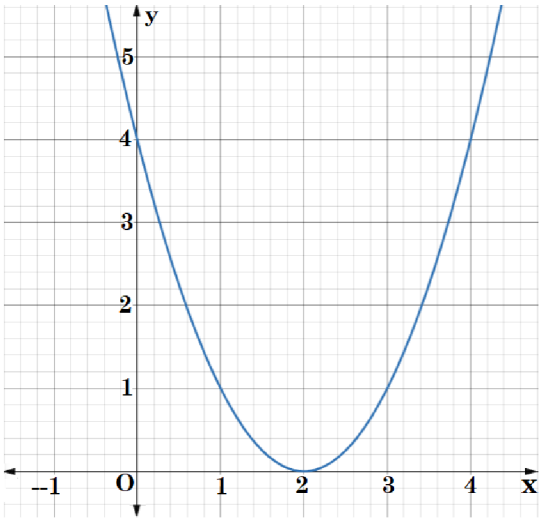
Ex17. Consider the graph of a polynomial $p(x)$.



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

Ex18. The graph of polynomial $p(x) = (x-2)^2$ is shown in the figure given below.



(i) Write the degree of polynomial p(x).
(ii) Write the number of zeroes of p(x), as per the degree of given polynomial.
(iii) 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) $x^2 + px + q$

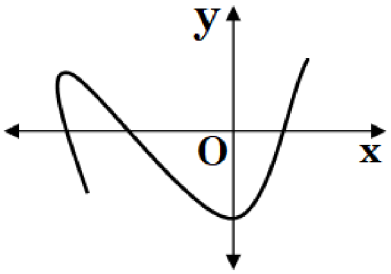
(c) $x^2 + \frac{1}{x^2} + 8$ (d) $2x^3 + 3x^2 - 5x - 6$.

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. The graph of polynomial p(x) is shown in figure.



Write the number of zeroes of p(x).

Q06. Is $7x^2 - \sqrt{x} + 2$ a polynomial? If yes, write its degree. Justify your answer.

Q07. Write a quadratic polynomial whose zeroes are given as α and β.

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. Find the zeroes of the polynomial $2x^2 - 7x + 3$ and hence find the sum and product of its zeroes.

Q08. 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.

Exercise 2.3

Q01. Find a quadratic polynomial whose zeroes are – 5 and 7.

Q02. Form a quadratic polynomial whose sum and product of zeroes are $\sqrt{2}$ and $\frac{1}{3}$ respectively.

Q03. Find a quadratic polynomial whose sum and product of zeroes are $\sqrt{2}$ and 3 respectively.

Q04. Find the quadratic polynomial whose one zero is $2 + \sqrt{3}$.

Q05. Form a quadratic polynomial whose zeroes are 2 and –6. Verify the relation between the coefficients and zeroes of the polynomial.

Q06. If a and b are zeroes of the polynomial $x^2 - x - 6$, then find a quadratic polynomial whose zeroes are $3a + 2b$ and $2a + 3b$.

Q07. Form a quadratic polynomial whose zeroes are the squares of the zeroes of $x^2 - 2x - 5$.

Q08. 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 $p(x)$.

Exercise 2.4

Q01. If 1 is a zero of the polynomial $f(u) = au^2 - 3(a-1)u - 1$, then find the value of a.

Q02. For what value of k, –4 is a zero of the polynomial $x^2 - x - (2k + 2)$?

Q03. 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.

Q04. If one zero of polynomial $(k^2 + 9)x^2 + 13x + 6k$ is reciprocal of the other, find the value of k.

Q05. For what value of k, the polynomial $p(x) = (k^2 - 4k + 4)x^2 + (k + 3)x + (2k - 4)$ is quadratic? If one zero of the polynomial $p(x)$ is reciprocal of the other, then find the value/s of k.

Q06. If one zero of $4x^2 - 9 - 8kx$ is negative of the other, determine the value of k.

Q07. If 1 is a zero of the polynomials $at^2 + at + 3$ and $t^2 + t + b$, then find the value of (ab).

Q08. 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.

Q09. If sum of the zeroes of $kx^2 + 3k + 2x$ is equal to their product, then write the value of k.

Q10. 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.

Q11. 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.

Q12. The difference between the squares of the zeroes of $x^2 + px + 45$ is 216, find the value of p.

Q13. If α and β are zeroes of $2x^2 - 7x + 3$, then find the sum of reciprocal of the square of its zeroes.

Q14. If the zeroes of $x^2 + (a + 1)x + b$ are 2 and –3, then find the values of a and b.

Exercise 2.5

Q01. If α and β are the zeroes of polynomial $ax^2 + bx + c$, $a \neq 0$, then evaluate:

(a) $\alpha^2 + \beta^2$ (b) $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$

(c) $\left(\frac{\alpha}{\beta}\right)^2 + \left(\frac{\beta}{\alpha}\right)^2$ (d) $\frac{1}{\alpha^3} + \frac{1}{\beta^3}$

Q02. If α and β are the zeroes of the quadratic polynomial $f(x) = x^2 - 4x + 3$, then find the value of $\alpha^4\beta^3 + \alpha^3\beta^4$.

Q03. If sum of the squares of zeroes of $f(x) = x^2 - 8x - \lambda$ is 40, then find the value of λ.

Q04. 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.

Q05. 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 $2\beta + 1$.

Q06. 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.

Q07. If α and β are the zeroes of $2x^2 + 7x - 3$, then find the sum of the reciprocal of its zeroes.

Q08. If m and n are zeroes of $3x^2 + 11x - 4$, then find the value of $\frac{m}{n} + \frac{n}{m}$.

Q09. If p and q are zeroes of polynomial $t^2 - 4t + 3$, then show that $\frac{1}{p} + \frac{1}{q} - 2pq + \frac{14}{3} = 0$.

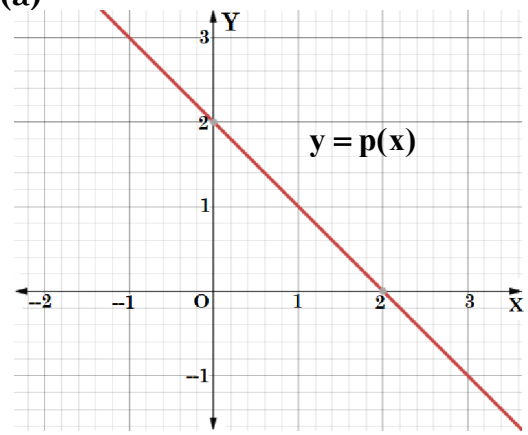
Q10. If $(x - 6)$ is a factor of $x^3 + ax^2 + bx = 0$ and $a - b = 7$, then find the values of a and b.

Q11. For what value of k, the polynomial $x^4+10x^3+25x^2+15x+k$ is exactly divisible by $x+7$.

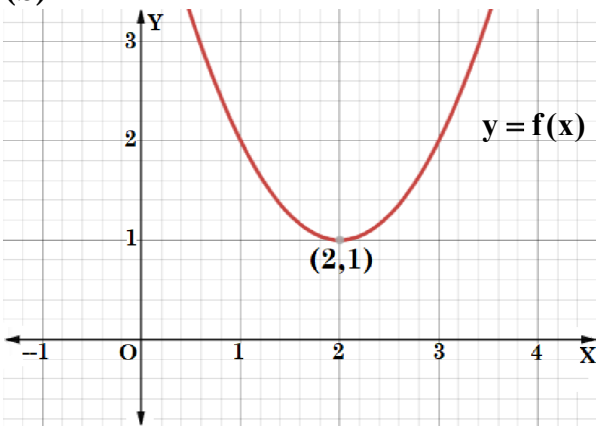
Q12. The coefficient of x in the quadratic polynomial $f(x)=x^2+px+q$ was wrongly written as 17 in place of 13 and the zeroes thus found were –2 and –15. Find the zeroes of correct polynomial.

Q13. Find the number of zeroes and values of zeroes (if possible) in the following graphs.

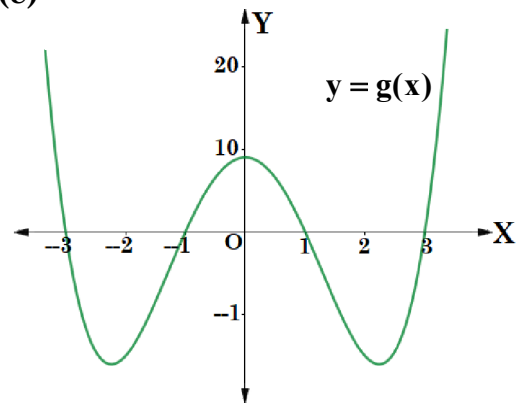
(a)



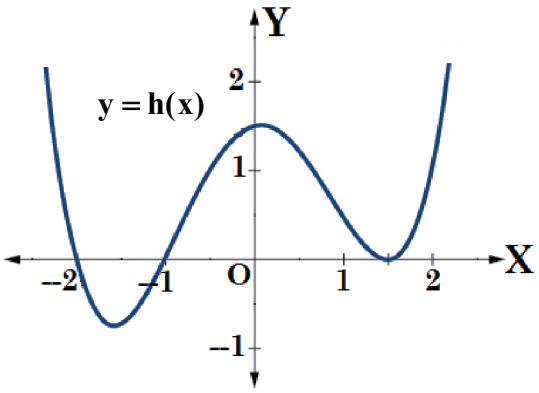
(b)



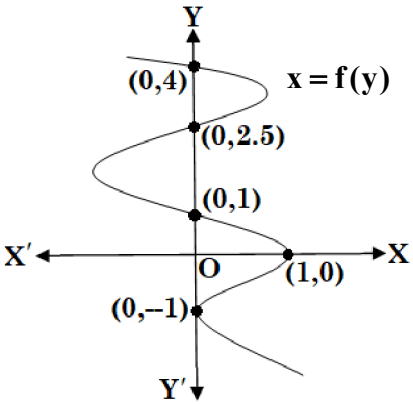
(c)



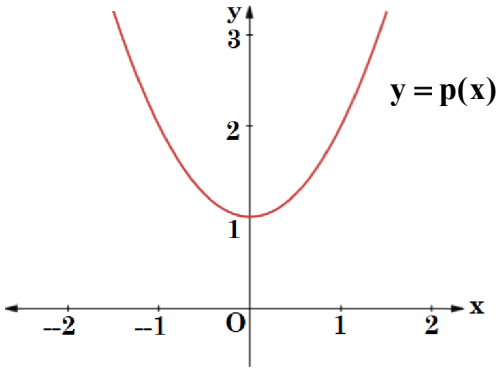
(d)



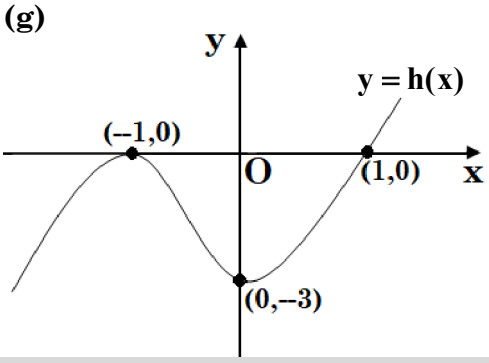
(e)



(f)



(g)



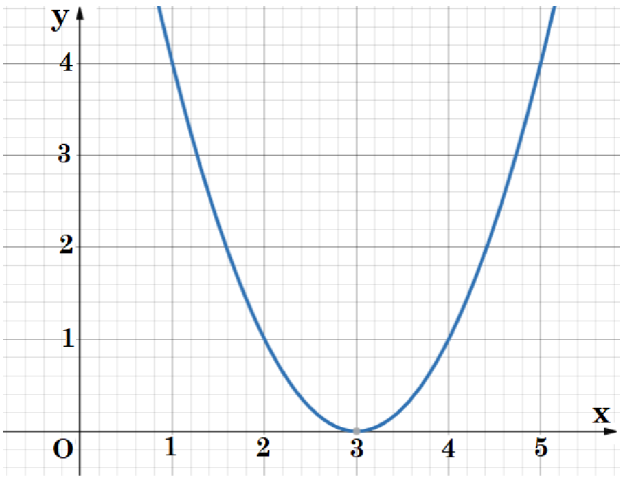
📖 This is only a Demo sample file of **MATHMISSION FOR X** (2026-27).
The contents shown here are just glimpses of what we have provided in the Printed book.

Q14. If α and β are the zeroes of the polynomial $f(x) = a x^2 + b x + c$, then find $\frac{1}{a\alpha + b} + \frac{1}{a\beta + b}$.

Q15. If α and β are the zeroes of the quadratic polynomial $p(x) = x^2 - a x + b$, then find the value of $\frac{\alpha^2}{\beta^2} + \frac{\beta^2}{\alpha^2} - \frac{a^4}{b^2} + \frac{4a^2}{b}$.

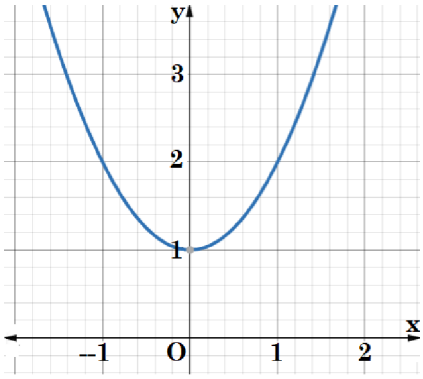
Q16. If α and β are the zeroes of the quadratic polynomial $f(x) = 3x^2 - 4x + 1$, then find a quadratic polynomial whose zeores are $\frac{\alpha^2}{\beta}$ and $\frac{\beta^2}{\alpha}$.

Q17. 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.

Q18. 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)?

MULTIPLE CHOICE TYPE QUESTIONS

For CBSE 2027 Exams - Mathematics - Class 10

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 $207\times781\times39\times94$ 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) $\sqrt{k}$ (b) k (c) $(k+p)$ (d) (k^3+1)

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 LCM $(91, 26)=182$, then 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) $2.123\overline{123}$ (iii) 2.123123...

(iv) $\left(2\sqrt{3}-\sqrt{2}\right)\left(2\sqrt{3}+\sqrt{2}\right)$, the irrational number is

(a) i (b) ii (c) iii (d) iv

Q21. $7\times11\times13+6$ is

(a) a prime number (b) a composite number

(c) an even number (d) None of these

Q22. If $p^n=(a\times5)^n$, for p^n to end with the digit zero a = _____ 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. HCF $(47, 61)=$

(a) 2867 (b) 1 (c) 47 (d) 61

Q25. 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) $b^2 - 4ac$ (b) $\sqrt{a^2 - 4bc}$ (c) $a^2 - 4bc$ (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 6^{th} and 7^{th} 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 9^{th} 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. $8\frac{1}{8}, 8\frac{2}{8}, 8\frac{3}{8}, \ldots$ 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

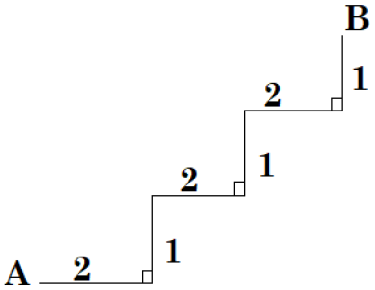
(a) $0.5\,n\,(n+1)$ (b) $\frac{n^2}{2}$ (c) $n+2$ (d) $0.5+(n+1)$

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

Chapter 06 - Triangles

Q01. Given that $\Delta ABC \sim \Delta DEF$. 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) $\Delta ABC = \Delta PQR$ (b) $\Delta ABC \approx \Delta PQR$ (c) $\Delta ABC \cong \Delta PQR$ (d) $\Delta ABC \sim \Delta PQR$

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 90º

Q06. If in two triangles ΔDEF and ΔPQR, $\angle D = \angle Q$ 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 ΔABC, D and E are points on the sides AB and AC respectively such that DE || 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 = ___ × 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) 60º (b) 90º (c) 45º (d) 30º

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 $\text{cosec}\,30^\circ-\sec 60^\circ$ 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 $\sec\theta\cot\theta-\text{cosec}\theta\tan\theta$ 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 $\cot^2\theta - \left(\frac{1}{\sin\theta} \times \text{cosec}\,\theta\right)$ 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

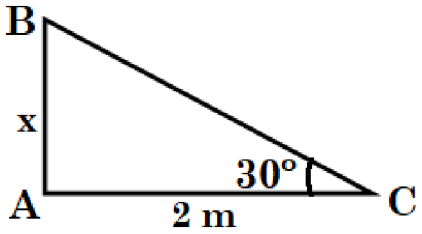
(a) $\sec\theta$ (b) $\sec^2\theta$ (c) $\sec 2\theta$ (d) $\cot^2\theta$

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

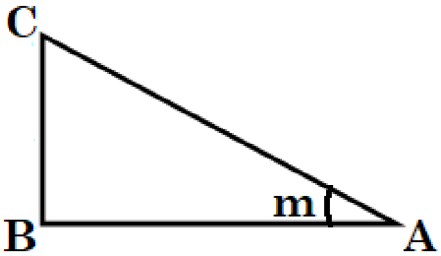
(a) 4 m (b) 7 m (c) 12 m (d) 6 m

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, form 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 60º. 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 63º is

(a) 118º (b) 28º (c) 38º (d) None of these

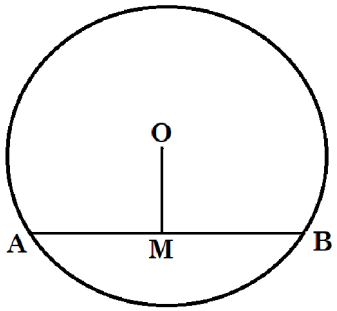
Q02. The supplement of 60º is

(a) 30º (b) 40º (c) 120º (d) None of these

Q03. An angle which is greater than 180º but less than 360º 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

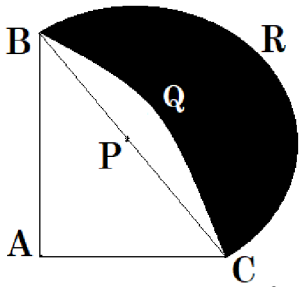
(a) 12 cm (b) 13 cm (c) 8.5 cm (d) $\sqrt{119}$ cm

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) $16\sqrt{2}$ cm^2 (b) $16\sqrt{3}$ cm^2 (c) $12\sqrt{2}$ cm^2 (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

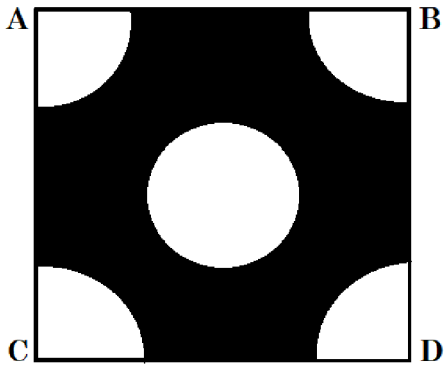
Q07. The minute hand of a clock is $\sqrt{21}$ cm long. The area described by minute hand on the face of the clock between 7:00 am to 7:05 am is

(a) 4.5 cm^2 (b) 6.6 cm^2 (c) 5.5 cm^2 (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 cm^2 (b) 9.72 cm^2 (c) 11.52 cm^2 (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 $\sqrt{3}$ m^2, 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) $\frac{2}{23}$

ASSERTION REASON TYPE QUESTIONS

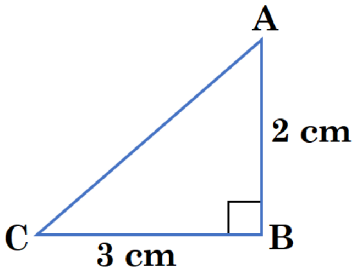
For CBSE 2027 Exams - Mathematics - Class 10

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 ΔABC 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, $HCF(a, b) \times LCM(a, b) = a \times b$.

◈ 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 $ax^2+bx+c=0;\ a\neq0$ 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. $a_1, a_2, a_3, ..., a_n$ is obtained by $d=a_n-a_{n-1}$.

Q03. **Assertion (A) :** $-5, -\frac{5}{2}, 0, \frac{5}{2}, ...$ 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 $\left(\frac{m_1x_2 + m_2x_1}{m_1 + m_2}, \frac{m_1y_2 + m_2y_1}{m_1 + m_2}\right)$.

◈ Chapter-08 Introduction to Trigonometry

Q01. **Assertion (A) :** For $0^\circ < \theta \le 90^\circ$, $\operatorname{cosec}\theta - \cot\theta$ 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 $\tan 45^\circ$.

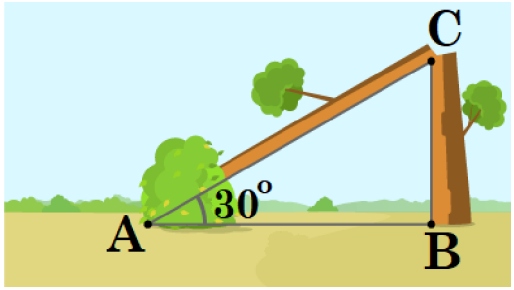
Reason (R) : When $0^\circ < \theta < 90^\circ$, the value of $\tan\theta$ increases as θ increases.

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 $y = 45^\circ$.

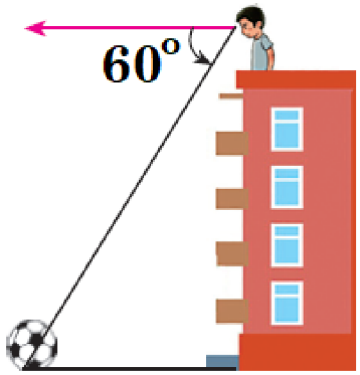
◈ Chapter-09 Applications of Trigonometry

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.



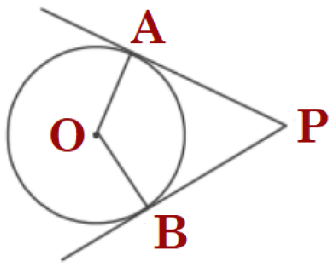
Assertion (A) : Angle of depression is 60°.
Reason (R) : The angle of depression is the angle formed between the line of sight and the horizontal line when looking downward from a point.

◈ 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 $154\ \text{cm}^2$.

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 $\frac{53}{6}$ cm^2.

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

Q04. **Assertion (A) :** In a circle of radius 6 cm, the angle of a sector 60^o. Then the area of the sector is $18\frac{6}{7}$ 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 πa^2 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 Mode = 3 Median – 2 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 $0 \le P(E) \le 1$.

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 $\frac{1}{2}$.

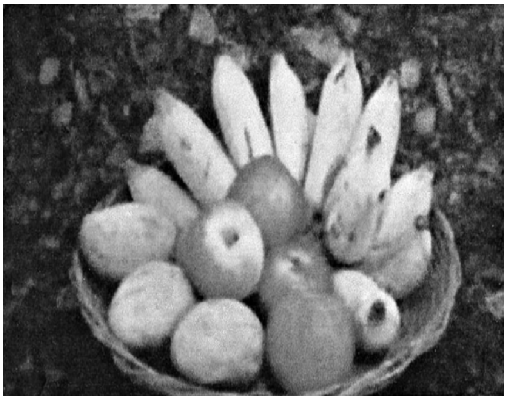
Reason (R) : $P(\text{event}) = \frac{\text{Number of favourable outcomes}}{\text{Total number of possible outcomes}}$.

CASE STUDY & PASSAGE BASED QUESTIONS

For CBSE 2027 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?

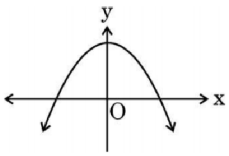
(iii) If Khushi decides to add 42 mangoes, how many guests Khushi can invite at the most?

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

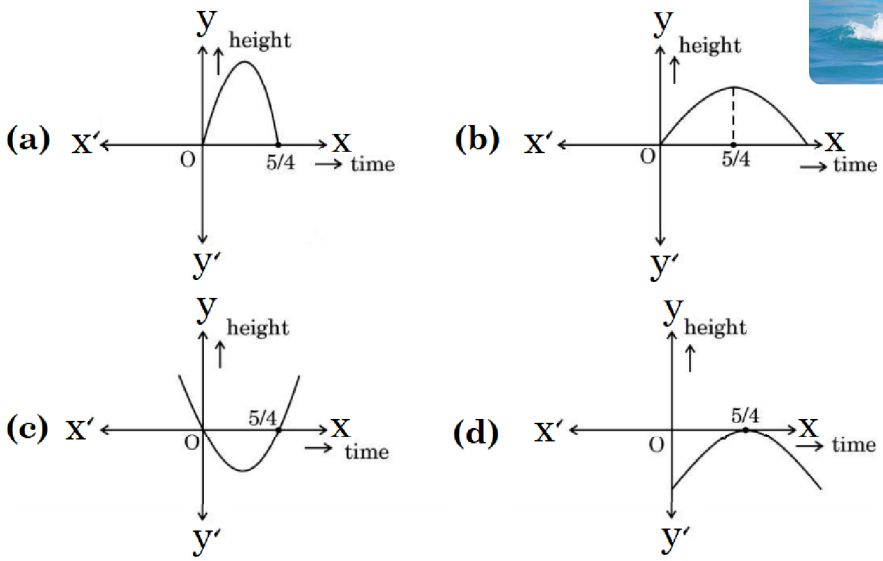
(iii) The polynomial $x^2 - 2x - (7p+3)$ represents a rainbow. If –4 is a zero of it, find the value of p.

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?

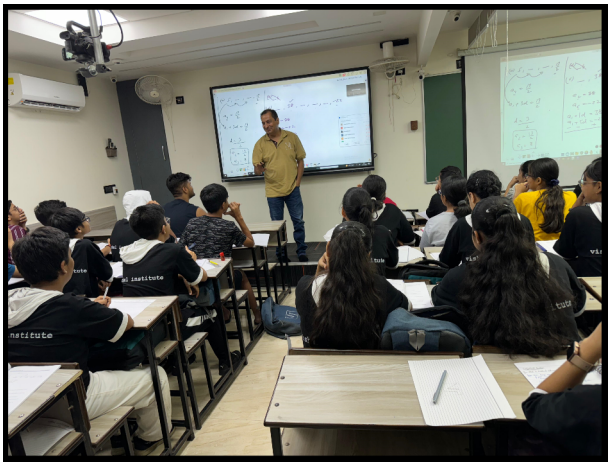
(iii) If fixed charges are ₹20 and charges per km are ₹10, then how much Lokesh have to pay for travelling a distance of 10 km?

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 institue 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.

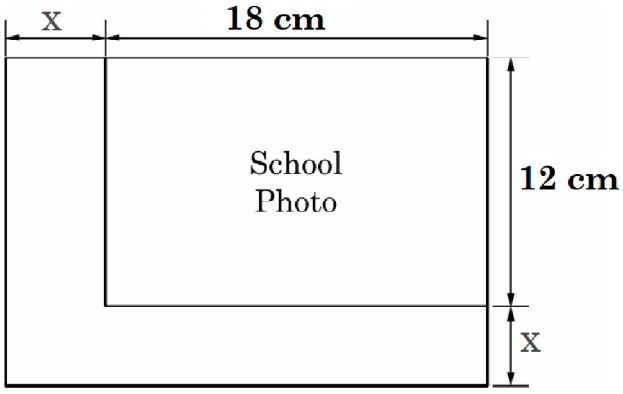
Based on the above information, answer the questions given below.
(i) Represent the given information algebraically (in terms of x and y).
(ii) What is the prize amount for hockey?

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 competely 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.

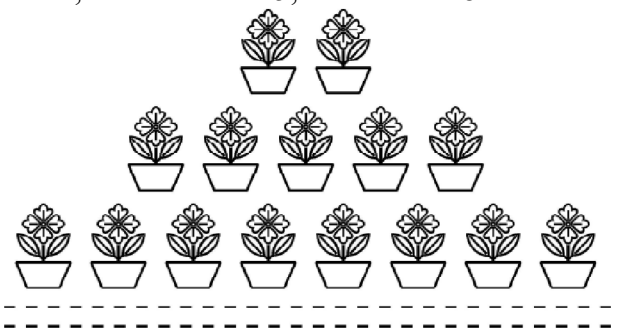
(i) Assuiming the original length of each side of a tile be x units, make a quadratic equation from the above information.
(ii) Write the corresponding quadratic equation in standard form.
(iii) Find the value of x, the length of side of a tile by factorisation.

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 10^{th} row.
(ii) Find the difference in the number of pots placed in 5^{th} row and 2^{nd} 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 $(n-2)^{th}$ 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.

(i) How many coins were added to the piggy bank on 8^{th} day?

(ii) How much money will be there in the piggy bank after 8 days?

(iii) 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

(iii) 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.

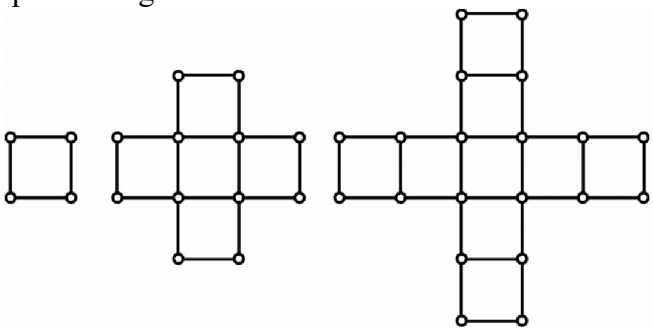


Fig. (1) Fig. (2) Fig. (3) .....

Based on the above information, answer the following questions.

(i) Write first term and common difference of the A.P. formed by number of squares in each figure.

(ii) Write first term and common difference of the A.P. formed by number of sticks used in each figure.

(iii) How many squares are there in Fig. (10)? Also write the number of sticks used in Fig. (10).

OR

(iii) 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.

(i) Find the production in the first year.

(ii) Find the production in the tenth year.

(iii) Find the total production in first ten years.

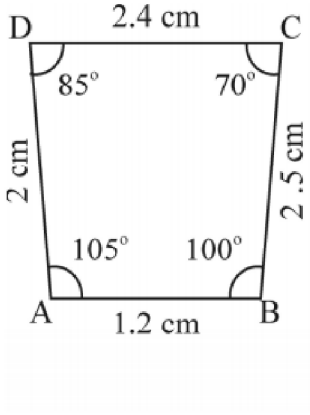
OR

(iii) In how many years will the total production reach 27200 bikes?

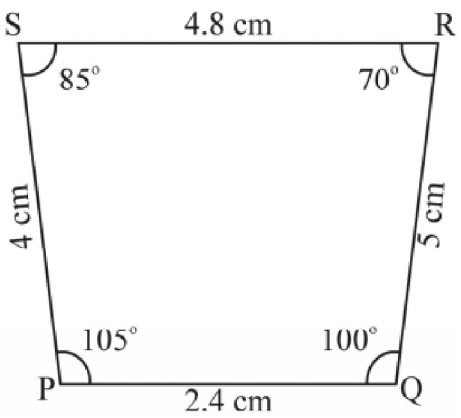
Chapter-06 Triangles

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

Figure A

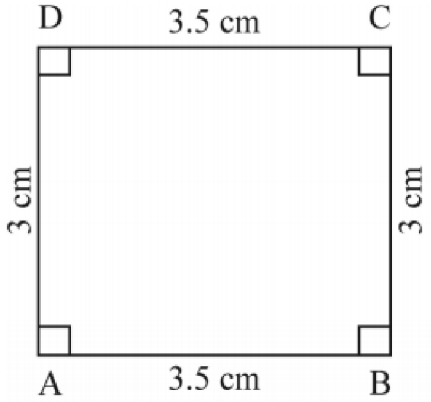


A (i)

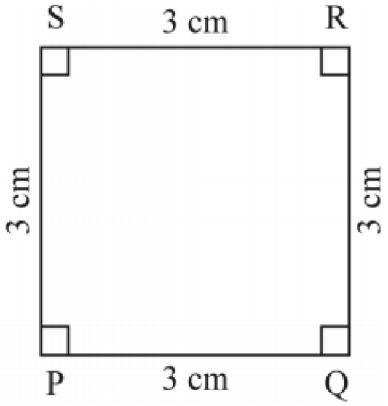


A (ii)

Figure B

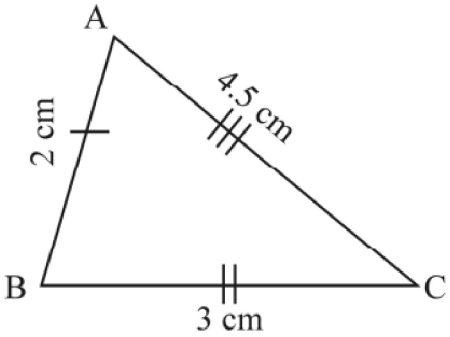


B (iii)

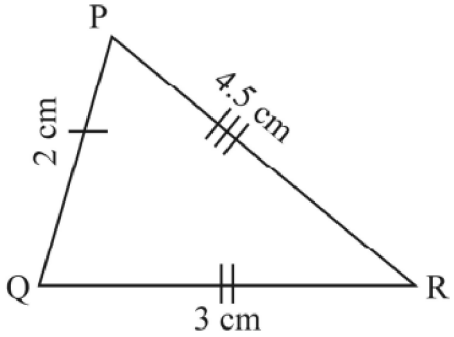


B (iv)

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.

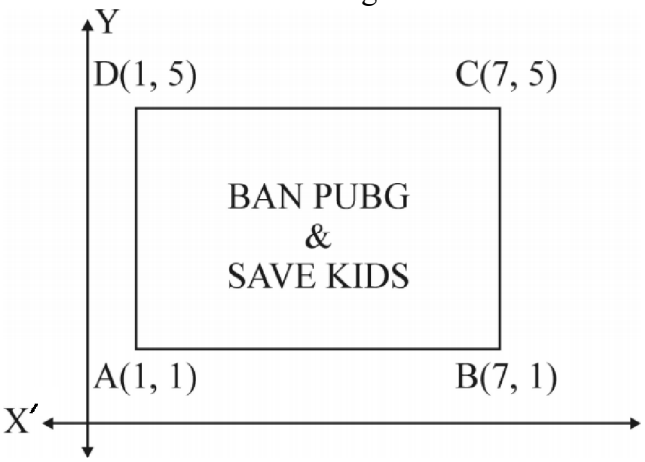
OR

(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 addidcted 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.



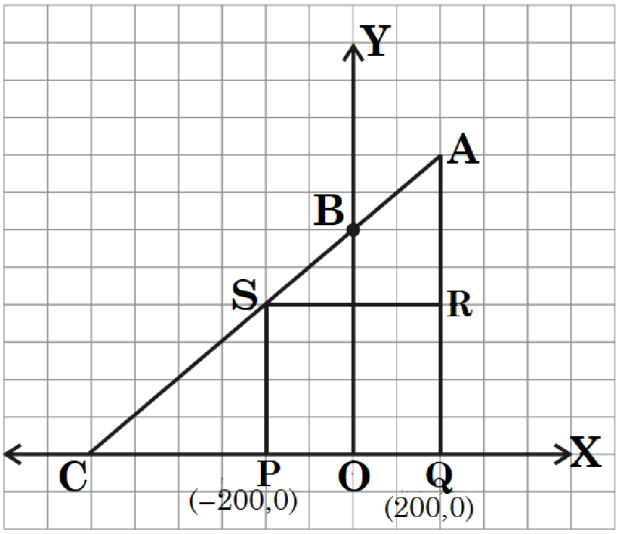
Based on the above information, answer the following questions.

(i) Find the coordinates of the point of intersection of diagonals AC and BD.
(ii) Find the length of the diagonal AC.
(iii) Find the area of the campaign Board ABCD.

OR

(iii) 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.



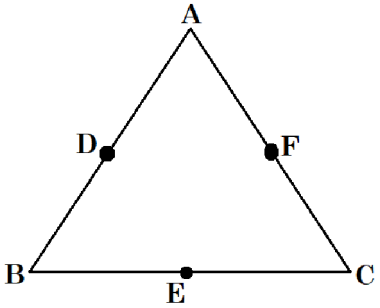
Based on the above information, answer the following questions.

(i) 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?
(ii) What is the area of square PQRS?

OR

(ii) What is the length of diagonal PR in square PQRS?
(iii) 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.



(i) Find the distance between A and D.
(ii) Find the distance between E and F.
(iii) Find the coordinates of of D, E and F.

OR

(iii) Find the coordinates of point of intersection of AE, BF and CD.

Chapter-08 Introduction to Trigonometry

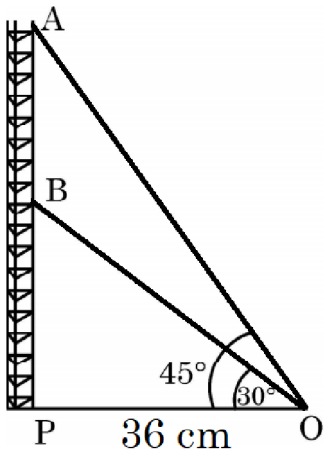
Q01. Mr Ajay helped his students learn about trigonometric ratios.
He asked his students to draw a right-angled ΔABC, with hypotenuse $(h) = 17$, base $(b) = 8$ and perpendicular $(p) = 15$.
Using the information given above, answer the following questions.
(i) Write the value of $\sin x$.
(ii) Write the value of $\cos x$.
(iii) Find the value of $\sec^2 x - \tan^2 x$.

OR

(iii) Find the value of $\cot^2 x - \text{cosec}^2 x$.

Chapter-09 Applications of Trigonometry

Q01. Radio towers are used for transmitting a range of communication services inluding 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.

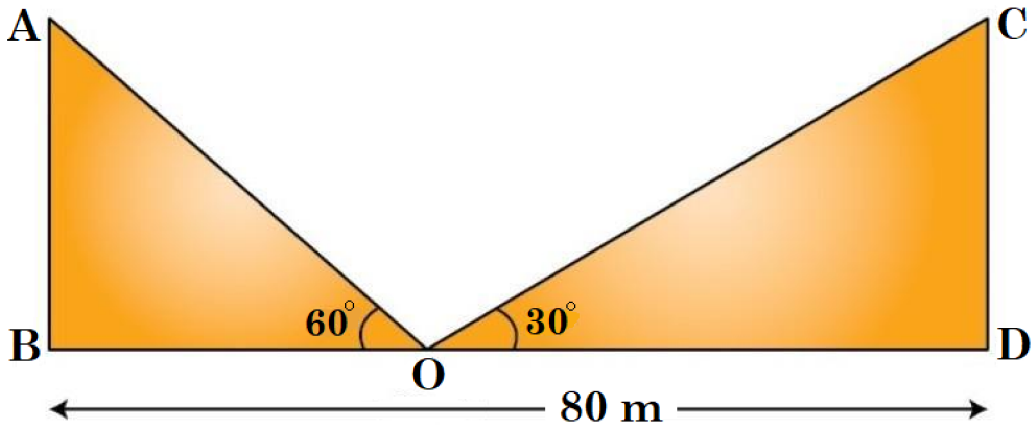


Distance between the base of the tower and point O is 36 cm. From point O, the angle of elevation of the top of the Section B is 30° and the angle of elevation of the top of Section A is 45°.
Based on the above information, answer the following questions.
(i) Find the length of the wire from the point O to the top of Section B.
(ii) Find the distance AB.

OR

(ii) Find the area of ΔOPB.
(iii) 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.
(i) Point O is closer to which pole?
(ii) Find the distances of the point (O) from the poles.
(iii) Find the height of each pole.

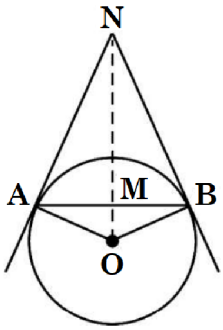
OR

(iii) 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 $\angle ANO = 30^o$ and $OA = 5$ cm.

Based on the above information, answer the following questions.

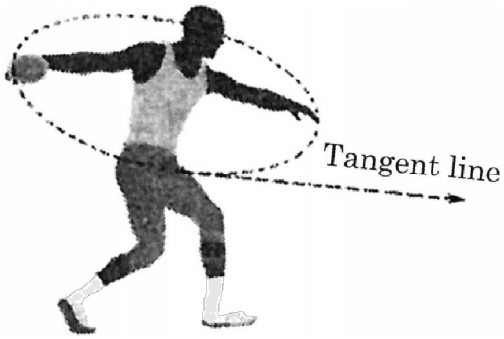


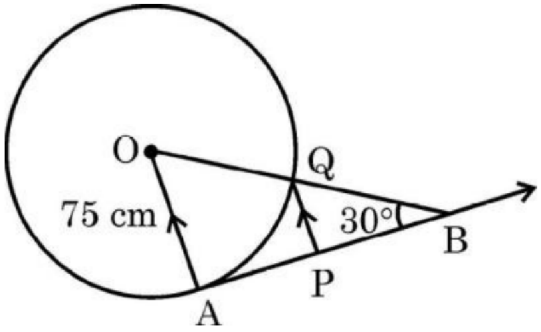
(i) Find the distance AN.
(ii) Find the measure of $\angle AOB$.
(iii) Find the total length of cords NA, NB and the chord AB.

OR

(iii) If $\angle ANO$ is 45^o, 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 $\angle ABO = 30^o$. PQ is parallel to OA.

Based on the above information,

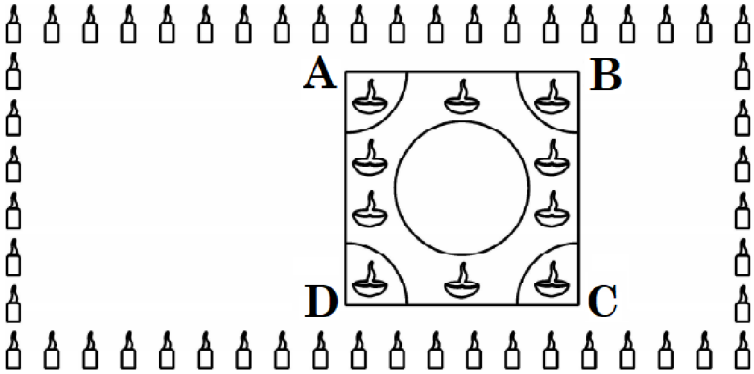
(i) find the length of AB.
(ii) find the length of OB.
(iii) find the length of AP.

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.

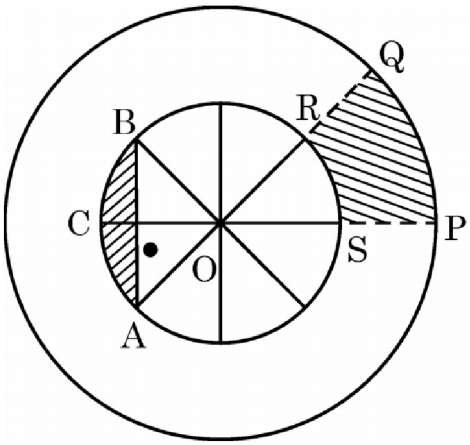
NSS symbol is based on the 'Rath' wheel of the Konark Sun Temple situated in Odisha. The wheel signifies the progress cycle of life.

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 cm×17 cm×4 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.
(i) Write the modal class.
(ii) Find the median of the given data.

OR

(ii) Find the mean rainfall in this season.
(iii) 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

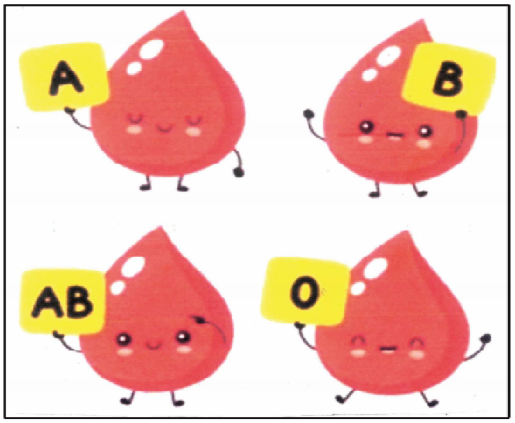
Based on the above information, answer the following questions.
(i) What is the upper limit of modal class of the data?
(ii) What is the median class of the date?
(iii) What is the mode NAV of mutual funds?

OR

(iii) 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.

(i) What is the probability that a person chosen at random had type O blood?
(ii) What is the probability that a person chosen at random had type AB blood group?
(iii) What is the probability that a person chosen at random had neither type A nor type B blood group?
OR
(iii) What is the probability that person chosen at random had either type A or type B or type O blood group?

Q16. A family has 3 children. Assume each child is equally likely to be a boy or a girl. Consider all the possible combinations.

Find the probability that
(i) all are boys
(ii) exactly one girl
(iii) at least one boy
OR
(iii) all are girls.

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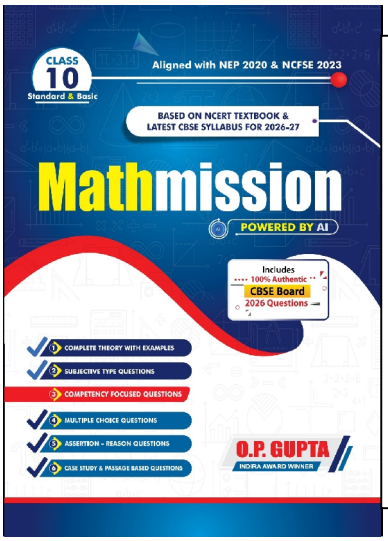

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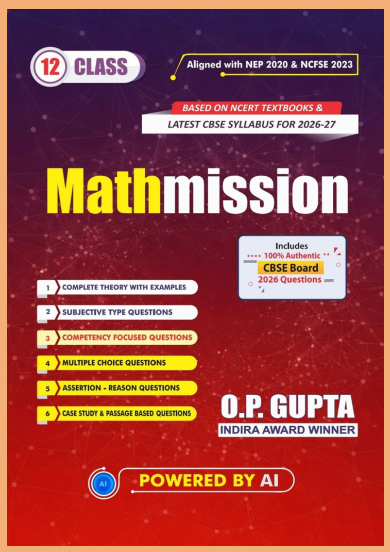

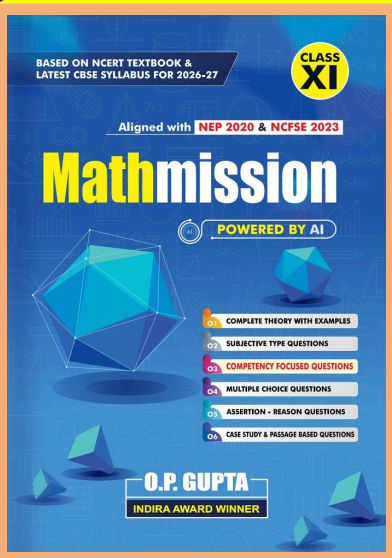

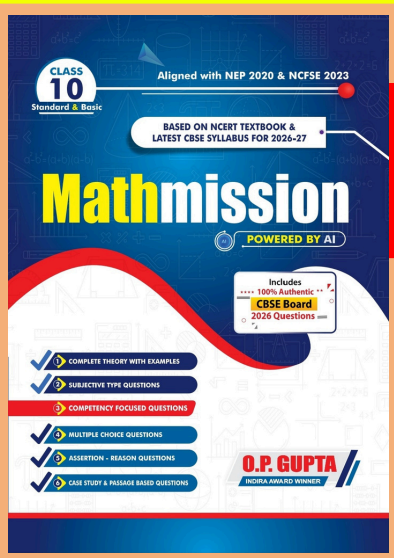

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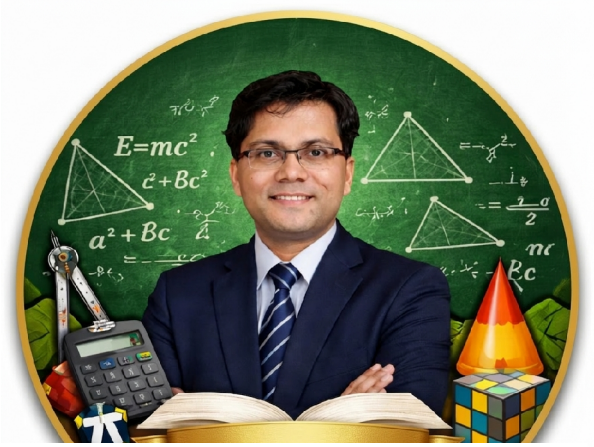

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• Durgesh Rastogi (PGT, Parvati Radhakishen Fomra School, Mathura)
• Ruchi Pokhriyal (TGT, JSS Public School, Noida)
• Satendra Dhama (PGT, Golden Gate Intl. School, Ghaziabad)
• Mayank Joshi (PGT, Sacred Heart School, Lucknow)
• Peiush Agarwal (PGT, 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, Mayoor 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, Kunskapsskolan International School, Gurugram)
• Rohit Yadav (HOD, Suaj School, Gurugram)
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• 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 Sindhwani (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)
• Pradeep Heda (PGT, Bhanwarlal Gothi Public Sr. Sec. School, Beawar)
• Jayant Parwani (PGT, Kendriya Vidyalaya, Jodhpur)
• Rajendra K Mathur (Director, The High Aims, Jaipur)
• Rahul Agarwal (PGT, Shri Agrasen Public School, Jaipur)
• Mohan Jangir (PGT, Jawahar Navodaya Vidyalaya, Mavli, Udaipur)
• Arti Sharma (PGT, S.R. Public Sr. Sec. School, Kota)
• Pankaj Kumar Mittal (PGT, Pancy Children's Academy, Jaipur)
• Gaurav Jaju (PGT, St. Paul's Sr. Sec. School, Jodhpur)
• Ved Prakash Vrati (PGT, Maheshwari Public School, Jaipur)
• Deepak Makhija (TGT, Subodh Public School, Rambagh Crossing, Jaipur)
• Chetan Gautam (PGT, LBS School, Kota)
• Santosh Saini (PGT, St. Gregorios Sr. Sec. School, Udaipur)
• Anup Taparia (PGT, Maheshwari Public School, Jaipur)
• Bharat Singh (PGT, Good Day Defence School, Hanumangarh)
• KK Sharma (TGT, Maheshwari Public School, Jaipur)
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• Simranpreet Kaur (PGT, Subodh Public School, Jaipur)
• Vikas Alavadi (PGT, Dharav High School, Jaipur)
• Jitendra Kumar Maheshwari (PGT, The Aditya Birla Public School, Chittorgarh)
• Manoj Kumar Sharma (HOD, Vardhman International School, Jaipur)
• Daljeet Kaur (PGT, Morning Star St. Anslem School, Jaipur)
• Deepak Sharma (TGT, Sony Academy Sr. Sec. School, Bharatpur)
• Deepesh Joshi (PGT, Kautilya Sr. Sec. School, Kota)

Kerala
• Smitha Jilesh (PGT, Tolins World School, Ernakulam, Kerala)
• Mini Saju (TGT, Navdeep Public School, Kollam)
• Jayasree PV (TGT, The Choice School, Tripunithura, Ernakulam)
• Arathi Chandran (PGT, Prabhath Public School, Udayamperoor)
• Aji Paulose (Bhavan's Newsprint Vidyalaya, Kottayam)
• Jibeesh Balan (Amrita Vidyalayam, Kodungallur, Thrissur)
• Jasmine P Xavier (PGT, Toc H Public School, Kochi)
• Padmaja Devi L (Amrita Vidyalayam, Thiruvananthapuram)
• Shyma MP (TGT, Crescent English School, Ajanur)
• Sindhu S (PGT, Cochin Refineries School, Kerala)
• Nithun MJ (PGT, Navajeevan Bethany Vidhyalaya, Kerala)
• G Uma Priya (PGT, Dr. Raju Davis International School, Thrissur)
• Mala S (PGT, Madhavakripa School, Manipal, Udupi)
• Shruthi Shylet Dsouza (PGT, St. Mary's English Medium School, Udupi)
• Suma Satheesh (Principal, Vishwa Sishya Vidyodaya School, Pollachi)
• Santhi V Sasidharan (PGT, St. John's School, Kollam)
• G Rameshkumar (PGT, KPM Model School, Kollam)
• M. Mangalavathi (HOD, The High Range School, Munnar)
• Sreevidya (PGT, Fr. Thomas Porukara Central School, Champakulam, Kerala)
• Asha Manohara Das (PGT, Sree Narayana Public School, Tiruvandrum)
• Dhanya MK (PGT, Navy Children School, Kochi)
• Lincy T Abraham (PGT, St. Thomas Public School, Ernakulam)
• Vidya Sangameswaran (PGT, Bharatiya Vidya Bhavan's Vidya Mandir, Irinjalakuda, Thrissur)
• Swapna S (PGT, Bhavan's Vidya Mandir, Chithali, Palakkad)
• Anon DL (Anons Academy for Maths, Kollam)
• Sangeetha KP (PGT, Cochin Refineries School, Kochi)
• Beena Krishnan PC (PGT, Guruvayur Devaswom English Medium School, Kerala)
• Gisha John (PGT, Bharatiya Vidya Bhavan School, Calicut)
• Prabhamani S (PGT, Navdeep Public School, Kollam)
• Dhanya VG (TGT, Najath Public School, Ernakulam)
• Sulakshna V (TGT, Carmel School, Shoranur)
• Subhasree VP (PGT, Devagiri CMI Public School, Calicut)

Maharashtra
• Sant Prakash (PGT, SNBP Intl. School, Pune)
• Dr. Abhijeet Shivraj Shelke (PGT, Podar International School, Latur)
• Lata Mahadev Chinchali (PGT, DAV Public School, Airoli, Navi Mumbai, Maharashtra)
• Anil Tiwari (PGT, MK International Vidyalaya, Borivali West, Mubmai)
• Sunjoty Chintawar (HOD, Mansukhbhai Kothari National School, Pune)
• Sonia Saxena (HOD, Ryan International School, Navi Mumbai)
• Pooja V Kadam (Don Bosco High School, Borivali, Mumbai)
• Komal Solanki (PGT, Solanki Tutorials, Navi Mumbai)
• Mirza Nighat Khan (PGT, Akshara International School, Pune)
• Harmeet Kaur Sharma (PGT, Hillgreen High School & Junior College, Pune)
• Sameer M Shaikh (PGT, Sacred Heart School, Kalyan)
• Ritu Atreja (PGT, DAV Public School, Pune)
• Dr. Ashish Tawani (Tawani Tutorials, Nagpur)
• Manmohan Dubey (PGT, St. Raphael's Academy, Pune)
• Shubham Pardeshi (PGT, NTVS Anudanit Secondary & Higher Secondary Aashram School, Kolde, Nandurbar, Maharashtra) • Shalini Kaistha (PGT, Royale Concorde Intl. School, Kalyan Nagar)
• Harish Ratole (PGT, Shree Vallabh Sanskar Dham's Day Boarding School, Valsad)
• Sandhya Binu (PGT, Sacred Heart School, Kalyan West, Thane)

• Sarita Vishwanath Dingore (Dr Shivajirao S Jondhle International School, Asangaon, Thane)
• Sarika Patil (PGT, Bharati Vidyapeeth English Medium School, Navi Mumbai)
• Dipak M Choudhari (PGT, Reliance Foundation School, Navi Mumbai)
• Rajalakshmi Iyer (PGT, Apeejay School, Navi Mumbai)
• MP Raju (PGT, Jindal Vidya Mandir, Thane)
• Roopa Das (PGT, Tilak Public School, Navi Mumbai)
• Arvind Kumar Yadav (HOD, The Aditya Birla Public School, Chandrapur, Maharashtra)
• Rajkumar Shrestha (PGT, Ryan Intl. School, Kandivali, Mumbai)
• Vipin Kumar Shukla (PGT, New Bombay City School, CBSE, Navi Mumbai)
• Ravinder Singh (TGT, Army Public School, Ahmednagar, Maharashtra)
• Rashmi Dubey (PGT, U.S. Ostwal English Academy, Boisar)
• Vidya Patil (PGT, Ayaansh Leadership Academy, Wagholi)
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• Poonam Verma (HOD, Indira National School, Pune)
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Gujarat
• Avinash Kumar Sharma (PGT, Saksham Institute, Anand, Gujarat)
• Kunal Shah (HOD, Swaminarayan Vidyapith, Karmsad, Anand)
• Mohemmedmuez Khatri (HOD, Rafai Public School, Boru)
• Rekha Thakur (HOD, SD Jain Modern School, Surat)
• Nirali Kansagra (PGT, Green Valley High School, Vadodara)
• Sandeep Gaur (TGT, Tatachem DAV Public School, Mithapur)
• Vijay Vora (Retired Academic Advisor, Adani Vidya Mandir, Gujarat)
• Zubair Gopalani (Director, Hanifa School, Borsad, Gujarat)
• Valmik Bhadane (PGT, The Aditya Birla Public School, Kovaya, Gujarat)
• Sabita Routroy (HOD, Adani Vidya Mandir, Ahmedabad)
• Hitesh Santwani (PGT, N Infinity Coachings, Surat)
• Dip Choksi (Director, Choksi Classes, Navsari, Gujarat)
• Ashish Kumar Jhanwar (PGT, Vatsalya Intl. School, Anand, Gujarat)
• Dhaval Kumar Patel (HOD, Nand Vidya Niketan, Jamnagar)
• Jignesh Kumar Pithiya (PGT, Eklavya Global School, Junagadh)
• Rekha Thakur (TGT, SD Jain Modern School, Surat)
• Devraj Sharma (HOD, Shanti Asiatic School, Ahmedabad)
• Vandana Singh (PGT, Green Valley High School, Vadodara)
• Savitha Prakash (PGT, AMNS International School, Surat)

Karnataka
• Shivakumar S Kamlapurkar (PGT, Appa Public School, Kalaburagi)
• Uma Ashok (Delhi Public School, Bangalore West)
• Chidambara G (HOD, Delhi Public School, Mysore)
• Shyamalamma MV (PGT, Presidency School, Bangalore)
• Murugan S (PGT, Freedom International School, Bangalore)
• Lokashree Manjunath (PGT, The San Global School, Ramanagara)
• Parul Patel (PGT, Bangalore)
• Shalini Kaistha (PGT, Royale Concorde International School, Kalyan Nagar, Bengaluru)
• G. B. Jnanananda (PGT, DAV Public School, Mysore)
• Sudha S (PGT, Vydehi School Of Excellence, Bengaluru)
• Subha PS (PGT, Sri Sri Ravi Shankar Vidya Mandir, Bangalore South)
• Uma N (HOD, Presidency School, Bangalore East)
• Prathibha HM (PGT, Sri Sri Ravi Shankar Vidya Mandir, Bangalore North)
• Ruchi Bansal (Magic Brain, Mysore)
• S Murali Krishna (Vice Principal, Shree Nandi Residential Public School, Badanahatti)
• Deepa Abraham (HOD, Presidency School, Bangalore North)
• CA Krishna (HOD, Presidency School, Bangalore South)
• Kotresh M Kandagal (PGT, KLE Society's English Medium School, Haveri, Karnataka)
• Sagar RH (PGT, Appa Public School, Gulbarga)
• A. Meena (TGT, Sri Jnanakshi Vidyaniketan, Bangalore)
• GV Shankar Prasad (PGT, CIT Public School, Tumkur)
• Veerabhadra Hubballi (PGT, Kalpavruksha Model School, Bailhongal, Karnataka)
• Sunitha S (PGT, Presidency School, Bangalore South)
• Snigdha Pradhan (HOD, Indian Public School, Bangalore)
• Raghavendra Devadiga (HOD, Don Bosco School, Trasi)

Madhya Pradesh
• Jackey Lakhwani (PGT, Saint Paul's Convent School, Jaora)
• Suhaseeni Kavale (PGT, St. Raphael's Higher Secondary School, Indore)
• Aparna Barole (PGT, Pragya Girls School, Indore)
• Ankit Mod (PGT, Mandsaur International School, Mandsaur)
• Abhijeet Doshi (PGT, Shrikanwartara Public Higher Secondary School Mandaleshwar)
• SV Chandra Shekhar (Principal, Mansarovar The School, Betul)
• Payal Joshi (TGT,The Aditya Birla Public School, Ujjain)
• Dheeraj Minocha (PGT, Army Public School, No.2, Jabalpur)
• Maneesh Kumar Jain (PGT, Central Academy English Medium School, Jabalpur)
• Tarun Jaiswal (PGT, Carmel Convent Sr. Sec. School, Neemuch)
• Aaqil Ahmed Ansari (HOD, Nirmala Convent School, Ratlam)
• Manisha Tiwari (PGT, Air Force School No.1, Gwalior)
• Kirti Naik (PGT, St. Joseph's Convent School, Indore)
• Ajay Kumar Singh (PGT, Jawahar Navodaya Vidyalaya, Shahdol)
• Rashmik Kumar Sharma (HOD, Delhi Public School, Indore)
• Nitin Kumar Tiwari (PGT, IES Public School, Bhopal)
• Satyam Sen (HOD, Delhi Intl. School, Indore)
• Shobha Vijayan (PGT Maths, St. Xavier's School, Bhopal)
• Prafful Sharma (PGT, Sai Shree Intl. Academy, Ratlam)
• Mradul Jain (PGT, Macro Vision Academy, Burhanpur, Madhya Pradesh)
• Manoj Kumar Sharma (PGT, Shree Sai Public School, Mandsaur)
• Diptee Jain (PGT, Holycross Senior Secondary School, Bhopal)
• Shweta Joshi (TGT, Delhi International School, Indore)
• Radheshyam Verma (PGT, Himalaya International School, Dhamnod)
• Syed Bilal Ali (PGT, Kamla Devi Public School, Bhopal)

Chhattisgarh
• Lokesh Kumar Pradhan (PGT, Ashoka Public School, Sarangarh)
• Ashutosh Upadhyay (PGT, The Aditya Birla Public School, Baikunth, Chhattisgarh)

• Sagar Soni (PGT, MGM Higher Secondary School, Raipur)

Punjab

• Renu Rani (PGT, Bhupindra Intl. School, Patiala)
• Mandeep Singh (PGT, Guru Nanak Dev DAV Public School, Bhikhiwind, Tarn Taran)
• Rakesh Kumar (TGT, Modern Sr. Sec. School, Patiala)
• Hemant Sehgal (PGT, MGN Public School, Adarsh Nagar, Jalandhar)
• Hardeep Singh (PGT, Holy Heart Public Sr. Sec. School, Sangrur)
• Hemant Gaba (PGT, KB DAV Sr. Sec. School, Chandigarh)
• Rajeev Khurana (Director, R.K. Institute of Commerce, Chandigarh)
• Manpreet Singh Grewal (PGT, GTB School, Ludhiana)
• Maninder Pal Singh (PGT, Anand Isher Sr. Sec. Public School, Ahmedgarh, Punjab)
• Rachna Amrit (PGT, Jawahar Navodaya Vidyalaya, Ropar)
• Pardeep Chopra (PGT, St. Thomas Sr. Sec. School, Ludhiana)
• Mithilesh Arora (PGT, Cambridge Intl. School, Kapurthala)
• Rohit Gupta (HOD, HVM Convent Senior Secondary School, Ludhiana)
• Anita Rani (TGT, Stephan International School, Sangrur)
• Ranvir Kaur (PGT, Jai Vatika Public School, Barnala)
• Cheena Gupta (Cheena Maths Tutorials, Ludhiana)
• Pradeep Mehta (Sacred Heart Convent School, Punjab)

Andhra Pradesh & Telangana

• Sireesha Katepalli (PGT, Delhi Public School, Hyderabad)
• P Sunil Kumar (PGT, Oxford Olympiad School, Eluru)
• P Shobhan Reddy (Nirmal Hridai School, Khammam)
• Qudsia Ahmed Syeda (PGT, Oakridge Intl. School, Gachibowli, Hyderabad)
• Talari Kasim (TGT & HOD, I.P.S. International School, Hyderabad)
• B S Esther Rani (PGT, Timpany Secondary School,Visakhapatnam)
• P Gayatri (HOD, Sri Chaitanya School CBSE, Vishakhapatnam)
• UV Santhosh Kumar (PGT, Sanskruthi Global School, Vishakhapatnam)
• NNB Prasad (Lecturer, SDR Akansha Junior College, Venkateswara Puram, Nandyal, Andhra Pradesh)
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• Ramesh Kumar Kunchakuri (TGT, Birla Open Minds Intl. School, Kollur, Telengana)
• DNR Chowdary (PGT, Sri Chaitanya Olympiad School, Khammam, Telangana)
• B Kiranmai (PGT, Kennedy High School, Hyderabad, Telangana)
• Venkateswara Rao Yeluri (PGT, Nalanda Vidya Niketan, Vijayawada)
• D Lakshmanarao (TGT, St. John's English Medium School, Vijayawada)
• Madhuri (TGT, Matrusri DAV Public School, Miyapur)
• Gurram Sunil (PGT, Sister Stanislas Memorial English School, Kurnool)
• Mohan Rao (Sharada Vidyanikethan, Nandyal)
• KV Prameela Rani (HOD, Oak Valley International School, Vishakhapatnam)
• Lakshmareddy V (TGT, Brahm Prakash DAV School, Telangana)
• Koka Anuradha (PGT, Maharishi Vidya Mandir, Hyderabad)
• A Krishna Mohan Rao (HOD, DAV Public School, Ukkunagaram, Vishakhapatnam)
• D Suryaprakasa Rao (PGT, Sri Chaitanya Vidyaniketan, Vishakhapatnam)
• Gaddam Srinivas (PGT, Viswabharathi Wisewoods International School, Gudivada)
• Bharti Bansal (TGT, St. Andrews High School, Suchitra, Hyderabad)
• VVSN Lakshmi (The Presidential School, Vishakhapatnam)
• Aravini Ravi Shanker (TGT, Indu International School, Hyderabad)

Bihar & Jharkhand

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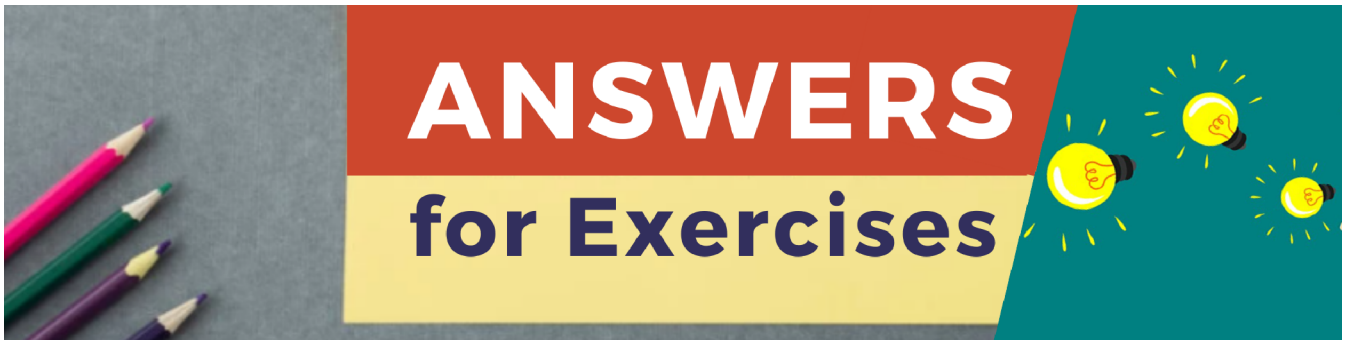


CHAPTER 01

EXERCISE 1.1

Q01. (a) algorithm (b) irrational no. (c) lemma (d) unique (e) product (f) 1; $a \times b$
(g) irrational (h) composite

Q02. $\frac{3}{2}$ Q03. $\frac{3}{2}$, 2, $\frac{5}{2}$ etc. Q04. $\sqrt{3}$ Q05. 2; $\frac{1}{2}+\sqrt{3}$

Q06. Non terminating and non repeating decimal expansion; the decimal expansion will never terminate

Q07. $\frac{7}{9}$ Q08. $\sqrt{2}$ and $\sqrt{3}$ Q09. 2 Q10. 2520 Q11. 10's multiple

Q12. $\frac{l \times h}{a}$ Q13. $3^2 \times 5^2 \times 17$ Q14. $2^2 \times 3 \times 13$ Q15. 2

EXERCISE 1.2

Q01. 4 Q02. 4914 Q03. (a) 24 (b) 26 (c) 48 (d) 4 Q04. 10 Q05. 4
Q06. 4335 Q07. 96 Q08. 22338 Q09. 19000 Q10. $2^3 \times 3 \times 5$
Q11. 720; 24 Q12. 3 Q13. 90 Q14. 23460; 2
Q15. 90900; 1515 Q16. 3, 420 Q17. 675 Q18. 9 Q19. 3024
Q20. $x = 161$ Q21. 91 Q22. 180
Q23. No; LCM is always multiple of HCF

EXERCISE 1.3

Q01. $x = 21,\ y = 42$ Q02. More than two factors Q03. More than two factors
Q04. When n is odd, unit digit is 9; when n is even, unit digit is 1 Q05. Yes Q08. No
Q09. No
Q11. No, as prime factorization of 15 contains 3 and 5; but it does not contain both 2 and 5

EXERCISE 1.4

Q01. 30; rational Q02. $\sqrt{5}+\sqrt{3}$; 2

EXERCISE 1.5

Q01. 14 Q02. 64 Q03. 360 Q04. 5^4 i.e., 625 Q05. 6
Q06. 240 minutes (or 4 hours) Q07. 180 minutes Q08. 17
Q09. 6 : 36 a.m. Q10. 7 Q11. 75 cm Q12. 80 Q13. 6 minutes
Q14. 08:07:12 a.m. Q15. 2520 cm
Q16. 4 packets of colour pencils and 3 packets of crayons Q17. $k = 2^8$ Q18. 12
Q19. 36 minutes Q20. 60 L Q21. 900 Q22. 344864 Q23. 2 pairs
Q24. 2 pairs; (13, 156) and (39, 52) Q25. 10 days Q26. 35 cm Q27. 16
Q28. 29 and 145 Q29. 6 Q30. 4 m Q31. 6
Q32. Ishanvi is correct Q33. Manya is correct

CHAPTER 02

EXERCISE 2.1

Q01. (a) and (c)
Q02. The value of a polynomial at a given point refers to the result obtained when the polynomial is evaluated at that specific point. To find the value of the polynomial $p(x)$ at a given point $x = c$, you

substitute c for x in the polynomial and simplify the expression. Mathematically, this is written as $p(c)$.

Q03. 23 Q04. One zero Q05. Three Q06. Not a polynomial

Q07. $k\left[x^2-(\alpha+\beta)x+\alpha\beta\right]$, where k is any non-zero real no.

EXERCISE 2.2

Q01. $x=-\frac{n}{m},-1$ Q03. $\pm\sqrt{2}$ Q04. $0,-2$ Q05. $-\frac{3}{2},\frac{5}{3}$ Q06. $-\frac{2}{\sqrt{3}},\frac{\sqrt{3}}{4}$

Q07. $3,\frac{1}{2};\frac{7}{2},\frac{3}{2}$ Q08. $-1,\frac{q^2}{p^2}$

EXERCISE 2.3

Q01. $x^2-2x-35$ Q02. $x^2-\sqrt{2}x+\frac{1}{3}$ Q03. $x^2-\sqrt{2}x+3$ Q04. x^2-4x+1

Q05. $x^2+4x-12$ Q06. x^2-5x Q07. $x^2-14x+25$ Q08. $\sqrt{2},\sqrt{3}\,;\ x^2-5x+6$

EXERCISE 2.4

Q01. 1 Q02. 9 Q03. $k=-\frac{2}{7};-\frac{8}{7}$ Q04. 3

Q05. $k\neq 2$ (any real number except 2), $k=4$ Q06. 0 Q07. 3

Q08. $-\frac{2}{3}$ Q09. $-\frac{2}{3}$ Q10. 1 Q11. $\frac{7}{4}$ Q12. ± 18

Q13. $\frac{37}{9}$ Q14. $a=0,\ b=-6$

EXERCISE 2.5

Q01. (a) $\frac{b^2-2ac}{a^2}$ (b) $\frac{b^2-2ac}{ac}$ (c) $\frac{b^4-4ab^2c+2a^2c^2}{a^2c^2}$ (d) $\frac{3abc-b^3}{c^3}$ Q02. 108

Q03. –12 Q04. 2 Q05. x^2-4x-5 Q06. 6 Q07. $\frac{7}{3}$

Q08. $-\frac{145}{12}$ Q10. $a=-\frac{29}{7},\ b=-\frac{78}{7}$ Q11. –91 Q12. –3, –10

Q13. (a) One; 2 (b) No zero (c) Four zeroes; –3, –1, 1, 3 (d) Three zeroes; –2, –1, $\frac{3}{2}$

(e) Four zeroes; 4, $\frac{5}{2}$, 1, –1 (f) No zeroes (g) Two zeroes; –1, 1

Q14. $\frac{b}{ca}$ Q15. 2 Q16. $9x^2-28x+3$

Q17. (i) Degree : 2

(ii) As the degree of p(x) is 2 so, there are exactly two zeroes. (However the polynomial will have **repeated zeroes**, as there is a multiplicity of 2. You may note that in the given quadratic polynomial $p(x)=(x-3)^2$, the factor $(x-3)$ appears twice, so there is multiplicity of 2 for the polynomial.)

(iii) Since the polynomial touches the x-axis at only **one** point i.e., at $x=3$. The polynomial has Single real and repeated zeroes at $x=3$ i.e., p(x) has only **one** zero.

Q18. (i) Degree : 2

(ii) As the degree of p(x) is 2 so, there are exactly two zeroes. (However the polynomial will have **no real zeroes**, as there is **no real value of x** for which $p(x)=x^2+1$ is 0 i.e., $p(x)\neq 0$ for any real value of x.)

(iii) The polynomial has **no real zeroes**. Since the polynomial does not touch the x-axis anywhere.

CHAPTER 03

EXERCISE 3.1

Q01. Yes, by finding the ratio of $\frac{a_1}{a_2}, \frac{b_1}{b_2}, \frac{c_1}{c_2}$ Q02. Intersecting Q03. Consistent

Q04. $x+3y=1$ (or any other suitable equation) Q05. $4x+6y=8$

EXERCISE 3.2

Q01. Unique solution, intersecting lines Q02. Yes, it is consistent; $(0, 2); (0,-2)$

Q03. $k \neq -6$ Q04. $k=2$ Q05. $k=7$ Q06. $k=6$

Q07. $m=4, n=8$ Q08. $k=6$ Q09. $k=2$ Q10. $k=4$

Q11. Any value except 4 Q12. Any value except –1 Q14. $k=-1$

Q15. All real values except 3 Q16. $a=4, b=8$; $b-2a=0$

Q17. Coincident lines Q18. Inconsistent

EXERCISE 3.3

Q02. Consistent system of linear equations

Q03. Consistent system with unique solution; $x=-3, y=4$

Q04. $m=a, n=b$ Q05. (i) $x=3, y=5$ Q06. (2, 0), (–3, 0), (3, 4)

Q08. (3, –4) Q09. (i) $x=5, y=0$ Q10. $x=1, y=-2$; (0, –4), (0, –1)

Q11. $x=1, y=0$; 2 Q12. (2, 2)

EXERCISE 3.4

Q01. True

Q02. (a) 3, 2 (b) $\frac{142}{99}, \frac{133}{99}$ (c) $\frac{2}{5}, \frac{3}{5}$ (d) $-\frac{1}{2}$, 2 (e) 4, 5 (f) $-\frac{1}{2}, \frac{1}{3}$

(g) $\frac{a}{a^2+b^2}, \frac{b}{a^2+b^2}$ (h) 7, 13 (i) 3, 2 (j) 3, 4 (k) 1, 2 (l) 3, 2

(m) 4, 9 (n) $-\frac{1}{2}, \frac{1}{4}$ (o) 1, 1 (p) $-\frac{5}{4}, -\frac{1}{4}$ (q) 2, 1 (r) 1, 1

Q03. $x=3, y=1, p=9$ Q04. $x=4, y=3$; 1 Q05. $x=2, y=3$; 1

Q06. $x=2, y=1$ Q07. $x=3, y=2$ Q08. $x=\frac{22}{5}, y=\frac{8}{5}$ Q09. 2

EXERCISE 3.5

Q01. $x-y=-3, 2x-y=1$, if x and y represent Nr and Dr respectively Q02. $x=85^\circ, y=55^\circ$

Q03. $\frac{5}{7}$ Q04. 36 Q05. 18 Q06. 15, 10 Q07. 41 Q08. 692

Q09. 100 Q10. 136 Q11. 2.5 km/hr Q12. 3 km/hr, 8 km/hr, 17 hours

Q13. 35 km/hr, 5 km/hr Q14. 45 m/min, 30 m/min Q15. 30 minutes

Q16. 6 litres of 50 % acid, 4 litres of 25% acid Q17. Cost of 2 pencils and 1 rubber : ₹5

Q18. 100, 80 Q19. ₹101; 5 Q20. 28 m, 15 m Q21. ₹15, ₹3

Q22. ₹448 Q23. 20 Q24. 12 years Q25. ₹12000, ₹10500

Q26. 7, 3 Q27. 40 years

Q28. Tap with smaller diameter can fill the tank in 10 hours; Tap with larger diameter can fill the tank in 5 hours

Q29. The pipes of larger and smaller diameters fill the swimming pool alone in 20 hours and 30 hours separately Q30. $81^\circ, 99^\circ$

Q31. Coins with Anshu : 212, coins with Bhanu : 124; required difference : 88 Q32. 300 and 200

Q33. 70 kg of 42% iron alloy and 70 kg of 28% iron alloy Q34. 26

Q35. 36

CHAPTER 04

EXERCISE 4.1

Q01. The roots of a quadratic equation are the values of the variable that satisfy the equation, meaning they make the equation true when substituted for the variable. Q02. (a), (c)

Q03. (a) $x^2-x-25=0$ (b) $x^2-8x+9=0$ (c) $x^2-8x+1=0$ (d) $x^2-4x+0=0$

Q04. $k=-\frac{9}{4}$ Q05. $q-p=1$

Q06. (i) $(q-p)=0$ (ii) $(q-p)=0$ (iii) Yes

EXERCISE 4.2

Q01. (a) $\frac{7}{2},-8$ (b) $0,\frac{5}{3}$ (c) $-4,-5$ (d) $8,-8$

Q02. (a) $\sqrt{6},-\sqrt{\frac{2}{3}}$ (b) $\frac{a+b}{6},\frac{a-b}{6}$ (c) -4 (d) $2,-5$

(e) $-\frac{1}{5},-10$ (f) $\frac{-13\pm3\sqrt{21}}{10}$ Q03. $2,-\frac{3}{2}$ Q04. $x=-a,-b$

Q05. $x=-a,\frac{a}{2}$ Q06. Common root $=2$ Q07. (a) 3 (b) $1+\sqrt{2}$

Q08. (a) 4 (b) $4,-\frac{14}{5}$ (c) 3 (d) $\pm2,\pm\sqrt{2}$ (e) 2, 3, 9, –4

(f) 0, 2 (g) $\frac{-1\pm\sqrt{5}}{2}$(repeated) (h) –1, –2 (i) –1, 2 (j) ±3

EXERCISE 4.3

Q01. $k=-1;-\frac{3}{2}$ Q02. False Q03. –5 Q04. $x^2-6x+7=0$

Q05. $x^2-4x+1=0$ Q06. $ax^2-(a^2+1)x+a=0$ Q07. $x^2-29x+100=0$

Q08. $\frac{b^2-2ac}{a^2}$ Q11. $k=7$ Q12. 1, 0 or $0,-1$ Q13. $a=-16$

EXERCISE 4.4

Q02. 16 Q05. 5 Q06. $p\geq6$ Q07. $k=\pm4$

Q08. $c=\frac{b^2}{4a}$ Q09. $-\frac{8}{5}<p<\frac{8}{5}$ Q10. $c=\frac{1}{9}$ Q11. $\frac{k}{3}=1$

EXERCISE 4.5

Q01. 11, 12 Q02. 45 km/hr Q03. Upward : 20 km/h, Downward : 30 km/h

Q04. 36 hours Q05. 12 days Q06. $x^2+20x-1125=0$ Q07. 40 km/hr

Q08. 8, 15 Q09. 64 Q10. 63, 90 or 90, 63 Q11. 30 kmph

Q12. 2 m Q13. 15 hours, 10 hours, 6 hours Q14. 10 minutes, 15 minutes

Q15. 150 sq. cm Q16. 120 m, 90 m Q17. 36 years, 9 years Q18. 20; ₹100

Q19. 576 Q20. 81 Q21. 19, 26 or 24, 21 Q22. 2 hours

Q23. 12 Q24. Height in orientation I : 12 cm; Height in orientation II : 6 cm

Q25. 14 minutes Q26. 1

CHAPTER 05

EXERCISE 5.1

Q01. $5, 2, -1, -4, \ldots$

Q02. (i) $a=\frac{1}{4},\ d=1$ (ii) $a=-1.25,\ d=-0.25$ (iii) $a=\sqrt{2},\ d=2\sqrt{2}$

Q03. $a_n = 6n-3$, $a_9 = 51$, $a_{15} = 87$ Q04. $a_n = 4n+5$, $a_{12} = 53$ Q05. 58^{th} term

Q06. 41 terms Q07. Not possible Q08. 7, 12, 17, 22, ... Q09. 111

Q11. 3, 5, 7, … Q12. 76 Q13. 5 Q14. $x = 6$ Q15. 4

Q16. $\frac{1+(n-1)m}{m}$ Q18. 3 Q19. 40 Q20. –25 Q21. 153

Q23. $a_{16} = 0$ Q24. 17 Q25. 64 Q26. 7, 1, –5 or –5, 1, 7

Q27. 2, 4, 6, 8 or 8, 6, 4, 2 Q28. 8, 12, 16, 20 or 20, 16, 12, 8

Q29. 2, 6, 10, 14 or 14, 10, 6, 2 Q30. 2, 5, 8, 11, … or 8, 5, 2, –1, …

Q31. $x = -1$, $y = 15$, $z = 31$ Q32. 1 Q33. 22^{nd} term; $a_{22} = -\frac{3}{5}$

Q34. 0 Q39. $n = 0$ Q40. $n = 5$ Q41. $\frac{3}{5}$

EXERCISE 5.2

Q01. 1335 Q02. 931 Q03. 55350 Q04. $\frac{5n^2+7n}{2}$ Q05. $6-2n$

Q06. 6 Q07. 5, 11, 17, … Q08. 27 Q09. Q Q10. 2q

Q11. $a_n = 4n+5$, $a_3 = 17$ Q12. 2500 Q13. 1002001 Q14. 55

Q15. n^2 Q16. 98450 Q17. 37881 Q18. 2000 Q19. 50000

Q20. 17696 Q21. 73; 11315 Q22. 77:176 Q23. 4

Q24. $a_1 = 2$, $a_{13} = 26$ Q25. –50 Q26. 179 : 321 Q28. 26; 182

Q30. 0 Q32. $n = 6, 10$ Q33. 3:7; 25:189 Q34. $\frac{n}{4}(13-3n)$

Q35. $a = 4$; $d = 6$; $a_{15} = 88$ Q36. $a = 5$, $d = 3$, $S_{40} = 2540$ Q37. $n = 16$, $d = \frac{8}{3}$

Q38. $a = 4$, $d = 4$ Q40. $\frac{(b+c-2a)(c+a)}{2(b-a)}$

EXERCISE 5.3

Q01. 160, 140, 120, 100, 80, 60, 40 (in rupees) Q02. ₹870 Q03. ₹68000

Q04. ₹166500 Q05. ₹132 Q06. ₹7900000 Q07. 32π cm

Q08. 20 rows; 3 logs Q09. 5 minutes

Q10. (a) $a = 6000$, $d = 150$ (b) ₹8850 (c) ₹148500 (d) 28^{th} day.

CHAPTER 06

EXERCISE 6.1

Q01. 2.6 cm Q07. **Greek mathematician** Thales gave this theorem Q12. 7.5 cm

EXERCISE 6.2

Q05. 18 cm Q07. 4 m Q08. 8 m Q15. $\frac{20}{3}$ cm Q17. PN = 15 cm, RM = $\frac{32}{3}$ cm

CHAPTER 07

EXERCISE 7.1

Q01. (a) real line (b) (a, 0) (c) (0, b) (d) equal in lengths
(e) any two sides are equal in lengths (f) Pythagoras

Q02. $\sqrt{34}$ units Q03. $a(n-m)\sqrt{(n+m)^2+4}$ units Q04. $2\sqrt{a^2+b^2}$

Q09. Yes Q20. True Q24. Scalene triangle

Q25. Not a rectangle Q27. $x = \pm 4$ Q28. $x = -3, 5$ Q29. $y = -7, 5$

Q33. $(0, 3-5\sqrt{3})$ i.e., (0, –5.5); $(0, 3+5\sqrt{3})$ i.e., (0, 11.5) Q34. $(0, 2\sqrt{3})$ or $(3, -\sqrt{3})$

Q35. 3 or –9 Q36. $\left(2 \pm \frac{\sqrt{11}}{2}, \frac{5}{2}\right)$ Q37. (5, 2); 5 units Q38. (–2, 0)

Q39. $k = \pm 4$ Q41. $\left(\frac{3}{2}, \frac{11}{2}\right), \frac{\sqrt{130}}{2}$ units Q42. $(5, 5\sqrt{3})$

Q43. $(0, 9), \left(0, \frac{35}{3}\right)$ Q44. 4 Q45. 3 Q46. $(0, \sqrt{3}a), (0, -\sqrt{3}a)$

EXERCISE 7.2

Q01. $\left(0, \frac{21}{5}\right)$ Q02. $\left(\frac{a^2+b^2}{a+b}, \frac{a^2+2ab-b^2}{a+b}\right)$ Q03. –8

Q06. $\left(\frac{9}{2}, \frac{1}{2}\right), \left(-\frac{1}{2}, \frac{5}{2}\right)$ Q07. (9, 4) Q08. (–2, 1) Q09. $\left(-\frac{1}{3}, 2\right)$

Q10. (4, –11) Q11. $\left(\frac{6}{7}, \frac{19}{7}\right)$ Q12. 5 units Q13. (–5, 5), (9, 3)

Q14. 2:3 Q15. –15 Q16. $x = 4, y = 2$ Q17. $\left(2, \frac{2}{3}\right)$

Q18. (5, 6) Q19. $4y = 1 + 5x$ Q20. P(3, 3), Q(4, 1), R(5, –1), S(6, –3)

Q21. 4 : 7 Q22. $3:4; \left(\frac{10}{7}, \frac{33}{7}\right)$ Q23. $(-1, -2)$ Q25. 2 : 3; (5, 3)

Q26. $p = 4, q = 2$ Q27. (4, 2) Q28. $\frac{\sqrt{130}}{2}, \sqrt{13}, \frac{\sqrt{130}}{2}$ (in units)

Q30. 2:1 Q31. $3:2; m = -\frac{2}{5}$ Q32. (4, –4) Q33. $\frac{14\sqrt{2}}{3}$ units

Q34. (p, q) Q35. (4, 2) Q39. $(4, 5), 2\sqrt{2}$ units

Q40. (7, –2) Q41. $\left(\frac{1}{2}, 3\right)$ Q42. 2 : 7 Q43. $x = 8, y = 4$

Q44. 2:7; $k = 6$ Q45. (3, 1) Q46. (2, –1), (–1, 1)

EXERCISE 7.3

Q01. They are sitting in Parellelogram; using coordinate geometry (distance formula)

Q06. $y = -1$; radius = 5 units Q04. 3 : 2; m = 6

Q05. Isosceles triangle; $\frac{\sqrt{130}}{2}$ units Q06. $\sqrt{65}$ units; $\left(\frac{1}{3}, \frac{5}{3}\right)$

Q08. (i) 10 km (ii) Drone B is closer (iii) Yes, Drone A can reach the charging station.

CHAPTER 08

EXERCISE 8.1

Q01. $\sin A = \frac{3}{5}, \cos A = \frac{4}{5}, \tan A = \frac{3}{4}, \text{cosec } A = \frac{5}{3}, \sec A = \frac{5}{4}, \cot A = \frac{4}{3}$

Q02. 1 Q03. $\cos A = \sqrt{1-y^2}, \tan A = \frac{y}{\sqrt{1-y^2}}$ Q04. $\frac{7}{17}$ Q05. $\sqrt{2}$

Q06. 9 Q07. 5 Q08. $\frac{3\sqrt{2}-\sqrt{6}}{8}$ Q09. $-\frac{17}{3}$ Q10. $\frac{67}{12}$

Q11. 4 Q12. 0 Q13. 11 Q14. $-\frac{1}{4}$ Q15. 4

Q16. $A = 67.5^\circ, B = 37.5^\circ, C = 75^\circ$ Q17. $\sqrt{3}$ Q18. $\sqrt{2}(\sqrt{2}+1)$

Q19. $\frac{1-\sqrt{2}}{1+\sqrt{2}}$ Q20. 15°

EXERCISE 8.3

Q07. $2\sec\theta$ Q23. $\frac{1}{3}$ Q37. 60° Q38. $\frac{1}{3}$ Q39. 1

Q40. 1 Q41. $\frac{x-1}{2\sqrt{x}}$ Q42. (i) $\frac{1}{\sqrt{3}}$ (ii) 30° (iii) 60° (iv) $\frac{1}{2}$

CHAPTER 09

EXERCISE 9.1

Q01. 60° Q02. 30° Q03. 30° Q04. 45° Q05. 45°

Q06. $10\sqrt{3}$ m, 10 m Q07. $30\sqrt{3}$ m, $10\sqrt{3}$ m Q08. $800\sqrt{3}$ m

Q09. $200\left(\frac{1}{\sqrt{3}}+1\right)$ m Q10. 25 m from 1st pole and 75 m from 2nd pole, $25\sqrt{3}$ m

Q11. $100(\sqrt{3}-1)$ m Q12. 40 m, $20\sqrt{3}$ m Q13. $10\sqrt{3}$ m, 40 m

Q14. $50(\sqrt{3}-1)$ m Q15. $4000\left(1-\frac{1}{\sqrt{3}}\right)$ m Q16. 42.35 m

Q17. Height : 236.6 m; Distances : 236.6 m, 136.6 m Q18. P, 7.32 km

Q19. 16.39 min = 16 min 23 sec Q20. 200 m/s i.e., 720 km/hr Q21. 864 km/hr

Q22. 5.464 km Q23. 415.68 km/hr Q24. 9 minutes

Q25. 3 seconds Q26. 3.29 km/hr Q27. 29.28 m/s Q28. 120 m

Q29. 373 m Q30. $60(1+\sqrt{3})$ m Q31. 5.46 m Q32. 3464 m

Q33. 17.32 m, 10 m Q34. 70.7 m Q35. $\frac{200\sqrt{3}}{3}$ m/sec Q36. 6.96 m

Q37. $\frac{5}{6}\left(1-\frac{1}{\sqrt{3}}\right)$ m/s i.e., 21 m/min Q38. 25 m

Q39. (i) $20\sqrt{3}$ m (ii) 40 m (iii) 20 m Q40. 24 m Q41. $15\sqrt{3}$ m

Q42. 45° Q43. 2400 m Q44. h = 18 m Q45. 42.30 m

Q46. 16.7 m Q47. $8\sqrt{3}$ m, 8 m, $8\sqrt{7}$ m Q49. 86.5 m Q50. 60 m

Q51. 30° Q52. $10\sqrt{3}$ m Q53. 73 m

Q54. 40 m, $20\sqrt{3}$ m Q55. 40.95 m, 70.95 m Q56. $10\sqrt{3}$ m Q57. 4000 m

EXERCISE 9.2

Q01. 5 km Q04. $\frac{h\tan\alpha}{\tan\alpha-\tan\beta}, \frac{h}{\tan\alpha-\tan\beta}$

Q10. Height : $H - d\tan\alpha$; Distance : $(H-h)\cot\alpha$ Q11. 180 m Q12. 160 m

Q13. $150\sqrt{2}$ m Q14. $\sqrt{pq}$

CHAPTER 10

EXERCISE 10.1

Q01. Point of contact Q02. 106 cm Q03. 15 cm Q04. 6 cm

Q05. Parallel Q06. 50° Q07. 9 cm

Q08. $OT = 5$ cm, $TP = 12$ cm, $OP = 13$ cm Q09. 3 cm Q11. 1 cm

Q14. 11 cm Q15. $\frac{169}{24}$ cm Q16. $TP = TQ = \frac{20}{3}$ cm Q17. 8 cm

Q19. 80° Q21. 3 cm

EXERCISE 10.2

Q03. 19 cm Q06. 3 cm Q07. 14 cm Q08. 8 cm Q09. 50°

Q12. 30° Q13. 70° Q15. $x = 107.5^\circ$ Q19. $12\sqrt{3}$ cm

Q20. 3.75 cm Q21. 80° Q22. 30° Q26. 120°

CHAPTER 11

EXERCISE 11.1

Q01. (a) 6.125 cm^2 (b) 57.14 cm^2 (c) 37.71 cm^2 (d) 9384 cm^2

Q02. 140.29 cm^2 Q03. 339.42 cm^2, 199.13 cm^2

Q04. (a) $\frac{2\pi x r}{360}$ units (b) $\left(\frac{2\pi x r}{360} + 2r\right)$ units (c) 8 cm (d) $40\pi r$ (e) 880 cm

(f) $r(\pi + 2)$ (g) $\frac{\pi r \theta}{90} + l$, where $\sin\theta = \frac{l}{2r}$ (h) $\pi(R^2 - r^2)$

Q05. 3850 cm^2 Q06. 88 m Q07. 7056 m^2

Q08. 78.5 m^2, 28.5 m^2, 285.5 m^2, 235.5 m^2 Q09. 4325.14 cm^2

Q10. 22 cm, 231 cm^2, 40.05 cm^2 Q11. 12 m, 18 m

Q12. 6, 4 or 4, 6 (in cm) Q13. $\left(\frac{16\pi}{3} - 4\sqrt{3}\right)$ sq.cm. Q14. 77 sq. cm. Q15. 48 m

Q16. 1708 cm^2 Q17. 82.08 cm^2 Q18. 271.26 Q19. $\frac{77}{4}$ cm^2

Q20. 924 cm^2 Q21. 17.89 cm^2; 598.11 cm^2 Q22. 18.84 cm^2; 94.2 cm^2

Q23. 9.083 cm^2

EXERCISE 11.2

Q01. 56 cm Q02. 231 cm^2 Q03. 4658.5 m^2 Q04. 22 cm Q05. $\frac{d^2}{2}$

Q06. $\left(\frac{\pi}{3} - \frac{\sqrt{3}}{4}\right) \times r^2$ sq.units Q07. 10 m Q08. 24 cm

Q09. $\left(\frac{\pi}{4}\right) \times r^2$ sq. units Q10. 28 cm Q11. 52 cm^2 Q12. 50 cm

Q13. $\left(\frac{\pi}{3} - \frac{\sqrt{3}}{4}\right) \times r^2$ Q14. 26 cm Q15. 154 cm^2 Q16. 4 : 5 Q17. $\pi : 4$

Q18. 30 m Q19. 2240 cm^2 Q20. r^2 Q21. 14 cm Q22. 100°

Q23. $\pi : \sqrt{3}$ Q24. 4% decrease Q25. 500 Q26. 1 : 1 Q27. 9 : 16

Q28. 128 cm^2 Q29. 36 km/hr Q30. 220 m Q31. $\frac{1}{4}\pi a^2$ sq.units

Q32. $\left(\frac{60}{\pi}\right)$ cm Q33. $\pi(2r + h)h$ Q34. 9 cm Q35. 2 units

Q36. 52 cm^2 Q37. 384 cm^2 Q38. $4:\sqrt{3}$ Q39. 228 cm^2

Q40. 154 sq. cm Q41. 2520 m^2 Q42. 64 cm Q43. 500

CHAPTER 12

EXERCISE 12.1

Q01. (a) $2a(a+2b)$ (b) $2\pi r^3$ (c) $\frac{2}{3}\pi r^3$ (d) $2\pi h(R+r)$ (e) 8

(f) $\frac{1}{8}$ Q02. 1:2 Q03. 1162.85 cm^2 Q04. 572 cm^2

Q05. ₹3288.21 Q06. 100 min Q07. 231 cm^3, 203.9 cm^2 Q08. 1642.66 cm^3

Q09. 2 cm Q10. 6160 m^3, 1791.42 m^2 Q11. 377.14 cm^2

Q12. 113.14 cm^3 Q13. (a) remains the same (b) is changed Q14. 400

Q15. 374 cm^2 Q16. 1 cm Q17. 1 cm Q18. 100

Q19. 80 Q20. 16 cm Q21. 12 cm

EXERCISE 12.2

Q01. (i) 343π cm^3 (ii) $49\pi(\sqrt{2}+2)$ cm^2 Q02. 3 km/h Q03. 9 units

Q04. 75 minutes Q05. 858 Sq. cm. Q06. 21:11 Q07. 16369 cc

Q08. 10 m Q09. 10 Q10. 562500 m^2 Q11. ₹2068

Q12. 266.112 cm^3; 207.768 cm^2 Q13. 572 cm^2; 1642.66 cm^3

Q14. 74.3 cm^2 Q15. 282.6 cm^2 Q16. 63.585 cm^2; 195.465 cm^2

Q17. 44 m^2; ₹22000 Q18. 18 cm

Q19. Weight of graphite = 0.165 gm, weight of pencil = 2.805 gm Q20. 2 cm, 2.5 cm

Q21. 4 m Q22. 25.12 cm^3, 25.12 cm^3

Q23. 1128.75 m^3, 827.15 m^3 Q24. 30 cm Q25. ₹332640 Q26. 0.5 cm

Q27. 523.5 cm^3 Q28. 3:4 Q29. 220 mm^2 Q30. 338.185 $cm^3 \approx 338$ cm^3

Q31. 2 hours Q32. 49; 2992.5 cm^2

CHAPTER 13

EXERCISE 13.1

Q01. 20; 19.63 Q02. 35.87 Q03. 162.77 Q04. $k = 5$

Q05. 40.71 Q06. $x = 4,\ y = 6$ Q07. $k = 8$ Q08. 65

Q09. $f_1 = 7,\ f_2 = 12$ Q10. 149.8; 154 Q11. 40.7; 42 Q12. 211; 220.58

Q13. 42; 43.1 Q14. $\frac{74}{7}$ or 10.57 (approx.) Q15. 36.81; 35.375

Q16. 24 Q17. 145.2; 138.57 (approx.) Q18. 138

Q19. 11 Q20. No. of boys : 50, No. of girls : 100 Q21. 3

Q22. $f_1 = 28,\ f_2 = 24$ Q23. 10 Q24. 35.625; 33.85 Q25. 38.8; 38.57

Q26. 19.96; 18.35 Q27. 26.67; 28.33 Q28. 11.3; 5.67 Q29. 0.7 kg

Q30. 4.36 cm Q31. 726; 625

CHAPTER 14

EXERCISE 14.1

Q01. (a) 1 (b) 0, impossible event (c) 1, sure event

Q02. The outcomes Head / Tail are equally likely and result is unpredictable

Q03. $\{1,2,3,4,5,6\}$; $\frac{6}{6}$ or 1 Q04. 1, 0 Q05. $\frac{1}{4}, \frac{3}{4}, \frac{3}{4}$ Q06. 0.94

Q07. $\frac{1}{365}, \frac{364}{365}$ Q08. $\frac{2}{6}, \frac{3}{6}$ Q09. $\frac{2}{52}$ Q10. $\frac{6}{10}$

Q11. $\frac{9}{18}, \frac{9}{18}, \frac{3}{18}, \frac{2}{18}$ Q12. $\frac{0.385}{40} = 9.625 \times 10^{-3}$ Q13. $\frac{1}{366}$ Q14. $\frac{2}{4}$

Q15. $\frac{6}{15}, \frac{10}{15}, \frac{10}{15}$ Q16. $\frac{11}{13}$ Q17. $\frac{77}{80}$ Q18. $\frac{2}{7}, \frac{1}{7}$ Q19. $\frac{24}{52}$

Q20. $\frac{7}{8}$ Q21. $\frac{11}{35}$ Q22. 15 Q23. $\frac{3}{49}, \frac{3}{49}, \frac{23}{49}$

Q24. $\frac{6}{36}$ Q25. $\frac{1}{6}, \frac{2}{6}$ Q26. $\frac{1}{23}$ Q27. $\frac{11}{12}$ Q28. 6

Q29. $\frac{10}{70}, \frac{23}{70}$ Q30. 8 Q31. 0 Q32. $\frac{7}{11}$ Q33. $\frac{2}{6}$

Q34. 0.3 Q35. 0.38 Q36. 0.005 Q37. $\frac{11}{12}$

Q38. $\frac{1}{4}, \frac{2}{4}, \frac{1}{4}$ Q39. $\frac{2}{9}$ Q40. $\frac{5}{9}, \frac{4}{9}$ Q41. 0.7 Q42. $\frac{1}{3}, \frac{1}{6}, \frac{1}{2}$

Q43. $\frac{1}{18}$ Q44. $\frac{x}{12}, 3$ Q45. $\frac{1}{4}, \frac{1}{2}, \frac{1}{13}, \frac{1}{26}, \frac{11}{13}, \frac{3}{13}, \frac{2}{13}, \frac{5}{13}, \frac{1}{52}$

Q46. $\frac{1}{4}, \frac{1}{2}, 0, \frac{1}{11}, \frac{1}{44}, \frac{2}{11}, \frac{1}{22}, \frac{1}{4}$ Q47. $\frac{20}{24}, \frac{8}{24}$ Q48. $6, \frac{1}{3}$

Q49. $\frac{8}{18}, \frac{10}{18}, \frac{6}{18}, \frac{5}{18}$ Q50. $\frac{10}{500}, \frac{340}{500}$ Q51. $\frac{5}{26}, \frac{21}{26}$ Q52. $\frac{90}{101}$

Q53. $\frac{1}{9}$ Q54. $\frac{11}{36}$ Q55. $\frac{1}{2}, \frac{3}{34}$ Q56. $\frac{4}{40}, \frac{12}{40}, \frac{24}{40}$

Q57. $\{HHH, HHT, HTH, THH, HTT, THT, TTH, TTT\}$; $\frac{1}{8}, \frac{3}{8}, \frac{7}{8}$

EXERCISE 14.2

Q01. $\frac{3}{8}$ Q02. $\frac{5}{9}$ Q03. $\frac{4}{7}$ Q04. (i) $\frac{25}{36}$ (ii) $\frac{11}{36}$ (iii) $\frac{1}{36}$

Q05. (i) $\frac{3}{5}$ (ii) $\frac{3}{4}$ Q06. 3 Q07. (i) $\frac{3}{8}$ (ii) $\frac{7}{8}$ (iii) $\frac{7}{8}$ (iv) $\frac{1}{8}$ Q08. (i) $\frac{11}{13}$ (ii) $\frac{1}{26}$

Q09. $\frac{x}{12+x}$, $x = 6$ Q10. $\frac{23}{49}$ Q11. (i) $\frac{4}{9}$ (ii) $\frac{2}{9}$ Q12. $\frac{1}{13}$ Q13. 20 Q14. 10

Q15. (i) $\frac{10}{100}$ (ii) $\frac{90}{100}$ (iii) $\frac{65}{100}$ Q16. $\frac{2}{7}$ Q17. $\frac{3}{7}$ Q18. $\frac{6}{48}$

Q19. For Jayanti, the probability of getting product of numbers 36 is $\frac{1}{36}$; for Basanti, the probability of getting square of the number 36 is $\frac{1}{6}$. Clearly, Basanti has better chance of getting 36 as $\frac{1}{6} > \frac{1}{36}$

Q20. $\frac{4}{9}, \frac{5}{9}$.

MULTIPLE CHOICE QUESTIONS

Chapter-01 Real Numbers

Q01.	(c)	Q02.	(d)	Q03.	(b)	Q04.	(d)	Q05.	(c)	Q06.	(c)	Q07.	(b)
Q08.	(c)	Q09.	(a)	Q10.	(b)	Q11.	(c)	Q12.	(d)	Q13.	(d)	Q14.	(c)
Q15.	(c)	Q16.	(b)	Q17.	(b)	Q18.	(b)	Q19.	(a)	Q20.	(a)	Q21.	(b)
Q22.	(c)	Q23.	(b)	Q24.	(b)	Q25.	(a)	Q26.	(d)	Q27.	(c)	Q28.	(a)
Q29.	(b)	Q30.	(c)	Q31.	(b)	Q32.	(d)	Q33.	(d)	Q34.	(b)	Q35.	(b)
Q36.	(d)	Q37.	(a)	Q38.	(c)	Q39.	(d)	Q40.	(b)	Q41.	(b)	Q42.	(a)
Q43.	(c)	Q44.	(b)	Q45.	(d)	Q46.	(c)	Q47.	(c)	Q48.	(c)	Q49.	(a)
Q50.	(c)	Q51.	(a)	Q52.	(d)	Q53.	(c)	Q54.	(d)				

Chapter-02 Polynomials

Q01.	(d)	Q02.	(b)	Q03.	(b)	Q04.	(a)	Q05.	(a)	Q06.	(a)	Q07.	(c)
Q08.	(c)	Q09.	(a)	Q10.	(a)	Q11.	(c)	Q12.	(c)	Q13.	(a)	Q14.	(b)
Q15.	(d)	Q16.	(d)	Q17.	(c)	Q18.	(c)	Q19.	(b)	Q20	(c)	Q21.	(a)
Q22.	(d)	Q23.	(d)	Q24.	(d)	Q25.	(b)	Q26.	(a)	Q27.	(b)	Q28.	(a)
Q29.	(c)	Q30.	(c)	Q31.	(b)	Q32.	(a)	Q33.	(b)	Q34.	(d)	Q35.	(b)
Q36.	(a)	Q37.	(a)	Q38.	(b)	Q39.	(a)	Q40.	(b)	Q41.	(b)	Q42.	(b)
Q43.	(c)	Q44.	(b)	Q45.	(b)	Q46.	(a)	Q47.	(a)	Q48.	(c)	Q49.	(d)
Q50.	(b)	Q51.	(b)	Q52.	(d)	Q53.	(c)	Q54.	(a)	Q55.	(d)	Q56.	(a)
Q57.	(d)	Q58.	(c)	Q59.	(d)	Q60.	(b)	Q61.	(d)	Q62.	(b)	Q63.	(b)
Q64.	(b)	Q65.	(a)	Q66.	(d)	Q67.	(c)						

Chapter-03 Pair of Linear Equations in Two Variables

Q01.	(a)	Q02.	(c)	Q03.	(d)	Q04.	(d)	Q05.	(c)	Q06.	(c)	Q07.	(b)
Q08.	(a)	Q09.	(b)	Q10.	(c)	Q11.	(c)	Q12.	(c)	Q13.	(c)	Q14.	(b)
Q15.	(c)	Q16.	(c)	Q17.	(a)	Q18.	(a)	Q19.	(d)	Q20.	(c)	Q21.	(d)
Q22.	(c)	Q23.	(a)	Q24.	(b)	Q25.	(a)	Q26.	(c)	Q27.	(c)	Q28.	(d)
Q29.	(c)	Q30.	(c)	Q31.	(b)	Q32.	(a)	Q33.	(a)	Q34.	(a)	Q35.	(b)
Q36.	(c)	Q37.	(d)	Q38.	(d)	Q39.	(b)	Q40.	(c)	Q41.	(b)	Q42.	(a)
Q43.	(a)	Q44.	(a)	Q45.	(a)	Q46.	(b)	Q47.	(a)	Q48.	(d)	Q49.	(b)
Q50.	(a)	Q51.	(c)	Q52.	(a)	Q53.	(a)	Q54.	(b)	Q55.	(a)	Q56.	(d)
Q57.	(d)	Q58.	(c)	Q59.	(a)	Q60.	(c)	Q61.	(a)	Q62.	(a)	Q63.	(b)
Q64.	(a)	Q65.	(c)	Q66.	(a)	Q67.	(d)						

Chapter-04 Quadratic Equations

Q01.	(d)	Q02.	(a)	Q03.	(c)	Q04.	(b)	Q05.	(a)	Q06.	(d)	Q07.	(a)
Q08.	(d)	Q09.	(a)	Q10.	(c)	Q11.	(a)	Q12.	(c)	Q13.	(d)	Q14.	(c)
Q15.	(b)	Q16.	(d)	Q17.	(d)	Q18.	(b)	Q19.	(d)	Q20.	(d)	Q21.	(b)
Q22.	(b)	Q23.	(c)	Q24.	(b)	Q25.	(b)	Q26.	(a)	Q27.	(b)	Q28.	(b)
Q29.	(b)	Q30.	(a)	Q31.	(a)	Q32.	(c)	Q33.	(d)	Q34.	(d)	Q35.	(c)
Q36.	(b)	Q37.	(a)	Q38.	(c)	Q39.	(d)	Q40.	(b)	Q41.	(b)	Q42.	(b)
Q43.	(a)	Q44.	(a)	Q45.	(b)	Q46.	(d)	Q47.	(a)	Q48.	(c)	Q49.	(d)
Q50.	(d)	Q51.	(c)	Q52.	(a)	Q53.	(d)	Q54.	(d)	Q55.	(b)		

Chapter-05 Arithmetic Progression

Q01.	(a)	Q02.	(b)	Q03.	(d)	Q04.	(d)	Q05.	(c)	Q06.	(c)	Q07.	(a)
Q08.	(c)	Q09.	(a)	Q10.	(d)	Q11.	(d)	Q12.	(c)	Q13.	(c)	Q14.	(d)
Q15.	(c)	Q16.	(c)	Q17.	(b)	Q18.	(c)	Q19.	(b)	Q20.	(a)	Q21.	(b)
Q22.	(a)	Q23.	(c)	Q24.	(d)	Q25.	(c)	Q26.	(c)	Q27.	(c)	Q28.	(a)
Q29.	(b)	Q30.	(b)	Q31.	(c)	Q32.	(b)	Q33.	(b)	Q34.	(d)	Q35.	(a)
Q36.	(a)	Q37.	(c)	Q38.	(c)	Q39.	(d)	Q40.	(c)	Q41.	(a)	Q42.	(c)
Q43.	(b)	Q44.	(a)	Q45.	(b)	Q46.	(a)	Q47.	(a)	Q48.	(a)	Q49.	(b)
Q50.	(a)	Q51.	(b)	Q52.	(b)	Q53.	(c)	Q54.	(a)	Q55.	(b)	Q56.	(d)
Q57.	(b)	Q58.	(c)	Q59.	(c)	Q60.	(a)	Q61.	(b)	Q62.	(a)	Q63.	(b)
Q64.	(d)	Q65.	(c)	Q66.	(c)	Q67.	(d)	Q68.	(b)	Q69.	(b)	Q70.	(b)
Q71.	(b)	Q72.	(c)	Q73.	(a)	Q74.	(b)	Q75.	(c)				

Chapter-06 Triangles

Q01.	(d)	Q02.	(c)	Q03.	(d)	Q04.	(d)	Q05.	(c)	Q06.	(b)	Q07.	(a)
Q08.	(c)	Q09.	(b)	Q10.	(b)	Q11.	(a)	Q12.	(a)	Q13.	(c)	Q14.	(b)
Q15.	(c)	Q16.	(d)	Q17.	(b)	Q18.	(b)	Q19.	(b)	Q20.	(c)	Q21.	(c)
Q22.	(b)	Q23.	(b)	Q24.	(c)	Q25.	(d)	Q26.	(b)	Q27.	(c)	Q28.	(c)
Q29.	(a)	Q30.	(b)	Q31.	(d)	Q32.	(a)						

Chapter-07 Coordinate Geometry

Q01.	(c)	Q02.	(c)	Q03.	(d)	Q04.	(a)	Q05.	(d)	Q06.	(c)	Q07.	(c)
Q08.	(d)	Q09.	(b)	Q10.	(b)	Q11.	(b)	Q12.	(a)	Q13.	(a)	Q14.	(a)
Q15.	(b)	Q16.	(c)	Q17.	(c)	Q18.	(d)	Q19.	(c)	Q20.	(b)	Q21.	(c)
Q22.	(c)	Q23.	(b)	Q24.	(b)	Q25.	(a)	Q26.	(c)	Q27.	(a)	Q28.	(d)
Q29.	(d)	Q30.	(a)	Q31.	(b)	Q32.	(b)	Q33.	(a)	Q34.	(b)	Q35.	(c)
Q36.	(d)	Q37.	(a)	Q38.	(c)	Q39.	(c)	Q40.	(c)	Q41.	(c)	Q42.	(b)
Q43.	(b)	Q44.	(a)	Q45.	(a)	Q46.	(a)	Q47.	(c)	Q48.	(b)		

Chapter-08 Introduction to Trigonometry

Q01.	(b)	Q02.	(a)	Q03.	(c)	Q04.	(a)	Q05.	(d)	Q06.	(a)	Q07.	(a)
Q08.	(b)	Q09.	(d)	Q10.	(d)	Q11.	(d)	Q12.	(b)	Q13.	(a)	Q14.	(a)
Q15.	(c)	Q16.	(b)	Q17.	(a)	Q18.	(c)	Q19.	(a)	Q20.	(b)	Q21.	(a)
Q22.	(d)	Q23.	(b)	Q24.	(b)	Q25.	(d)	Q26.	(b)	Q27.	(a)	Q28.	(c)
Q29.	(b)	Q30.	(b)	Q31.	(d)	Q32.	(b)	Q33.	(c)	Q34.	(c)	Q35.	(b)
Q36.	(b)	Q37.	(d)	Q38.	(a)	Q39.	(c)	Q40.	(c)	Q41.	(c)	Q42.	(b)
Q43.	(c)	Q44.	(b)	Q45.	(d)	Q46.	(b)	Q47.	(a)	Q48.	(b)	Q49.	(b)
Q50.	(c)	Q51.	(c)	Q52.	(b)	Q53.	(a)	Q54.	(b)	Q55.	(b)	Q56.	(d)
Q57.	(a)	Q58.	(a)	Q59.	(c)	Q60.	(a)	Q61.	(a)	Q62.	(c)	Q63.	(c)
Q64.	(d)	Q65.	(c)										

Chapter-09 Applications of Trigonometry

Q01.	(c)	Q02.	(d)	Q03.	(b)	Q04.	(d)	Q05.	(b)	Q06.	(a)	Q07.	(a)
Q08.	(b)	Q09.	(c)	Q10.	(b)	Q11.	(b)	Q12.	(d)	Q13.	(d)	Q14.	(a)
Q15.	(a)												

Chapter-10 Circles

Q01.	(d)	Q02.	(c)	Q03.	(d)	Q04.	(c)	Q05.	(d)	Q06.	(a)	Q07.	(a)
Q08.	(b)	Q09.	(b)	Q10.	(b)	Q11.	(b)	Q12.	(c)	Q13.	(b)	Q14.	(c)
Q15.	(a)	Q16.	(d)	Q17.	(c)	Q18.	(a)	Q19.	(c)	Q20.	(a)	Q21.	(b)
Q22.	(d)	Q23.	(b)	Q24.	(a)	Q25.	(c)	Q26.	(d)	Q27.	(b)	Q28.	(a)

Chapter-11 Areas Related to Circles

Q01.	(b)	Q02.	(d)	Q03.	(a)	Q04.	(c)	Q05.	(b)	Q06.	(b)	Q07.	(c)
Q08.	(a)	Q09.	(b)	Q10.	(a)	Q11.	(d)	Q12.	(d)	Q13.	(a)	Q14.	(c)
Q15.	(b)	Q16.	(c)	Q17.	(c)	Q18.	(a)	Q19.	(a)	Q20.	(a)	Q21.	(c)
Q22.	(c)	Q23.	(b)	Q24.	(d)	Q25.	(c)	Q26.	(a)	Q27.	(a)	Q28.	(c)
Q29.	(c)	Q30.	(b)	Q31.	(b)	Q32.	(b)	Q33.	(c)	Q34.	(a)	Q35.	(d)
Q36.	(c)	Q37.	(a)	Q38.	(a)	Q39.	(c)	Q40.	(a)	Q41.	(a)	Q42.	(a)
Q43.	(d)	Q44.	(c)	Q45.	(c)	Q46.	(b)	Q47.	(c)	Q48.	(b)	Q49.	(b)
Q50.	(c)	Q51.	(b)	Q52.	(d)	Q53.	(a)	Q54.	(d)	Q55.	(b)	Q56.	(c)

Chapter-12 Surface Areas and Volumes

Q01.	(b)	Q02.	(a)	Q03.	(c)	Q04.	(c)	Q05.	(c)	Q06.	(b)	Q07.	(c)
Q08.	(d)	Q09.	(b)	Q10.	(c)	Q11.	(a)	Q12.	(d)	Q13.	(b)	Q14.	(b)
Q15.	(d)	Q16.	(d)	Q17.	(d)	Q18.	(c)	Q19.	(d)	Q20.	(c)	Q21.	(c)
Q22.	(a)	Q23.	(a)	Q24.	(a)	Q25.	(d)	Q26.	(b)	Q27.	(d)	Q28.	(a)
Q29.	(d)	Q30.	(b)	Q31.	(c)	Q32.	(b)	Q33.	(d)	Q34.	(d)	Q35.	(d)
Q36.	(c)												

Chapter-13 Statistics

Q01.	(d)	Q02.	(a)	Q03.	(b)	Q04.	(b)	Q05.	(d)	Q06.	(c)	Q07.	(b)
Q08.	(d)	Q09.	(c)	Q10.	(a)	Q11.	(c)	Q12.	(b)	Q13.	(a)	Q14.	(d)

Q15. (c) Q16. (d) Q17. (b) Q18. (b) Q19. (c) Q20. (b) Q21. (b)
Q22. (c) Q23. (d) Q24. (d) Q25. (c) Q26. (a) Q27. (d) Q28. (c)
Q29. (b) Q30. (b) Q31. (c) Q32. (b) Q33. (b) Q34. (b) Q35. (a)
Q36. (b)

Chapter-14 Probability

Q01. (b) Q02. (b) Q03. (b) Q04. (b) Q05. (d) Q06. (b) Q07. (b)
Q08. (d) Q09. (c) Q10. (a) Q11. (a) Q12. (b) Q13. (b) Q14. (d)
Q15. (a) Q16. (d) Q17. (c) Q18. (d) Q19. (c) Q20. (c) Q21. (c)
Q22. (a) Q23. (a) Q24. (b) Q25. (a) Q26. (b) Q27. (b) Q28. (a)
Q29. (c) Q30. (c) Q31. (b) Q32. (a) Q33. (b) Q34. (c) Q35. (d)
Q36. (b) Q37. (b) Q38. (c) Q39. (b) Q40. (a) Q41. (a) Q42. (b)
Q43. (c) Q44. (d) Q45. (a) Q46. (b) Q47. (a)

💻 ASSERTION-REASON BASED QUESTIONS

Chapter-01 Real Numbers

Q01. (d) Q02. (c) Q03. (c) Q04. (d) Q05. (b) Q06. (c) Q07. (d)
Q08. (b) Q09. (d) Q10. (c) Q11. (d) Q12. (c) Q13. (d) Q14. (a)
Q15. (c) Q16. (b)

Chapter-02 Polynomials

Q01. (d) Q02. (c) Q03. (b) Q04. (a) Q05. (d) Q06. (b) Q07. (a)
Q08. (d) Q09. (b) Q10. (a) Q11. (b) Q12. (b)

Chapter-03 Pair of Linear Equations in Two Variables

Q01. (a) Q02. (b) Q03. (d) Q04. (a) Q05. (b) Q06. (a) Q07. (b)
Q08. (b) Q09. (a) Q10. (b) Q11. (b)

Chapter-04 Quadratic Equations

Q01. (c) Q02. (c) Q03. (a) Q04. (a) Q05. (a) Q06. (c) Q07. (a)
Q08. (c) Q09. (b) Q10. (d) Q11. (c) Q12. (d) Q13. (a)

Chapter-05 Arithmetic Progression

Q01. (b) Q02. (d) Q03. (c) Q04. (c) Q05. (b) Q06. (c) Q07. (c)
Q08. (d) Q09. (c) Q10. (d) Q11. (d) Q12. (c) Q13. (c) Q14. (d)

Chapter-06 Triangles

Q01. (b) Q02. (a) Q03. (a) Q04. (c) Q05. (a) Q06. (b) Q07. (a)
Q08. (c) Q09. (d) Q10. (c) Q11. (a) Q12. (a)

Chapter-07 Coordinate Geometry

Q01. (a) Q02. (c) Q03. (c) Q04. (d) Q05. (d) Q06. (a) Q07. (d)
Q08. (c) Q09. (a) Q10. (a) Q11. (a) Q12. (d) Q13. (c) Q14. (c)

Chapter-08 Introduction to Trigonometry

Q01. (c) Q02. (a) Q03. (d) Q04. (d) Q05. (a) Q06. (d) Q07. (b)
Q08. (b) Q09. (a) Q10. (a) Q11. (a) Q12. (a) Q13. (d) Q14. (a)

Chapter-09 Applications of Trigonometry

Q01. (a) Q02. (a)

Chapter-10 Circles

Q01. (b) Q02. (b) Q03. (d) Q04. (d) Q05. (b) Q06. (c) Q07. (b)
Q08. (a) Q09. (c) Q10. (b)

Chapter-11 Areas Related to Circles

Q01. (a) Q02. (a) Q03. (d) Q04. (b) Q05. (d) Q06. (d) Q07. (a)
Q08. (a) Q09. (b) Q10. (d) Q11. (a)

Chapter-12 Surface Areas and Volumes

Q01. (c) Q02. (d) Q03. (d) Q04. (a) Q05. (b) Q06. (c) Q07. (a)

Q08. (a) Q09. (b) Q10. (a) Q11. (d) Q12. (c)

Chapter-13 Statistics

Q01. (a) Q02. (b) Q03. (a)

Chapter-14 Probability

Q01. (a) Q02. (a) Q03. (d) Q04. (b) Q05. (b) Q06. (a) Q07. (c)
Q08. (a) Q09. (a) Q10. (a) Q11. (d) Q12. (c) Q13. (a) Q14. (c)
Q15. (b) Q16. (d) Q17. (d) Q18. (d) Q19. (a) Q20. (c) Q21. (a)
Q22. (a) Q23. (d)

CASE STUDY QUESTIONS

Chapter-01 Real Numbers

Q01. (i) 12 (ii) 3 apples and 5 bananas (iii) 6 guests OR (iii) ₹1680

Q02. (i) 3 (ii) 7 OR (ii) 11 (iii) 5

Q03. (i) 9:12 a.m.
(ii) Bell A rings 14 times (including 8:00 a.m.) and Bell B rings 10 times.
(iii) 4 times i.e., at 8:00 a.m., 9:12 a.m., 10:24 a.m., 11:36 a.m. OR (iii) 9:12 a.m.

Q04. (i) 18 boxes (ii) 13 chocolates (iii) ₹900 OR (iii) ₹360

Q05. (i) 1 m (ii) 73 hops (iii) 9310 hops OR (iii) Zero (0) possibilities

Q06. (i) 120 minutes (ii) 3 times (iii) 20 minutes OR (iii) 120 minutes

Q07. (i) 30 boxes (ii) 5 pens (iii) 7 pencils OR (iii) 9 erasers

Chapter-02 Polynomials

Q01. (i) Two zeroes (ii) 0 or no zero (iii) $a = 0, b = -6$ OR (iii) $p = 3$

Q02. (i) $t = 0$ or $t = \frac{5}{4}$ (ii) Graph (a)

(iii) -6; It means after $\frac{3}{2}$ seconds, dolphin has reached 6 cm below water level.

OR (iii) 25 cm

Q03. (i) 0, 5 (ii) 31.25 m (iii) $t = 2$ seconds OR (iii) $t = 4, 1$

Q04. (i) 1, 4 (ii) $x = \frac{5}{2}$ (iii) 2.35 m OR (iii) $(2, 0), (3, 0)$

Q05. (i) $x^2 + 8x + 16$ (ii) One real and equal zero
(iii) There will be no real zeroes OR (iii) Two zeroes; $x = -2, -6$

Q06. (i) 21 m (ii) $t = 2 + \frac{\sqrt{105}}{5}$ sec (iii) 1 sec and 3 sec OR (iii) $t = 2 \pm \sqrt{2}$ sec

Q07. (i) $A(x) = 20x - 2x^2$ (ii) 50 m^2
(iii) 3 m or 7 m OR (iii) Sum of zeroes = 10 and, product of zeroes = 0

Chapter-03 Pair of Linear Equations in Two Variables

Q01. (i) ₹5 (ii) ₹10 (iii) ₹120 OR (iii) ₹360

Q02. (i) $20x + 5y = 9000, 5x + 25y = 26000$ (ii) ₹200 OR (ii) ₹800
(iii) ₹22000

Q03. (i) $5x + 4y = 9500, 4x + 3y = 7370$
(ii) ₹980 OR (ii) Prize amount for cricket is more and by ₹170
(iii) ₹4260

Q04. (i) $x + y = 300, 150x + 250y = 55000$ (ii) 200 OR (ii) 100
(iii) ₹62500

Q05. (i) $3x+2y=80,\ 4x+3y=110$ (ii) ₹20 OR (ii) ₹10
(iii) ₹150
Q06. (i) $5x+3y=115,\ 3x+2y=75$ (ii) Local ticket : ₹5, Express ticket : ₹30
(iii) ₹140 OR (iii) ₹105

Chapter-04 Quadratic Equations

Q01. (i) $(18+x)(12+x)=2(18\times12)$ (ii) $x^2+30x-216=0$
(iii) 24 cm×18 cm OR (iii) No
Q02. (i) $200x^2=128(x+1)^2$ (ii) $9x^2-32x-16=0$
(iii) $x=4$ OR (iii) $x=-\frac{4}{9},\ 4$
Q03. (i) $R^2+r^2=130$ (ii) $r^2-14r+33=0$
(iii) $r=3$ m ; 9π sq. m OR (iii) $R=11$ m ; 121π sq. m

Chapter-05 Arithmetic Progression

Q01. (i) 29 (ii) 9 (iii) $n=8$ OR (iii) 222
Q02. (i) ₹3800 (ii) ₹29000 (iii) 50 OR (iii) ₹288000
Q03. (i) 24 (ii) 23 OR (ii) 420 (iii) $4n+12$
Q04. (i) 8 coins (ii) ₹180 (iii) 15 OR (iii) ₹600
Q05. (i) First term : 1 and common difference : 4 (ii) First term : 4 and common difference : 12
(iii) 37; 112 OR (iii) $m=8$; 29
Q06. (i) 13 (ii) 10 (iii) 255 OR (iii) ₹4500
Q07. (i) 160 throws (ii) 8.1 m OR (ii) 41 weeks (iii) 1860 throws
Q08. (i) 12^{th} year (ii) 20400 OR (ii) 21600 (iii) 6600
Q09. (i) 70 (ii) 50 (iii) 25 OR (iii) 10
Q10. (i) 31000 (ii) 80000 (iii) 11^{th} year OR (iii) 9000
Q11. (i) $3n^2+7n$ metres (ii) $a_n=6n+4$ (iii) 370 m OR (iii) 20
Q12. (i) 165 (ii) 225 (iii) 27 OR (iii) 2625
Q13. (i) 120 (ii) 15 OR (ii) 750 (iii) 110
Q14. (i) 1200 (ii) 3400 (iii) 21000 OR (iii) 13
Q15. (i) ₹496 (ii) ₹442 (iii) ₹306 OR (iii) 23^{rd} January
Q16. (i) 15 (ii) 31 (iii) 141 OR (iii) 104
Q17. (i) 1500, 1505, 1510, 1515, … (ii) 200 days OR (ii) 300 days (iii) 402000
Q18. (i) 6 (ii) 16 (iii) 555 OR (iii) 77
Q19. (i) ₹3900 OR (i) ₹73500 (ii) ₹44500 (iii) ₹4900
Q20. (i) 11 m (ii) 44 m (iii) 638 m OR (iii) 66 seconds
Q21. (i) 200 (ii) 2000 (iii) 11000 OR (iii) 16
Q22. (i) 13, 12 (ii) 10 (iii) 16 rows OR 5 logs
Q23. (i) 595 (ii) 25 (iii) 35 OR (iii) 792
Q24. (i) ₹10 (ii) ₹29 (iii) ₹201.50 OR (iii) 100^{th} day
Q25. (i) Raju calls 34 times, Gurpreet calls 33 times and Rahim calls 33 times.
(ii) 2211 (iii) 434 OR (iii) –1777.
Q26. (i) A.P. : 3, 6, 9, …; $d=3$ (ii) 42 layers (iii) 15 layers OR (iii) 93.
Q27. (i) A.P. : 3, 6, 9, 12, ..., 24; $d=3$. (ii) Not possible
(iii) $\frac{3n}{2}[1+n]$; 108. OR (iii) 18.

Chapter-06 Triangles

Q01. (i) Figure A and Figure C (ii) Figure C

(iii) Triangles are congruent so, corresponding angles are equal. That is, the triangles are similar. Conversaly, if triangles are similar then ratio of corresponding sides is same which does not imply corresponding sides are equal. So, the similar triangles may not be congruent.

OR

(iii) One pair of corresponding side must be equal.

Q02. (i) Since $\angle D = \angle C$ and $\angle B = \angle A$ (Alternate interior angles)

So, $\Delta OAC \sim \Delta OBD$ (by AA similarity)

(ii) As $\Delta OAC \sim \Delta OBD$ so, $\frac{OA}{OB} = \frac{AC}{BD}$ i.e., $\frac{OA}{AC} = \frac{OB}{BD}$.

(iii) $x = 2$; $OC = 25$ OR (iii) $\frac{BD}{AC} = \frac{1}{5}$

Q03. (i) 2.076 m (ii) 0.692 m (iii) 1.887 m (approx.) OR (iii) 1.193 m (approx.)

Q04. (i) 20 m (ii) 15 m (iii) 15 m OR 3 : 5

Q05. (ii) $\frac{5}{12}$

Chapter-07 Coordinate Geometry

Q01. (i) (4, 3) (ii) $2\sqrt{13}$ (iii) 24 sq. units OR (iii) $3:\sqrt{13}$

Q02. (i) $AB = \sqrt{26}$; $CD = \sqrt{26}$ (ii) $BC = \sqrt{26}$; $AD = \sqrt{26}$

(iii) $AC = 4\sqrt{2}$; $BD = 6\sqrt{2}$ OR (iii) (1, 1); (1, 1)

Q03. (i) R(200, 400), S(–200, 400) (ii) 160000 sq. units OR (ii) $400\sqrt{2}$ units

(iii) $K = 1$

Q04. (i) $\sqrt{68}$ units (ii) $\sqrt{68}$ units

(iii) $AB = \sqrt{25+25} = 5\sqrt{2}$ units, $CD = \sqrt{25+25} = 5\sqrt{2}$ units, $BC = \sqrt{9+9} = 3\sqrt{2}$ units and $AD = \sqrt{9+9} = 3\sqrt{2}$ units.

Note that, $AB = CD$, $BC = AD$ and diagonals $AC = BD = \sqrt{68}$ units.

Hence, ABCD is rectangle.

OR (iii) $16\sqrt{2}$ units

Q05. (i) (–1, 2) (ii) $2\sqrt{13}$ units OR (ii) $\left(3, \frac{7}{2}\right)$ (iii) (–2, –5)

Q06. (i) P(4, 6), Q(3, 2) and R(6, 5) (ii) $\sqrt{17}$; $3\sqrt{2}$ OR (ii) $\left(\frac{16}{3}, \frac{16}{3}\right)$ (iii) No

Q07. (i) A(1, 9) and B(5, 13) (ii) (11, 11) (iii) $4\sqrt{5}$ OR (iii) (6, 11)

Q08. (i) C(5, 4) (ii) $6\sqrt{2}$ (iii) (1, 5) OR (iii) $3\sqrt{2}$

Q09. (i) (3, 5)

(ii) G, H and K lie on a same straight line.

OR

(ii) J and I are equidistant from forward C; C is NOT the mid-point of IJ.

(iii) (3, –10)

Q10. (i) 2 units (ii) 2 units

(iii) Note that, $OB = \sqrt{5}$ units.

Distance between Alia's house and Shagun's house $AB = 2$ units.

Distance between Library and Shagun's house $CB = 2$ units.
Clearly, OB is greater than AB and CB,
For Shagun, school [O] is farther than Alia's house [A] and Library [C].

OR

(iii) Here $CA = 2\sqrt{2}$ units.
Distance between Alia's house and Shagun's house $AB = 2$ units
Distance between Library and Shagun's house $CB = 2$ units.
As $AC^2 + BC^2 = 2^2 + 2^2 = 4 + 4 = 8$. Therefore, A, B and C form an isosceles right triangle.

Q11. (i) $\left(\frac{17}{3}, \frac{10}{3}\right)$ (ii) isosceles right triangle
(iii) 110.5 m^2 OR (iii) $\left(11, \frac{31}{5}\right)$

Q12. (i) 3 : 2 (ii) $2\sqrt{2}$ units (iii) 10 units OR (iii) $5\sqrt{2}$ units

Q13. (i) $\sqrt{137}$ km = 11.70 km (ii) 10 km (iii) 2 : 1 OR (iii) 1 : 1

Q14. (i) 9 units (ii) 7 units (iii) $\sqrt{61}$ units; $x = 9$ OR (iii) (–1, 4)

Q15. (i) $\sqrt{58}$ units (ii) $\left(-\frac{1}{2}, \frac{11}{2}\right)$ (iii) (0, 5.7) OR (iii) 10 Sq.units

Q16. (i) $150\sqrt{34}$ km (ii) $\left(3, \frac{41}{5}\right)$ (iii) isosceles triangle OR (iii) $\left(0, \frac{25}{8}\right)$

Q17. (i) $\sqrt{89}$ units (ii) $\sqrt{89}$ units (iii) No OR (iii) $10 + 2\sqrt{89}$ units

Q18. (i) (–5, 11) (ii) (5, 11) (iii) 10 units OR (iii) $10\sqrt{2}$ units

Q19. (i) Student at point A (ii) $\sqrt{37}$ units (iii) $\left(5, \frac{11}{2}\right)$ OR (iii) $\left(\frac{10}{3}, \frac{13}{3}\right)$

Q20. (i) $\sqrt{58}$ units (ii) $\left(-\frac{1}{2}, \frac{11}{2}\right)$ (iii) $\left(0, \frac{57}{10}\right)$ OR (iii) 10 sq. units

Q21. (i) $4\sqrt{5}$ units (ii) $2\sqrt{5}$ units (iii) (5, –1)

Q22. (i) $5\sqrt{5}$ units (ii) $\sqrt{101}$ units (iii) $(0, -8 \pm 6\sqrt{3})$ OR (iii) No

Q23. (i) P(–12, –2) (ii) Q(–13, 2) (iii) scalene OR (iii) $\frac{\sqrt{26}}{2}$

Q24. (i) $\sqrt{10}$ units (ii) 5 units (iii) (3, –2) OR (iii) $\left(4, -\frac{10}{3}\right)$

Q25. (i) $\sqrt{5}$ units (ii) $\sqrt{5}$ units (iii) D(4,4), $E\left(\frac{13}{2}, \frac{7}{2}\right)$, $F\left(\frac{11}{2}, \frac{3}{2}\right)$ OR (iii) $\left(\frac{16}{3}, 3\right)$

Q26. (i) Draw the graph yourself (ii) 10 units
(iii) (0, –5.5) OR (iii) Draw the graph yourself; $25\sqrt{3}$ sq. units

Chapter-08 Introduction to Trigonometry

Q01. (i) $\frac{15}{17}$ (ii) $\frac{8}{17}$ (iii) 1 OR (iii) –1

Q02. (i) $\frac{5}{\sqrt{41}}$ (ii) $\frac{4}{\sqrt{41}}$ (iii) $\frac{9}{41}$ OR (iii) 0

Chapter-09 Applications of Trigonometry

Q01. (i) $24\sqrt{3}$ cm (ii) $12(3-\sqrt{3})$ cm OR (ii) $216\sqrt{3}$ cm^2 (iii) 36 cm

Q02. (i) $12\sqrt{3}$ m (ii) $12(3-\sqrt{3})$ m (iii) $36\sqrt{2}$ m OR (iii) $24\sqrt{3}$ m

Q03. (i) 80 m (ii) $80(\sqrt{3}-1)$ m OR (ii) $80\left(1-\frac{1}{\sqrt{3}}\right)$ m (iii) $600(\sqrt{3}+1)$ m/min

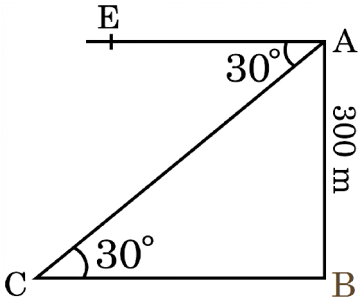
Q04. (i) 45°

(ii) Note that XY || PQ and AQ is a transversal, so alternate interior angles are equal.
That is, $\angle YAQ = \angle AQD$.

(iii) 100 m OR (iii) $100\sqrt{3}$ m

Q05. (i) 60° (ii) 84.77 cm^2 (iii) 102.67 cm^2 OR (iii) 42.67 cm

Q06. (i) Labeled diagram is given below.



(ii) $200\sqrt{3}$ m

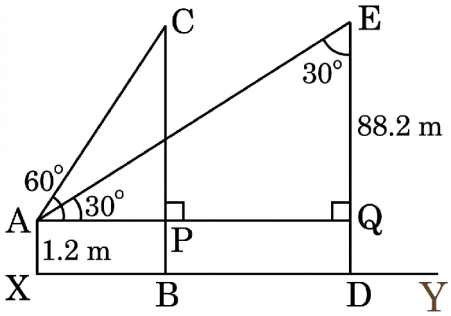
(iii) 15 minutes OR (iii) $20\sqrt{3}$ m/min

Required distance = $300\sqrt{3}$ m.

Q07. (i) $4\sqrt{3}$ m (ii) Increase

(iii) 60° OR (iii) Angle of elevation remains unchanged.

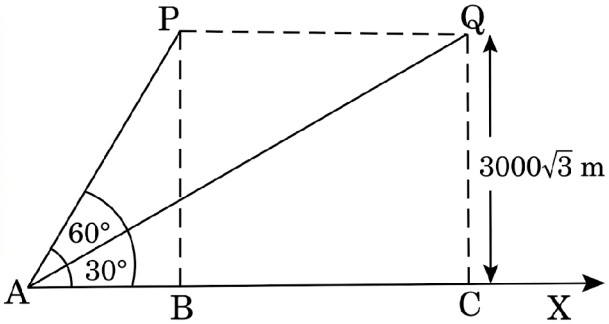
Q08. (i) Let XY be the horizontal ground; AX is the girl; C and E are the positions of the balloon, A is the girl's point of observation.



(ii) $58\sqrt{3}$ m

(iii) 50.17 m/min OR (iii) 45°

Q09. (i) In the figure shown, P and Q are the two positions of the plane flying at a height of $3000\sqrt{3}$ m. Also, A is the point of observation.



(ii) 6000 m OR (ii) $3000(\sqrt{3}-1)$ m

(iii) 720 km/hr

Q10. (i) $12\sqrt{3}$ m (ii) 36 m (iii) $24\sqrt{3}$ m OR (iii) 36 m

Q11. (i) $800\sqrt{3}$ m (ii) 900 kmph (iii) 1200 m OR (iii) $400\sqrt{3}$ m

Q12. (i) 80 m (ii) 160 m (iii) 80 m OR (iii) $80\sqrt{3}$ m

Q13. (i) 100 m (ii) 69.2 m approx. (iii) 121.10 approx. OR $20\sqrt{37}$ m

Q14. (i) $25\sqrt{3}$ m (ii) 50 m (iii) 50 m OR (iii) 9 seconds

Q15. (i) $\frac{40\sqrt{3}}{3}$ m (ii) $40\sqrt{3}$ m (iii) $\frac{80\sqrt{3}}{3}$ m OR (iii) $\frac{40\sqrt{3}}{3}$ m

Q16. (i) decrease (ii) 200 m/s (iii) 3000 m OR (iii) $3000\sqrt{3}$ m

Q17. (i) $20\sqrt{3}$ m (ii) 30 m (iii) $30(\sqrt{3}-1)$ m OR (iii) $(30+10\sqrt{3})$ m

Q18. (i) $\frac{20\sqrt{3}}{3}$ m (ii) $\frac{10\sqrt{3}}{3}$ m (iii) $10\left(1-\frac{\sqrt{3}}{3}\right)$ m OR (iii) $10\left(1-\frac{\sqrt{3}}{3}\right)$ m

Q19. (i) AB (ii) 20 m, 60 m (iii) $20\sqrt{3}$ meter OR (iii) $1:\sqrt{3}$

Chapter-10 Circles

Q01. (i) $5\sqrt{3}$ cm (ii) 120° (iii) $15\sqrt{3}$ cm OR (iii) Square

Q02. (i) $75\sqrt{3}$ cm (ii) 150 cm (iii) $\frac{75\sqrt{3}}{2}$ cm OR (iii) $\frac{75}{2}$ cm

Q03. (i) x m (ii) Square (iii) $8+x$ m ; 4.28 m OR (iii) 4.28 m ; 2.72 m

Q04. (i) 30 cm (ii) 120° (iii) $20\sqrt{3}$ cm OR (iii) $10\sqrt{3}$ cm

Chapter-11 Areas Related to Circles

Q01. (i) 1600 cm^2 (ii) $\frac{2200}{7}$ cm^2 or 314.28 cm^2

(iii) $\frac{6800}{7}$ cm^2 or 971.43 cm^2 OR (iii) $\frac{4400}{7}$ cm^2 or 628.57 cm^2

Q02. (i) $\frac{1}{4}\pi r^2-\frac{1}{2}r^2+\frac{1}{6}\pi r^2-\frac{\sqrt{3}}{4}r^2=256\frac{2}{3}$ (ii) r = 26.1 cm (approx.)

(iii) 194.63 m^2 OR (iii) 62.03 m^2

Q03. (i) 64 cm^2 (ii) $8\sqrt{2}$ cm (iii) $\frac{88}{7}$ cm^2 OR (iii) $\frac{96}{7}$ cm^2

Q04. (i) 40 m (ii) 15 m (iii) $\frac{660}{7}$ m OR (iii) $\frac{4950}{7}$ sq. m

Q05. (i) 18 units (ii) $\frac{715}{28}$ sq. units or 25.54 sq. units OR (ii) 56:11 (iii) ₹106

Q06. (i) 38.5 cm^2 (ii) 50 cm^2 (iii) ₹230 OR (iii) 11 cm

Q07. (i) 400 m^2 (ii) 154 m^2 OR (ii) 78.5 m^2 (iii) 399.9846 m^2

Q08. (i) 45° (ii) 58.5 cm (iii) 133.96 cm^2 OR (iii) 28.57 cm^2

Chapter-12 Surface Areas and Volumes

Q01. (i) $\frac{264}{7}$ cm^3 or 37.7 cm^3 (ii) 248 cm^2 (iii) 688 cm^3 OR (iii) 150 cm^2

Q02. (i) 125.6 cm^3 (ii) 157 cm^2 (iii) 190.5 cm^3 OR (iii) 150.7 cm^2

Q03. (i) 25.1 mm^2 (ii) 16.76 mm^3 (iii) 9504 mm^2 OR (iii) 33528 mm^3

Q04. (i) 38.5 cm^2 (ii) 2425.5 cm^3 OR (ii) 539 cm^3 (iii) 308 cm^2

Q05. (i) 17.5 m (ii) 616 m^2 (iii) 1474 m^2 OR (iii) 7084 m^3

Q06. (i) 14400 cm^3 (ii) 470 cm^2 OR (ii) 24 (iii) 550 cm^3 or 550 mL

Q07. (i) 17248 cm^3 (ii) 12936 cm^3 (iii) 10348.8 cm^3 OR (iii) 4 : 3

Q08. (i) 2.5 m (ii) 11.78 m^2 (iii) ₹132000 OR (iii) 54.21 m^3

Q09. (i) 1.3 cm (ii) (0.65π) cm^2 (iii) (6.15π) cm^2 OR (iii) (3.2π) cm^3

Chapter-13 Statistics

Q01. (i) 600-800 (ii) 771.4 OR (ii) 850 (iii) 7

Q02. (i) 19.5 (ii) 19.5-24.5 OR (ii) 361 (iii) 3 Median = Mode + 2 Mean

Q03. (i) 40-60 (ii) 43 OR (ii) 46 (iii) 31 Students

Q04. (i) 100-110 (ii) 23 (iii) 102.5 OR (iii) Modal class : 100-110; Mode : 103

Q05. (i) 15 (ii) 74-77 (iii) 76.5 OR (iii) 76.25

Q06. (i) 15 (ii) 10-15 (iii) 13 OR (iii) 12.5

Chapter-14 Probability

Q01. (i) $\frac{21}{50}$ (ii) $\frac{2}{50}$ (iii) $\frac{23}{50}$ OR (iii) $\frac{48}{50}$

Q02. (i) $\frac{1}{15}$ (ii) $\frac{7}{15}$ OR (ii) $\frac{5}{15}$ (iii) $\frac{4}{15}$

Q03. (i) $\frac{1}{3}$ (ii) $\frac{1}{3}$ (iii) $x = 60$ OR (iii) $\frac{1}{4}$

Q04. (i) RR, RG, RB, GR, GB, GG, YR, YB, YG (ii) $\frac{1}{9}$

(iii) ₹330 OR (iii) ₹385

Q05. (i) 0.08 (ii) 0.74 OR (ii) 0.45 (iii) 0.25

Q06. (i) 30-45 (ii) $\frac{37}{75}$ (iii) 40.5 OR (iii) 51

Q07. (i) $\frac{23}{120}$ (ii) 59 (iii) 24 OR (iii) ₹70000

Q08. (i) $\frac{26}{100}$ (ii) $\frac{29}{100}$ (iii) $\frac{90}{100}$ OR (iii) $\frac{10}{100}$

Q09. (i) $\frac{5}{36}$ (ii) 0 (iii) $\frac{1}{6}$ OR (iii) $\frac{5}{18}$

Q10. (i) $\frac{0}{44}$ i.e., 0 (ii) $\frac{22}{44}$ (iii) $\frac{2}{44}$ OR (iii) $\frac{6}{44}$

Q11. (i) $\frac{0}{15}$ i.e., 0 (ii) $\frac{4}{15}$ (iii) $\frac{15}{15}$ i.e., 1 OR (iii) $\frac{7}{15}$

Q12. (i) $\frac{2}{5}$ (ii) $\frac{17}{20}$ (iii) $\frac{11}{20}$ OR (iii) $\frac{1}{20}$

Q13. (i) $\frac{1}{2}$ (ii) $\frac{3}{13}$ (iii) $\frac{12}{13}$ OR (iii) $\frac{1}{26}$

Q14. (i) $\frac{1}{2}$ (ii) $\frac{1}{4}$ (iii) $\frac{3}{4}$ OR (iii) $\frac{1}{4}$

Q15. (i) $\frac{1}{2}$ (ii) $\frac{1}{3}$ (iii) $\frac{1}{2}$ OR (iii) $\frac{2}{3}$

Q16. (i) $\frac{1}{8}$ (ii) $\frac{3}{8}$ (iii) $\frac{7}{8}$ OR (iii) $\frac{1}{8}$.

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O.P. GUPTA
INDIRA AWARD WINNER

ABOUT THE AUTHOR

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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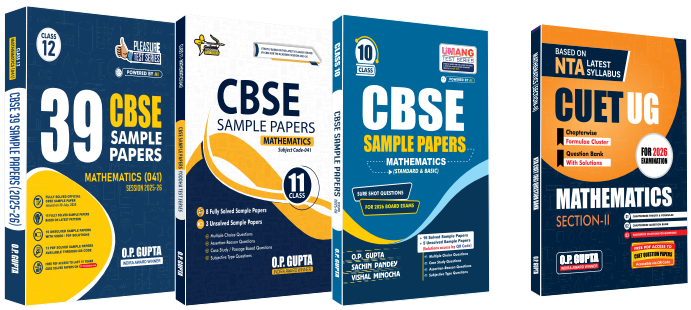

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