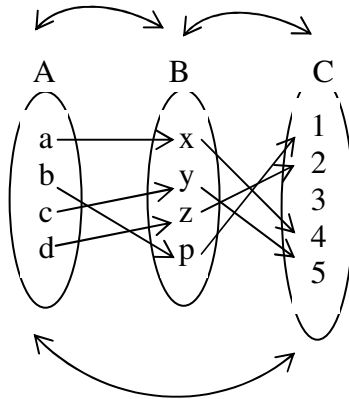
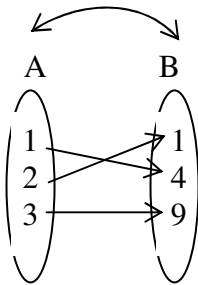


Exercise 1.1

Q.1 From the given figures, find the values of $gof(a)$, $gof(b)$, $gof(c)$ and $gof(d)$.



Q.2 From the given figures, find the values of $f^{-1}(1)$, $f^{-1}(4)$ and $f^{-1}(9)$.



Q.3 Find the range and inverse of function $f = \{(2, \frac{1}{2}), (3, \frac{1}{3}), (4, \frac{1}{4})\}$.

Q.4 If $f = \{(-2, 4), (-1, 8)\}$ and $g = \{(4, 0), (8, -2)\}$ be two functions, find the gof .

Q.5 If $f = \{(1, 2), (3, 5)\}$ and $g = \{(5, 1), (2, 3)\}$ be two functions, find gof .

Q.6 If $f: A \rightarrow B$ such that $f(x) = x - 2$ and $g: B \rightarrow C$ such that $g(x) = x^2 - 1$. Find the composite function which is defined from the set A to the set C.

Q.7

(a) If $f = \{(-2, 4), (-1, 8), (0, 0), (1, 4), (2, 6)\}$ and $g = \{(0, -2), (4, 0), (6, 1), (8, -2)\}$ Find the ordered pairs of gf and draw arrow diagram.

(b) If $f = \{(1, 3), (0, 0), (-1, -3)\}$ and $g = \{(0, 2), (-3, -1), (3, 5)\}$, show the function gof in the arrow diagram and find it in ordered pair form.

Q.8 If $f(x) = x + 1$ and $g(x) = x^2$, $x \in \mathbb{R}$ find gf .

Q.9 If $f(x) = x + 1$ and $g(x) = x - 1$; $x \in \mathbb{R}$, find the value of : (i) $gf(2)$ (ii) $fg(1)$ (iii) $ff(1)$ (iv) $gg(-2)$

Q.10 if $f: x \rightarrow 3x + 1$ and $h: x \rightarrow 3x$

(i) Find the equation of: $fh(x)$ and $hf(x)$

(ii) Find the value of: $fh(2)$, $hf(2)$

Q.11

- (i) Find the inverse function of $\{(1, 1), (2, 2), (3, 3), (4, 4), (5, 5)\}$ and
(ii) $\{(x, y): y = x, x, y \in \mathbb{R}\}$

Q.12 Find the inverse function f^{-1} of $f: x \rightarrow 4x$

Q.13 Find the inverse function f^{-1} of $f(x) = x^3$

Q.14 Find the inverse function f^{-1} of $f(x) = 2x + 5$

Q.15 Find the inverse function f^{-1} of $f(x) = 2x + 5, x \neq -2$
 $x + 2$

Q.16 If $f(x) = x + 2$, find f^{-1} and also find the following values:

- (i) $f(-2)$ (ii) $f(4)$ (iii) $f^{-1}(2)$ (iv) $f^{-1}(-2)$ (v) $f^{-1}(4)$
(vi) $f(x-2)$ (vii) $f^{-1}(x-2)$ (viii) $f^{-1}(x+2)$

Long Questions

Q.1 If $f(x) = 3x - 4$, $h(x) = x + 3$ and $g(x) = -2x + 1$, find the following equations:

- (i) fh (ii) hh (iii) $gh(f)$ (iv) $f(gh)$ (v) $f(hh)$

Q.2 If $f(x) = x^2$ and $g(x) = x + 1$, find: $f \circ g$ and $g \circ f$. Is $f \circ g = g \circ f$?

Q.3 From the equations given in question no 1, find the values of the following:

- (i) $fh(2)$ (ii) $hh(2)$ (iii) $f(gh)$ (iv) $f(hh)$ (v) $f^{-1}(-5)$

Q.4 If $f(x) = 3x - 2$ and $g(x) = 2x^2$ find, (i) $g \circ f(2)$ and (ii) $g \circ f(-2)$

Q.5 If $f(x) = 1/x, x \in \mathbb{R}, x \neq 0$, find $ff(x), ff(3), ff(-3)$ and $ff(2)$.

Q.6 If $f(x) = x + 2, g(x) = 3x + 4$ and $h(x) = (x + 2)/2$ find the equation of:

- (i) $ff^{-1}(x)$ (ii) gh^{-1} (iii) $g \circ g^{-1}(x)$

Q.7 If $f^{-1}(x) = x/2$ and $g^{-1}(x) = x + 3$, find the values of: $f^{-1} \circ g^{-1}(3)$ and $g^{-1} \circ f^{-1}(3)$. Are they equal?

Q.8 If $f(x) = 4x - 2$ and $g(x) = 1/x$, find the value of $f^{-1}(6)$ and $g \circ f(2)$.

Q.9 If $f(x) = 8x - 3x$, evaluate $f^{-1}(-4)$ and $ff(2)$.

Q.10 If $f(x) = x^2$ and $g(x) = 3x$, find the values of:

- (i) $f \circ g(x)$ (ii) $g \circ f(x)$ (iii) $f \circ g(2)$ (iv) $g \circ f(2)$

- Q.11 If $f(x) = 1 + 2x$ and $g(x) = 1/(1 - x)$, find the value of: $g^{-1}(1/2)$ and $gf(-1)$.
- Q.12 Given that function $f(x) = 3x + a$. if $ff(6) = 10$, find the values of a and $f^{-1}(4)$.
- Q.13 It is given that $f(x) = 4x - 17$ and $g(x) = (2x + 8)/5$. If $ff(x) = g^{-1}(x)$, find the value of x .
- Q.14 If function $f(x) = (2x + 3)/(x + 2)$ and $g(x) = x - 2$, find the values of $f^{-1}(x)$, $f^{-1}(1)$, $fg(x)$ and $fg(1)$.
- Q.15 If $f(x) = 3x + 4$; $g(x) = 2(x + 1)$, prove that $f \circ g = g \circ f$ and find the value of $f^{-1}(2)$.
- Q.16 If $f(x) = 2x - 3$ and $g(x) = x^2 + 2$, find:
 (i) $f^{-1}(-2)$ (ii) $f \circ g(x)$
- Q.17 It is given that $f(x) = 4x + 7$ and $g(x) = 3x - 5$. if $fg^{-1}(x) = 15$, find the value of x .
- Q.18 It is given that the function $f(x) = 4x + 7$ and $g(x) = 3x - 5$. If $fg^{-1}(x) = 15$, find the value of x .
- Q.19 Functions $f(x) = (3x + 11)/(x - 3)$, $x \neq 3$ and $g(x) = (x - 3)/2$ are given. Find $f^{-1}(x)$ and if $f(x) = g^{-1}(x)$, find the values of x .
- Q.20 Functions $f(x) = (x - 2)/(2x + 1)$, $x \neq -1/2$ and $g(x) = 1/x$, $x \neq 0$ are given. If $f^{-1}(x) = gf(x)$, find the value of x .
- Q.21 If $f(x) = 2x - 3$, $x \in \mathbb{R}$, prove that $ff^{-1}(x) = f^{-1}f(x)$.
- Q.22 If functions $f(x) = x^2 + 1$ and $f(x) = x^5$ are given find the values of $f^{-1}(10)$, $g^{-1}(32)$, $fg(x)$, $gf(x)$.
- Q.23 If $f(x) = 4x - 2$, $g(x) = 1/x$ and $f^{-1}(6) \times gf(x) = 1$, find the value of x .
- Q.24 Given the functions $f(x) = x - 3$ and $g(x) = (2x + 5)/(x + 2)$ ($x \neq -2$). If $fg^{-1}(x) = -4$, find the value of x .
- Q.25 Given the functions $f(x) = (2x + 3)/(x + 2)$ ($x \neq -2$) and $g(x) = x + 1$. If $fg^{-1}(x) = -2$, find the value of x .
- Q.26 It is given that $f(x) = (x, 4x - 17)$ and $g(x) = (x, (2x + 8)/5)$. If $g^{-1}(x) = ff(x)$, find the value of x .
- Q.27 If $f(x) = 3x + 4$ and $g(x) = x/3 + 1$. Find the value of x , if $f^{-1}g(x) = 4$.
- Q.28 If $f(x) = x^2 - 2x$, $g(x) = 2x + 3$ and $f \circ g^{-1}(x) = 3$, calculate the value of x .

Q.29 If $f(x) = (3x + 5)/4$ and $g(x) = 2x + 3$, find:

- (i) $gg^{-1}(-2)$ (ii) $gf(4)$

Q.30 If $f(x) = 5x - k$ and $ff(5) = 19$, find the value of k and $f^{-1}(14)$.

Q.31 If $f(x) = 1 + 2x$ and $g(x) = 1/(1 - x)$, find the values of $g^{-1}(1/2)$ and $f^{-1}og^{-1}(-1)$

Q.32 If $fog(x) = 2x - 2$ and $f(x) = x + 1$ be two given functions, find: $f^{-1} \circ g^{-1}(x)$.

Q.33 If $f(x) = x/(2x - 3)$ and $f(x) = f^{-1}(x)$, find the value of x .

Q.34 Draw the graph pf trigonometric functions:

- (i) $y = \sin\theta$ (ii) $y = \tan\theta$ (iii) $y = \sin 2\theta$ (iv) $y = \cos 2\theta$
(v) $y = \cos 3\theta$ (vi) $y = \sin 3\theta$ (vii) $y = \tan 2\theta$

Q.35 Define the composite function with examples.

Q.36 Define the inverse functions.

Exercise 1.2

Q.1 Find the product of the following polynomials:

- (i) $p(x) = x + 3$ and $f(x) = x - 2$
(ii) $f(x) = 1 - 2x + x^2$ and $g(x) = 1 + x$
(iii) $f(m) = 2m^2 + m - 28$ and $g(m) = 4 - m$
(iv) $f(p) = 4p - 8$ and $g(p) = 2p^2 - 36p + 24$
(v) $P(u) = u^2 + 3u + 1$ and $g(u) = u^3 + 3u + 2$
(vi) $P(x) = x - 3y$ and $g(x) = 3x + 5y$
(vii) $F(x) = x + y$ and $g(x) = x^3 = x^2y + xy^2 - y^3$
(viii) $F(x) = x - y$ and $g(x) = x^3 + x^2y + xy^2 + y^3$

Q.2 From the given polynomials, divide $p(x)$ by $f(x)$:

- (i) $p(x) = x^4 - 3x + 5$; $f(x) = x + 2$
(ii) $p(x) = x^2 - 18x - 4$; $f(x) = x + 2$
(iii) $p(x) = 4x^2 + 23x + 15$; $f(x) = 4x + 3$
(iv) $p(x) = 8x^4 + 2x^3 - 3x - 18$; $f(x) = 2x^2 - 3$
(v) $p(x) = 24x^3 + 61x^2 - 14x + 6$; $f(x) = 3x + 8$
(vi) $p(x) = x^3 + y^3 - z^3 + 3xyz$; $f(x) = x + y - z$
(vii) $p(x) = x^3 - y^3$; $f(x) = x - y$
(viii) $p(x) = x^3 + y^3$; $f(x) = x + y$
(ix) $p(x) = x^4 + 3x^2 + 4x + 4$; $f(x) = x^2 + 3$

Q.3 Find the polynomials $Q(x)$ and remainder R of the following:

- (i) $2x^3 + 5x^2 + 4 = (x - 3)Q(x) + R$

- (ii) $x^4 - 5x^3 + 3x - 10 = (x - 5) Q(x) + R$
- (iii) $3x^3 + 5x^2 - 6x - 14 = (x^2 - 2) Q(x) + R$
- (iv) $12x^2 + 7x - 15 = (4x + 5) Q(x) + R$
- (v) $x^5 + 5x^3 + 3x^2 + 5x + 3 = (x^4 + 4x + 2) Q(x) + R$

Q.4 Find the value by using synthetic division method:

- (i) $x^3 - x^2 + 1 \div x - 1$
- (ii) $x^3 + 8 \div x + 2$
- (iii) $x^4 + 3x^2 - 2x - 5 \div x + 1$
- (iv) $x^3 + 3x^2 - 5x + 2 \div x - 2$
- (v) $4x^3 + 3x^2 + 2x - 4 \div x + 1$
- (vi) $3x^4 - 4x^3 + 2x^2 - 9x + 1 \div x - 1$

Q.5 What is obtained when $(x^2 + xy + y^2)(x - y)$ is subtracted from eth multiple of $x^2 - xy + y^2$ and $x + y$?

Q.6 Subtract $5x^3 - 2x^2 + 6$ by adding the polynomials $3x^2 + 2x - 5$ and $6x^3 - x$.

Q.7 If $P(x) = 3x^2 + 2x$ and $Q(x) = x^2 - 2x - 5$ find

- (i) $P(x) + Q(x)$
- (ii) $P(x) - Q(x)$
- (iii) $P(x) \times Q(x)$

Q.8 If $f(x) = 4x^3 - 3x^2 + 1$ and $g(x) = x^2 - 2x - 5$ find

- (i) $f(x) + g(x)$
- (ii) $f(x) - g(x)$
- (iii) $f(x).g(x)$

Q.9 Divide:

- (i) $(9x^4 + 4x + 6x^3 + 4) \div (3x^2 + 2x + 2)$
- (ii) $(2y^3 - 2z^3 + yz^2 - y^2z) \div (2y + z)$
- (iii) $(6x^4 + ax^3 - a^3x + a^4) \div (2x^2 - ax + a^2)$
- (iv) $(y^6 - b^8) \div (y^3 - by^2 + b^2y - b^3)$
- (v) $(t^6 - a^6) \div (t^2 + ta + a^2)$

Q.10 Find the value of the following polynomials by using synthetic division method:

- (i) $f(x) = x^4 - x^3 - 3x^2 - 2x + 5$, where $x = 2, -1, 3$
- (ii) $g(g) = 3x^3 - 5x^2 - 2 + x$, where $x = 3, -2, 4$
- (iii) $h(x) = x^2 + 6x^3 + 7x^4$, where $x = -3, 2, -2$
- (iv) $f(b) = 6b^4 + 5b^3 - 10b + 4$, where $b = 2, -1, 1$
- (v) $g(t) = t^2 + 6t^3 + 7t^4$, where $t = -2, 2, 3$
- (vi) $h(a) = a^2 + 2a + 1$, where $a = 1, -1, 2, -2$

Q.11 What do you mean by the multiplication of polynomials?

Q.12 Write the cancellation law with example.

Q.13 What do you mean by division of polynomials? Write the four terms used in division.

Exercise 1.3

Q.1 Use the remainder theorem to find the remainder R when the polynomials f(x) is divided by g(x).

	f(x)	g(x)
(i)	$4x^3 + 2x^2 - 4x + 3$	$2x + 3$
(ii)	$4x^4 + 5x^3 - 10x + 4$	$3x - 2$
(iii)	$2x^4 + x^3 - x - 2$	$x + 1$
(iv)	$x^5 - 1$	$x - 1$
(v)	$x^3 + 3x^2 - 2x + 6x - 3$	
(vi)	$x^6 - 1$	$x + 1$
(vii)	$x^3 + 6x^2 - x - 30x + 1$	
(viii)	$x^2 - 5x + 9$	$x + 2$
(ix)	$2x^3 - 3x^2 + 7x + 5$	$2x + 3$

Q.2 Find the polynomial Q(x) and remainder R of the followings:

- (i) $2x^3 + 5x^2 + 4 = (x - 3) Q(x) + R$
- (ii) $X^4 - 5x^3 + 2x - 5 = (x - 5) Q(x) + R$
- (iii) $X^3 + 4x^2 + x - 6 = (x - 1) Q(x) + R$
- (iv) $X^3 - 9x^2 + 24x - 20 = (x - 2) Q(x) + R$
- (v) $X^4 + 2x^3 - 3x^2 + x - 1 = (x - 2) Q(x) + R$

Q.3 By using factor theorem, decide whether the following binomial is a factor of polynomial f(x) or not.

	f(x)	g(x)
(i)	$x^3 + 5x^2 + 8x + 4$	$x + 2$
(ii)	$x^7 - x^5 + x^3 - x$	$x + 1$
(iii)	$x^5 + 2x^4 + x^3 + 2x^2 + x + 2$	$x + 2$
(iv)	$y^3 - 2y^2 - 3y + 6$	$y - \sqrt{3}$
(v)	$a^4 - 27a^2 + 14a + 120$	$a - 12$
(vi)	$t^5 + t^4 + 4t + 4$	$t + \sqrt{2}$
(vii)	$a^4 - 4a^2 + a - 4$	$a - 2$

Q.4 Find the remainder when $x^4 - 3x^3 - 2x^2 + x + 5$ is divided by $x + 1$.

Q.5 If $(x - 2)$ is a factor of the following polynomials, then find the value of a:

- (i) $x^2 - 3x + 5a$
- (ii) $x^3 - 2ax^2 + ax - 1$
- (iii) $x^5 - 3x^4 - ax^3 + 3ax^2 + 2ax + 4$
- (iv) $x^3 + 5x^2 + ax + 2a$

Q.6 Prove that $(3x - 6)$ is a factor of the polynomials $3x^3 - 15x + 6$.

Q.7 If $(x - a)$ is a factor of the following polynomials, find the value fo a:

- (i) $x^3 - ax^2 - 2x + a + 4$
- (ii) $x^4 - a^2x^2 + 3x - a$

Q.8 For what value of a will $(x - 1)$ be a factor of the polynomial $3x^5 + 9x^4 - 7x^3 - 5x^2 - 4ax + 3a^2$?

Q.9 If $f(x) = 2x^3 + 3x^2 - 3x + k$ and $f(2) = 8$, find the value of k .

Q.10 If the polynomial $2x^3 + 9x^2 - x - k$ is divisible by $2x + 3$ exactly, find the value of k .

Q.11 Find the value of c , if $x^3 + 4x^2 - cx + 8$ is exactly divisible by $(x - 2)$.

Q.12 If $(x + 3)$ is a factor of $x^3 - (k - 1)x^2 + kx + 54$, find the value of k .

Q.13 If $(2x + 1)$ is a factor of $2x^3 + ax^2 + x + 2$, find the value of a .

Q.14 If $f(x) = 2x^4 - 3x^2 + 6x + k$ and $f(1) = 0$, find the value of k .

Q.15 $(x + 2)$ is a factor of $x^3 + kx^2 - 4x + 12$, find the value of k .

Q.16 It is given that $2x^3 - 7x^2 + x + 10 = (x - 1)Q(x) + R$. find the remainder R and polynomial $Q(x)$.

Q.17 Calculate the value of p if $x + 2$ is a factor of $3x^3 + px^2 - 2x - 8$.

Q.18 Define the remainder theorem and find the remainder when $2x^3 - 7x^2 + 5x + 4$ is divided by $(x - 3)$.

Q.19 What do you mean by a factor theorem and find the remainder when $2x^3 - kx^2 - 8x + 5$, find the value of k .

Q.20 If $x - 3$ is a factor of $x^3 + 4x^2 + kx - 30$, find the value of k .

Q.21 If $2x - 5$ is a factor of $6x^3 - (k + 6)x^2 + 2kx - 25$, find the value of k .

Q.22 If $x^3 + ax^2 - x + 7$ leaves the remainder 4 when it is divided by $x - 3$, find the value of a .

Q.23 If the polynomial $3x^3 + kx^2 + 2x - 3$ leaves a remainder 5 when divided by $x - 2$, find the value of k using the remainder theorem.

Q.24 State the remainder theorem and use it to find the remainder when the polynomial $5x^2 - 10x + 4$ is divided by $2x + 3$.

Q.25 If $x - k$ is a factor of the polynomial $x^3 - kx^2 - 2x + k + 4$ find the value of k .

Q.26 If $(x - 1)$ is a factor of $p(x) = x^2 + bx + 2$; check whether $(x - 2)$ is also a factor of the polynomial $p(x)$ or not.

- Q.27 If $2x + 1$ is a factor of the polynomial $x^3 + 2x^2 - kx - 6$, find the value of k .
- Q.28 If the polynomial $2x^3 + 3x^2 + ax - 2$ leaves a remainder 7 when divided by $2x - 3$, find the value of a .
- Q.29 State a factor theorem. If $(x - 3)$ is a factor of $x^3 - (p - 1)x^2 + px + 54$, find the value of p .
- Q.30 State remainder theorem. If $f(x) = 2x^4 - 3x^2 + 6x + k$ and $f(1) = 0$ find the value of k .
- Q.31 Define the remainder theorem and use it to find the remainder when $2x^3 - 7x^2 + 5x + 94$ is divided by $x - 3$.
- Q.32 Find the remainder when $3x^3 - 5x^2 + 2x - 3$ is divided by $x - 2$.
- Q.33 The polynomial $f(x) = kx^3 + 9x^2 + 4x - 8$ when divided by $(x + 3)$ leaves a remainder -20. find the value of k .
- Q.34 Define the factor theorem. What should be the value of k under which $x - 2$ becomes a factor $x^3 + 5(k-1)x^2 - kx - 6$?
- Q.35 Prove that $(a + 2)$ is a factor of the polynomial $a^3 + 5a^2 + 8a + 4$. Also express the polynomial in the form $f(x) = g(x) Q(x)$.
- Q.36 Find the values of $f(x) = x^3 - x^2 - 4x + 4$ when $x = 0, -1, 1, -2, 2, 3, -3$. Also find the factors of $f(x)$.
- Q.37 If $x^2 + 3x + 3$ is a quotient and 5 is the remainder of the polynomial $f(x)$ when divided by $(x + 2)$, then find $f(x)$.
- Q.38 Find the values of $f(x) = 6x^3 + 35x^2 - 7x - 6$ when $x = -6, -2, -1/3, 1/2, 3$. Also find the factors of $f(x)$.
- Q.39 When a polynomial is divided by $x + 1$, then the quotient $x^2 + 2x + 1$ and remainder is 5. find the polynomial.
- Q.40 State factor theorem. Use factor theorem to determine whether $(x - 1)$ is a factor of the polynomials $3x^3 + 2x - 5$.

Long Questions

- Q.1 Find the factors of the following polynomials by testing factors:
- $x^2 - 3x - 40$
 - $x^3 - 6x^2 + 11x - 6$
 - $5p^2 + 4p - 12$

- (iv) $y^3 - 8y^2 + 19y - 12$
- (v) $x^3 - 9x^2 + 24x - 20$
- (vi) $a^3 + 7a^2 - 21a - 27$
- (vii) $x^3 + 6x^2 + 11x + 6$
- (viii) $x^3 - 2x^2 - 5x + 6$
- (ix) $x^4 + 4x^3 + 6x^2 + 4x + 1$
- (x) $2x^4 - 7x^3 + 4x^2 + 7x - 6$
- (xi) $(x - 1)(x - 2)(x + 3)(x + 4) + 4$
- (xii) $(x + 1)(x + 3)(x - 4)(x - 6) + 13$

Q.2 Solve: $x^3 + x^2 + x + 1 = 0$

Q.3 Solve: $x^3 - x^2 - x + 1 = 0$

Q.4 Solve: $2x^3 + 3x^2 - 3x - 2 = 0$

Q.5 Solve: $2y^3 + y^2 - 2y - 1 = 0$

Q.6 Solve: $a^4 - a^3 + a - 1 = 0$

Q.7 Solve: $y^4 + y^3 - y - 1 = 0$

Q.8 Solve: $x^4 + 5x^3 - 2x^2 - 5x + 1 = 0$

Q.9 Solve: $4p^4 - 17p^2 + 4 = 0$

Q.10 Solve: $z^4 - 5z^2a^2 + 4a^4 = 0$

Q.11 Solve: $x^3 - 4x^2 + x + 6 = 0$

Q.12 Solve: $x^3 - 7x^2 + 7x + 15 = 0$

Q.13 Solve: $x^3 - 4x^2 - 7x + 10 = 0$

Q.14 Solve: $8x^3 + 7x^2 - x - 2 = 0$

Q.15 Solve: $6x^3 + 3x^2 - 3x - 2 = 0$

Q.16 Solve: $2x^3 + 3x^2 - 3x - 2 = 0$

Q.17 Solve: $6x^3 - 7x^2 - 7x + 6 = 0$

Q.18 Solve: $2x^3 + x^2 - 2x - 1 = 0$

Q.19 Solve: $2x^3 - 3x^2 - 3x + 2 = 0$

Q.20 Solve: $3x^3 - 13x^2 + 16 = 0$

Q.21 Solve: $2x^3 + 5x^2 - 4x - 3 = 0$

Q.22 Solve: $2x^3 - 3x^2 - 11x + 6 = 0$

Q.23 Solve: $2x^3 + 9y^2 - 7y - 6 = 0$

Q.24 Solve: $x^3 - 7x + 6 = 0$

Q.25 Solve: $x^3 - 19x - 30 = 0$

Q.26 Solve: $2x^3 + x^2 - 2x - 1 = 0$

Q.27 Solve: $2x^3 - x^2 - 13x - 6 = 0$

Q.28 Solve: $x^3 + 6x^2 - 11x - 6 = 0$

Q.29 Solve: $x^3 + x^2 - 17x + 15 = 0$

Q.30 Solve: $x^3 - x^2 - 14x + 24 = 0$

Q.31 Solve: $x^3 - 3x - 2 = 0$

Q.32 Solve: $4x^2(x - 3) + 5x + 6 = 0$

Q.33 Solve: $2x^3 - 3x^2 - 3x + 2 = 0$

Q.34 State the Remainder Theorem and prove it.

Q.35 State the Factor Theorem and prove it.

Q.36 State the converse of Factor Theorem and prove it.

Q.37 What is the use of Factor Theorem? State.

Exercise 1.4

Q.1 Examine whether the following sequences form arithmetic sequence or not:

- (a) 5, 8, 11, 14,
- (b) 2, 4, 8, 16, 32, 64,
- (c) $\frac{5}{4}$, 1, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$,
- (d) 6, 3, 0, -3, -6, -9,
- (e) 2, 5, 10, 17, 28,
- (f) $\frac{1}{2}$, $\frac{2}{2}$, $\frac{3}{2}$, $\frac{4}{2}$, $\frac{5}{2}$,
- (g) 8, 4, 0, -4, -8, -12, ...

(h) $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \dots$

Q.2 From the following arithmetic sequence, find:

- i) First term ii) Common difference
iii) Next four terms iv) general terms (t_n)

- (a) 2, 4, 6, 8, 10, (b) 1, -2, -5,
(c) 2, 6, 10, (d) 1, 5, 9,
(e) 9, 3, -3, (f) 24, 32, 40
(g) $5/4, 1, 3/4, \dots$ 0, -3, -6, -9,

Q.3 From the following arithmetic sequence, find:

- (a) 7th term of 2, 4, 6, 8,
(b) 20th term of 1, 3, 5, 7,
(c) 6th term of $9/7, 5/7, 1/7, \dots$
(d) 25th term of -7, -3, 1,
(e) 8th term of $13/3, 7/3, 1/3, -5/3, \dots$
(f) rth term of 8, 6, 4, 2,
(g) No. of terms of 10, 4, -2, -8,
(h) No. of terms of 9, $31/3, 35/3, 13, \dots, 133$
(i) Nth term of 8, 5, 2,
(j) Nth term of $a - b, a + b, a + 2b, \dots$

Q.4 Find the first five terms of the following arithmetic sequence:

- (a) First term 4 and common difference 3
(b) First term -5 and common difference 4
(c) First term 25 and common difference -4
(d) First term $1/5$ and common difference 2
(e) First term 0.3 and common difference 0.5
(f) First term $1/2$ and common difference 1
(g) First term $9/7$ and common difference -4
(h) First term $13/3$ and common difference -6

Q.5 Find the number of terms whose first term 1, common difference 6 and last term 49.

Q.6 Find the number of terms whose terms are 44, 36, 28,, -380.

Q.7 Find the last term of an arithmetic sequence whose first term 7, common difference 3 and number of terms 10.

Q.8 Find the number of terms of an arithmetic sequence
25, $22\frac{1}{2}$, 20,, -15

Q.9 Find the number of terms of an arithmetic sequence whose first term 13, second 11 and last term 1.

Q.10 Find the arithmetic means of the followings:

- (a) First term 5 and third term 8
- (b) First term 12 and third term 36
- (c) First term $\frac{4}{5}$ and third term $\frac{11}{5}$
- (d) First term -5 and last term 21
- (e) First term 13 and last term 27
- (f) First term $a - b$ and last term $a + b$
- (g) First term $(a + x)^2$ and last term $(a - x)^2$
- (h) First term $(a + x)(b + y)$ and last term $(a - x)(b - y)$

Q.11 Find the 10th term of A.S. whose 9th term and 11th term are 28 and 36 respectively.

Q.12 Find the value of 6th term of A.S. whose 5th and 7th terms are 11 and 15 respectively.

Q.13 If 7, x, 11 are the terms of A.S. find the value of x.

Q.14 If 4, p-1, 8 are in A.S., find the value of p.

Q.15 Find the average value of 14 and 36.

Q.16 Find the average value of $x + y$ and $x - y$.

Q.17 If 7, x, 11 are in A.P., find the value of x.

Long Questions

Q.1 Find the 8th and 10th terms of the following arithmetic sequences:

- (a) first term 7 and second term 11
- (b) first term 5 and second term 7
- (c) -6, -1, 4, 9,
- (d) 2, 5, 8, 11,
- (e) First term 1 and common difference 5
- (f) First term -5 and common difference 3
- (g) First term 9 and common difference 2
- (h) First term 1 and common difference 5
- (i) First term -5 and common difference 3
- (j) First term 9 and common difference 2
- (k) First term 3 and common difference 2

Q.2 Find the common differences of an arithmetic sequence when first term and fifth term 9 and 17 respectively are. What is its second term?

Q.3 Find the first term and common difference of an arithmetic sequence whose fifth and eighth terms are 22 and 34 respectively.

- Q.4 Find the first term and common difference of an arithmetic sequence whose 5th and 7th terms are 15 and 9 respectively.
- Q.5 Find the 10th term of an A.S. whose 4th and 6th terms are 13 and 7 respectively.
- Q.6 Find the last term of an arithmetic sequence of 10 terms whose first and fourth terms are 7 and 16 respectively.
- Q.7 If fifth and eighth terms of an A.S. are 22 and 34 respectively, find:
- Q.8 Find an arithmetic sequence whose first and seventh terms are 3 and 39 respectively.
- Q.9 Find 32nd term of an A.S. whose 1st and 20th terms are 2 and 59 respectively.
- Q.10 Find the first three terms of an AS whose 7th and 21st term are 6 and -22 respectively.
- Q.11 Which terms of an A.S. are 67, whose 5th and 8th terms are 19 and 31 respectively?
- Q.12 If n th term of the series 1, 5, 9,.... And 43, 46, 49,.... is same, find the value of n .
- Q.13 If n th term of an A.S. whose first term 21 and common difference 2 is equal to n th terms of an A.S. whose first term 51 and common difference -4, find the value of n .
- Q.14 The 3rd term and 13th terms of an Arithmetic sequence are -40 and 0 respectively, find 28th term of the sequence.
- Q.15 Find the arithmetic means of the followings:
- (a) 5 means between 9 and 33
 - (b) 3 means between 6 and 11
 - (c) 2 means between 14 and -7
 - (d) 4 means between -16 and 2
 - (e) 4 means between 140 and -60
 - (f) 2 means between 8 and 12
 - (g) 2 means between -6 and 14
 - (h) 4 means between 117 and 477
 - (i) 5 means between -6 and 54
 - (j) 6 means between -3 and 32
- Q.16 Insert 3 arithmetic means between a and b .
- Q.17 Find the values of x and y if 3, x , y , -9 are in A.S.
- Q.18 Find the values of a and b if $12\frac{1}{2}$, a , b , $16\frac{1}{3}$ are in A.S.

- Q.19 Find the values of p and q if $10\frac{2}{3}$, p, q, 14 are in A.S.
- Q.20 Find the values of x, y, z if -1, x, y, z, 1 are in A.S.
- Q.21 If 8, a, b, c, d, 14 are in A.S., find a, b, c and d.
- Q.22 If first term is reciprocal to the third term and their mean is $\frac{5}{4}$, find the first and third terms.
- Q.23 If there are n arithmetic means between 1 and 70 and the ratio of the first and last means is 4:67, find the value of n.
- Q.24 If there are n arithmetic means between 5 and 35 and the ratio of the second and last means is 1:4, find the value of n.
- Q.25 A taxi meter reads Rs 5 at the time of starting and Rs 9 for each additional milometer. Find the charge read by the taxi-meter when the distance covered is 10 kilometers.
- Q.26 The salary of an officer in a finance company is noticed as: the starting salary per month is RS 6000 and increase Rs 400 per six month for 5 years. In this way find the rate of last salary per month after 5 years.
- Q.27 Find the number of arithmetic means between 1 and 19 when first mean is to the last mean as 1: 4.
- Q.28 8 arithmetic means are inserted between a and b such that 3rd and last means are 8 and 18 respectively. Find the values of a and b.
- Q.29 Define arithmetic sequence with examples.
- Q.30 What do you mean by common difference of an A.S.?
- Q.31 What do you mean by general term of A.S.? State it.
- Q.32 Define arithmetic mean. If m be A.M. between two numbers a and b, find m.

Exercise 1.5

- Q.1 Find the sum of the following arithmetic series:
- $2 + 7 + 12 + 17 + \dots$ to 16 terms
 - $8 + 5 + 2 - 1 \dots$ to 17 terms
 - $-10 - 7 - 4 - 1 + 2 + \dots$ to 20 terms
 - $4 + 7 + 1 + \dots$ to 100 terms
 - $4 + 5\frac{1}{2} + 6\frac{1}{2} + \dots$ to 37 terms

- (f) $\frac{1}{2} + 1 + 1\frac{1}{2} + \dots$ to 33 terms
- (g) $5.3 + 3.9 + 2.5 + \dots$ to 15 terms
- (h) $2 + 4 + 6 + \dots$ to 20 terms
- (i) First term 7, common difference -3, number of terms 12
- (j) First term -4, common difference $\frac{2}{3}$, number of terms 100
- (k) First term 2, common difference 3 and number of terms 16

Q.2 Find the sum of the following series:

- (a) $1 + 3 + 5 + \dots + 15$
- (b) $2 + 4 + 6 + \dots + 20$
- (c) $50 + 40 + 30 + \dots - 50$
- (d) $-5 + 0 + 5 + \dots + 20$
- (e) $2 - 9 - 20 - \dots - 130$
- (f) $2.01 + 2.02 + 2.03 + \dots + 3.00$
- (g) First term 2, last term -8 and number of terms 16.
- (h) First term 13, last term 89 and common difference 4
- (i) $5 + 11 + 17 + \dots$ to 7 terms

Q.3 Find the sum of first 20 terms of an A.S. whose first term and common difference are 4 and 5 respectively.

Q.4 Find the number of an A.S. whose sum is 120 and first term and common difference are 16 and 4 respectively.

Q.5 If first term and common difference of an A.S. are 17 and -2 respectively, then find the number of terms whose sum is 72.

Q.6 If the sum of an arithmetic series $10 + 8\frac{2}{3} + 7\frac{1}{3} + \dots$ is 40, find the number of terms.

Q.7 Find the common difference of an arithmetic series whose first term is 16 and the sum of the first 5 terms is 120.

Q.8 Find the common difference of an arithmetic series whose first term is 2 and sum of the 10 terms is 120.

Q.9 Find the first term of an arithmetic series whose common difference is -3 and the sum of the first 7 terms is 0.

Q.10 Find the first term of an arithmetic series whose common difference is 3 and the sum of the 30 terms is 1395.

Q.11 Find the number of terms of an arithmetic series $3 + 6 + 9 + \dots$. Whose sum is 135.

Q.12 Find the number of terms whose first term is 17. Last term 23 and the sum of the terms is 120.

- Q.13 Find the common difference according to question number 12.
- Q.14 Find the number of terms whose first term is 7, last term 23 and sum of the terms is 90.
- Q.15 Find the sum of the first 50 natural numbers.
- Q.16 Find the sum of the first 100 natural numbers.
- Q.17 Find the sum of the first 20 even natural numbers.
- Q.18 Find the sum of the first 50 even natural numbers.
- Q.19 Find the sum of the first 30 odd natural numbers.
- Q.20 How many odd natural numbers have sum 25?
- Q.21 If the 3rd term of an A.P. is 6, find the sum of first 5 terms.

Long Questions

- Q.1 Find the first term and common difference of an arithmetic series whose 4th and 12th terms are 7 and 39 respectively. Also find the sum of first 15 terms.
- Q.2 Find the sum of first 20 terms of an arithmetic series whose sum of 5th and 10th terms are 17 and 42 respectively.
- Q.3 Find the sum of first 8 terms of an arithmetic series whose sum of first 12 terms is 522 and the sum of first 20 terms is 1270.
- Q.4 Find the sum of 28 terms whose 12th and 18th terms of an A.S. are 48 and 72 respectively.
- Q.5 The first term and last terms of an arithmetic series are -24 and 72 respectively. If sum of all the terms of the series is 600, find the number of terms and the common difference of the series.
- Q.6 Find the number of terms and the common difference of an arithmetic series whose first term 2, last term 29 and the sum of the term is 155. Also find the last term and the sum of the terms when 3 more terms are added.
- Q.7 Find the number of terms of an arithmetic series whose first term is 2, fifth term is 6 and the sum of the terms is 65.

- Q.8 Find the number of terms and the common difference of an arithmetic series whose first term -75 , sum of the terms -740 and the last term is 1 .
- Q.9 If first term and last term of an arithmetic series are 5 and 45 respectively, find the number of terms and the common difference whose sum is 400 .
- Q.10 The last term of an arithmetic series of 20 terms is 195 and the common difference 5 . Calculate the sum of the series.
- Q.11 Find the sum of numbers between 1 and 100 which are exactly divisible by 3 .
- Q.12 Find the sum of the even numbers less than 100 .
- Q.13 Find the sum of the numbers between 1 and 111 which are exactly divisible by 3 .
- Q.14 Find the sum of the 49 terms between 20 and 120 .
- Q.15 Find the sum of terms between 750 and 1000 which are exactly divisible by 13 .
- Q.16 In a series $9 + 6 + 3 + \dots - 9$.
- How many numbers of terms are there?
 - Find the sum of the series.
- Q.17 Find the sum of the 35 terms whose 7^{th} and 13^{th} terms are 19 and 34 respectively.
- Q.18 Find the first term and common difference is an arithmetic series whose 3^{rd} term is 35 and the sum of 20 terms is 2950 .
- Q.19 Find the first term of an arithmetic series whose common difference is 6 and the sum of the first n terms is $3n^2 - n$.
- Q.20 If the sum of the 3 terms in A.S. is 9 and the product -165 , find the three numbers.
- Q.21 If the sum of the three terms in A.S. is 21 and the sum of their square is 155 , find the numbers.
- Q.22 A shoe factory produces 10000 pairs of shoes in first year and 12000 pairs of shoes in second year. If the number of shoes produced in each year is same, find the total number of pair of shoes produced in 8 years.
- Q.23 To pay a sum of money amounts to Rs 29000 for a finance company, it takes 20 months to pay per month in installments system. If in each installment Rs 100 more is paid, find the amount that should be paid in first installment.
- Q.24 Ram saved Rs 16500 in 10 years. In each year after the first he saved RS 100 more than he did in the preceding year. How much did he save in the first year?

- Q.25 The sum of first three terms of an arithmetic series is 21. If the sum of first two terms is subtracted from the third term then it would be 9, find the three terms of the series.
- Q.26 If the fourth term of an AP is 1 and the sum of its first eight terms is 18, find the tenth term of the series.
- Q.27 In an arithmetic series, the sum of the first ten terms is 520. If its seventh term is double of its third term, calculate the first term and the common difference of the series.
- Q.28 If the third term of an AP is 1 and its fifth term is 7, find the sum of first ten terms of the series.
- Q.29 If the sum of the first three terms of an AS is 42 and the term of the first five terms is 80, find the 20th term.
- Q.30 Divide 15 into three parts which are in AP and their product is 120.
- Q.31 If the 12th term of an AP is 23 and the sum of the first 22 terms is 484, find the 7th term.
- Q.32 The 6th term of an AP is four times of 2nd term and the sum of first 24 terms is 1704; find the sum of the first 48 terms.
- Q.33 The sum of three numbers in AP is 12 and the sum of whose squares are 56. Find these numbers.
- Q.34 Prove that the sum of n terms of an arithmetic series is $S_n = \frac{n}{2} [2a + (n - 1)d]$.
- Q.35 What do you mean by natural numbers? Find the sum of the first n natural numbers.

Exercise 1.6

- Q.1 Find the first term, common difference and the other three terms of the following geometric sequence.
- 4, 12, 36,
 - $-\frac{1}{16}, -\frac{1}{4}, -1, -4, \dots$
 - 80, 20, 5,
 - $-\frac{3}{2}, 3, -6, 12, \dots$
 - 7, 14, 28,
 - 4, -1, $\frac{1}{4}, -\frac{1}{16}, \dots$
 - 1, a, a^2, a^3, \dots
 - 1, $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$

Q.2 Find the required terms of the following geometric sequence:

- (a) 6th term of 2, 6, 18, 54,
- (b) 8th term of 4, 12, 36, 72,
- (c) 6th term of 1, -3, 9, 27,
- (d) 9th term of 1, 4, 16,
- (e) $(n - 1)^{\text{th}}$ term of $3/2, -1, 2/3, \dots$
- (f) No. of terms of 5, -15, 45,, -10935
- (g) No. of terms of 7, 14, 28, 36,, 1792
- (h) No. of terms of $1/4, 1/2, 1, 2, \dots, 128$
- (i) No. of terms of 8, 12, 18,, $91 \frac{1}{8}$
- (j) No. of terms $1/\sqrt{2}, -1, \sqrt{2}, \dots, -16$

Q.3 Find the fourth term of a geometric sequence whose first term is 120 and common ratio $1/2$.

Q.4 Find the eight term of a geometric sequence whose first term is $-1/25$ and the common ratio -5.

Q.5 Find the common ratio of a geometric sequence whose 1st and 3rd terms are 2 and 242 respectively.

Q.6 Find the common ratio of a geometric sequence whose first and fifth terms are 14 and 224 respectively.

Q.7 Find the first term of a geometric sequence whose common ratio is and 3rd term 36. also find the fifth term,

Q.8 Find the first term and the eight term of a geometric sequence whose 5th term and common ratio are 32 and 2 respectively.

Q.9 Find the first 5 terms of a geometric sequence whose 4th term and common ration are 54 and 3 respectively.

Q.10 Find the first term of a geometric sequence whose 4th term is 81 and common ratio 3.

Q.11 Find the geometric mean between given two terms:

- (a) 54 and 6 (b) -9 and -81 (c) 25 and 625
- (d) 7 and 28 (e) 80 and 5 (f) $-1/16$ and -1 (g) $-3/2$ and -6

Q.12 Find the G.M. between $1/4$ and 1.

Q.13 Find the G.M. between 40 and 10.

Q.14 First and second terms of geometrical sequence are 32 and 8 respectively. What will be the sixth term?

Long Questions

Q.1 Find the first term and common ratio of a geometric sequence whose 5th and 6th terms are 36 and 72 respectively.

Q.2 Find the first 6 terms of a geometric sequence whose 3rd and 5th terms are 3 and 27 respectively.

Q.3 What is the fourth term of a geometric sequence whose second and fifth terms are 6 and 162 respectively.

Q.4 Find the geometric sequence whose 6th and 11th terms are 192 and 6144 respectively.

Q.5 Find a geometric sequence whose 3rd and 6th terms are 3 and 81 respectively.

Q.6 Find a geometric sequence whose 2nd and 8th terms are 9 and 1/81 respectively.

Q.7 Find the 12th term of a geometric sequence whose 6th and 9th terms are 1 and 8 respectively.

Q.8 Find the first term and common ratio of a geometric sequence whose 4th and 9th terms are 12 and 16/243 respectively. What is the 5th term?

Q.9 Find a geometric sequence whose 5th and 8th terms are 80 and 640 respectively.

Q.10 If the third term is 27 and fifth term is 3m which term is 1/9?

Q.11 If nth term of a geometric sequence 4, 8, 16, 32, is 1024, find the value of n.

Q.12 Find the geometric means as follow:

- (a) 2 means between 4 and 32
- (b) 4 means between -1/2 and 16.
- (c) 4 means between 1/16 and 64
- (d) 6 means between 1/14 and 64/7
- (e) 2 means between 2 and -16
- (f) 3 means between -16 and 128
- (g) 2 means between -18 and 486
- (h) 3 means between $2\frac{1}{4}$ and $\frac{4}{9}$
- (i) 4 means between $\frac{2}{3}$ and $-5\frac{1}{16}$
- (j) 7 means between 8 and $\frac{1}{2}$

Q.13 Insert 5 geometric means between $3\frac{5}{9}$ and $40\frac{1}{2}$.

- Q.14 Insert 4 geometric means between $\frac{2}{3}$ and $-\frac{1}{48}$.
- Q.15 4 is a geometric mean between x and x^3 , find the value of x .
- Q.16 If 1 is a GM between x and 0.2, find x .
- Q.17 If 4, x , 64 is a GS., find the value of x .
- Q.18 If 5, x , y , 40 is a geometric sequence, find x and y .
- Q.19 If 2, a , b , -54 be a geometric sequence, find a and b .
- Q.20 Find the two number whose arithmetic mean is 50 and geometric mean is 30.
- Q.21 Find the two number whose AM is 25 and GM is 20.
- Q.22 Find the two numbers whose arithmetic mean is 5 and geometric mean 4.
- Q.23 Find the two numbers whose arithmetic mean is 15 and geometric mean 9.
- Q.24 Find the ratio of two numbers whose ratio of arithmetic mean and geometric mean is 5:3.
- Q.25 Insert 3 geometric means between $\frac{1}{9}$ and 9.
- Q.26 $x + 6$, x , $x - 3$ are the first three terms of a geometric series. Find the value of x and its fifth term.
- Q.27 There are some geometric means between 5 and 80. if the second mean be 20. find the number of means between the two numbers. Also find the last mean.
- Q.28 Insert 3 geometric means between 3 and 243.
- Q.29 Define geometric sequence with example.
- Q.30 Define geometric sequence with example.
- Q.31 What do you mean by general term of geometric sequence? State it.
- Q.32 What do you mean by geometric mean?
- Q.33 For any two unequal positive numbers, prove that arithmetic mean is greater than geometric mean.

Exercise 1.7

Q.1 Find the sum of the following series:

- (a) $1 + 2 + 4 + 8 + \dots$ 8 terms
- (b) $1 + 3 + 9 + 27 + \dots$ 12 terms
- (c) $3 - 9 + 27 - 81 + \dots$ 8 terms
- (d) $81 - 27 + 9 - 3 + \dots$ 8 terms
- (e) $54 + 36 + 24 + \dots$ 7 terms
- (f) $1 + \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \dots$ 8 terms
- (g) $\frac{2}{3} - 1 + \frac{3}{2} + \dots$ 7 terms
- (h) $\sqrt{2} + 2 + 4\sqrt{2} + \dots$ 10 terms
- (i) $0.15 + 0.015 + 0.0015 + \dots$ 6 terms

Q.2 Find the sum of the following series:

- (a) $3 + 12 + 48 + \dots + 768$
- (b) $81 + 27 + 9 + \dots + \frac{1}{81}$
- (c) $\frac{1}{9} + \frac{2}{3} + 4 + \dots + 24$
- (d) $1 + \frac{1}{2} + \frac{1}{4} + \dots + \frac{1}{128}$
- (e) $1 + \frac{1}{3} + \frac{1}{32} + \dots + \frac{1}{35}$
- (f) $1 - 2 + 4 - 8 + \dots + 256$
- (g) $1 - \frac{1}{4} + \frac{1}{42} + \dots - \frac{1}{45}$
- (h) $\frac{1}{\sqrt{2}} - 1 + \sqrt{2} - \dots - 16$

Q.3 Find the value of the followings:

- (a) $\sum_{n=1} (-2)^{n+1}$
- (b) $\sum_{n=1} (-1)^n 2^n$
- (c) $\sum_{k=3} 2(-2)^k$
- (d) $\sum_{N=1} 3^N$
- (e) $\sum_{k=1} (-1)^{k+1} \left(\frac{1}{2}\right)^{k-1}$
- (f) $\sum_{k=4} x^k$

Q.4 Find the sum of the first 6 terms of a geometric series whose first term and common ratio $-\frac{1}{2}$.

Q.5 Find the sum of the first 3 terms of a geometric series whose first term and common ratio are 3 and 2 respectively.

Q.6 Find the sum of 4 terms of the series $32 + 8 + 2 + \dots$

Q.7 Find the sum of first five terms whose first term is 1 and common ratio 2.

Q.8 Find the sum of first 10 terms of a geometric series whose first term is $\frac{1}{9}$ and common ratio is 3.

Q.9 If the sum of the first 3 terms of a geometric sequence is 169 and the first term is 13, find the common ratio.

- Q.10 If the sum of first three terms is 7 and the first term 1, find the common ratio.
- Q.11 If the first term is 4 and the sum of the first two terms is 36, find the common ratio.
- Q.12 If the first term is 4 and the sum of the first two terms is 36, find the common ratio.
- Q.13 If common ratio is 3 and last term 189, find the first term whose sum of terms is 280.
- Q.14 If the sum of the first 6 terms of a geometric series $133/243$ and common ratio $-2/3$, find the first term.
- Q.15 If the sum of the first two terms is 144 and the common ratio $1/2$, find the first term,
- Q.16 How many terms of the series $64 + 32 + 16 + 8 + \dots$ have sum $127 \frac{1}{2}$?
- Q.17 How many terms of the series $1/16 + 1/8 + 1/4 + \dots$ have sum $31 \frac{15}{16}$?
- Q.18 Find the number of terms whose first term is 1, common ratio 3 and the sum of terms 1093.
- Q.19 If the sum of first 6 terms of a geometric series is 9 times the sum of the first 3 terms, find the common ratio.
- Q.20 If the sum of the first 8 terms of a geometric series is 5 times the sum of the first 4 terms find the common ratio.

Long Questions

- Q.1 In a series $9 + 3 + 1 + \dots + 1/9$
 (a) How many terms are there?
 (b) Find the sum of the series.
- Q.2 Find the number of terms and the sum of a geometric series whose first term is 27, common ratio $1/3$ and last term $1/81$.
- Q.3 Find the first and last terms of a geometric series whose common ratio is 2 and sum of 8 terms 255.
- Q.4 Find the common ratio, first term and the sum of the first seven terms of a G.S. whose 2^{nd} and 5^{th} terms are 3 and 81 respectively.
- Q.5 Find the sum of first 6 terms of a G.S. whose 3^{rd} and 6^{th} terms are $1/3$ and $1/81$ respectively.

Q.6 Find the sum of first 10 terms of a G.S. whose 4th and 6th terms are 8 and 32 respectively.

Q.7 Find the geometric series in which sum of first two terms is 6 and the sum of last two terms is 24.

Q.8 If the sum of three numbers is G.S. $24\frac{4}{5}$ and their product is 64, find the numbers.

Q.9 If the sum of first two terms is $\frac{4}{3}$ and the sum of last two terms 12, find the series.

Q.10 In a geometric series, second term -9, third term 27 and fourth term-81, what is the first term? Find the sum of first seven term.

Q.11 The sum of first four terms is 40 and the sum of the first two terms is 4 of a geometric series whose common ration is positive, find the sum of the first eight terms.

Q.12 Given series: $81 + 27 + 9 + \dots + 1/243$.

(a) How many terms are there in the series?

(b) Find the sum of the series.

Q.13 The product of three numbers in GP is 216 and the sum of their product in pairs is 126. Find the numbers.

Q.14 If first term a, common ratio r and number of terms n, prove that sum of n terms of a geometric series is $S_n = \frac{a(r^n - 1)}{r - 1}$

Q.15 If a be first term, r be common ratio and l be the last term of a geometric series, prove that the sum of the series is $S_n = \frac{l^r - a}{r - 1}$, for $r \neq 1$.

Mixed Exercise

Q.1 If 6.5 is the arithmetic mean between two positive numbers a and 9, find the geometric mean between them.

Q.2 If the sum of nth terms of a term of a series is $S_n = n^2 - 3n$, find the 9th term of the series.

Q.3 If G.M. between a and $\frac{1}{8}$ is $\frac{1}{2}$, find the value of a.

Q.4 Find the sum of first five terms of $81 + 27 + 9 + \dots$

- Q.5 The sum of three positive numbers in GP is 104 and the product of their extreme terms is 576. find the numbers.
- Q.6 If the 12th term of an AP is 23 and the sum of the first 22 terms is 484, find the 7th term.
- Q.7 How many terms of the series $32 + 48 + 72 + \dots$ will give the sum equal to 665?
- Q.8 Insert 5 arithmetic mean between -7 and 17.
- Q.9 Find the sum of all the integers between 200 and 500 which are divisible by 9.
- Q.10 The n th term and the sum of n terms of a geometric sequence are 5 and 55 respectively. If the common ratio is $-1/2$, find the first term and the value of n .
- Q.11 Three A.M.'s are inserted between two numbers a and b . if the first and the third means are 16 and 34, find the second mean and also the values of a and b .
- Q.12 Three numbers are in AP and their sum is 15. if 1, 3, 9 are added to them respectively they form a GP. Find the numbers.
- Q.13 The arithmetic mean of two numbers is 10 and their geometric mean is 8, find the numbers.
- Q.14 Find the number of geometric means between 1 and 64 when the first mean is to be the last mean as 1: 16.
- Q.15 The sum of three first terms of GP is 73 and their product is 512, find the terms.
- Q.16 If a, b, c are in AP and x, y, z are in GP, prove that: $x^{b-c} \cdot y^{c-a} \cdot z^{a-b} = 1$
- Q.17 In an AS, the sum of the first ten terms is 520. if its seventh term is double of its third term, find the sum of the first 12 terms.
- Q.18 Find the sum of first eight terms of an AP, whose 9th term is 19 and the sum of first 12 terms is 168.
- Q.19 Find the first five terms in a geometric sequence whose second term is 1 and fifth term is 27.
- Q.20 In a geometric series, 7th term is 27 times the 4th term and the sum of the first two terms is 8, find the series.
- Q.21 If 5, $x, y, 40$ are the terms of a GS, find the value of x and y .
- Q.22 Find the two numbers whose AM is 34 and GM is 16.

- Q.23 Define arithmetic and geometric means. If m be AM and G be GM of any two numbers, then prove that $m \geq G$.
- Q.24 Find the sum up to n th terms of the series $5 + 55 + 555 + 5555 + \dots$.
- Q.25 Find the sum up to n terms of the series $3 + 33 + 333 + 3333 + \dots$.
- Q.26 Find the sum up to n terms of the series $4 + 44 + 444 + 4444 + \dots$.
- Q.27 Find the sum up to n terms of the series: $0.6 + 0.66 + 0.666 + 0.6666 + \dots$ to n terms
- Q.28 Find the sum up to n terms of the series: $0.7 + 0.77 + 0.777 + 0.7777 + \dots$
- Q.29 Find the ratio of two numbers where the ratio of their arithmetic mean and geometric mean is 5:3.
- Q.30 If 2, x , y , -54 are in GS, find the values of x and y .
- Q.31 The sum of three numbers in AP is 13 and the geometric mean between first and last numbers is 4, find the numbers.
- Q.32 The sum of three numbers in AP is 36. When 1, 4 and 43 are added to each number respectively, then the resulting sequence is in GP, find the numbers.
- Q.33 If the n th term of the arithmetic series $7 + 12 + 17 + 22 + \dots$ and $27 + 30 + 33 + 36 + \dots$ are equal, find the value of n .
- Q.34 If the sum of the first seven terms of an arithmetic series is 14 and the sum of the first ten terms is 125 then find the fourth term of the series.
- Q.35 The sum of three consecutive terms in GP is 62 and their product is 1000, find the terms.
- Q.36 The second, fourth and ninth terms of an arithmetic progression are in geometric progression. Calculate the common ratio of geometric progression.
- Q.37 How many arithmetic means are between 5 and 35 such that the ratio of second mean and last mean is equal to 1:4?
- Q.38 Three terms are there in an AP, whose sum is 30. if 5 is added to the third term, then it becomes a GP. Find the terms.
- Q.39 If AM and GM between two positive and unequal numbers are 10 & 8 respectively, find the numbers.

Exercise 1.8

Q.1 Draw the graph of the following inequalities:

- (a) $x < 5$ (b) $x > -5$ (c) $x \leq 4$ (d) $x \geq -4$
(e) $x \geq 3$ (f) $x \geq -3$ (g) $x < 2$ (h) $x > -2$

Q.2 Solve the following inequalities and present in graph paper:

- (a) $2x + 1 > x + 3$ (b) $-x + 2 < 2x + 8$ (c) $2 - x \geq x - 2$
(d) $x + 6 \leq 6$ (e) $5x - 1 \leq 4x + 4$ (f) $x + 1 > 2x - 2$
(g) $2x - 2 \geq x + 1$

Q.3 Draw the graph of the following inequalities:

- (a) $2x + 2y \geq 6$ (b) $y > 2x + 1$ (c) $x \geq y$
(d) $x \geq 0$ (e) $y \leq 0$ (f) $y \geq -2x$
(g) $x + y < 2$ (h) $3x - y \leq -3$ (i) $2x - y < 2$
(j) $y \geq 4 - 4x$ (k) $3x < 2y$

Q.4 Draw the graph of the following inequalities and shade the common solution region:

- (a) $2x + 2y \geq 6$ and $y \geq 0$
(b) $x + y \leq 2$ and $x \leq 0$
(c) $x + y \geq 0$ and $2x - y \leq 4$
(d) $x + y > 3$ and $2x - y > 2$
(e) $2x + y \geq 1$ and $x - 2y \geq 2$
(f) $2x + 3y \geq 6$ and $3x - y \leq 0$
(g) $y < x - 1$ and $y > 1 - x$
(h) $y < 2x + 1$ and $y > x - 2$
(i) $y \leq 3x - 3$ and $y \geq 2x + 2$
(j) $2x + y \geq 1$ and $2x - y \geq -3$

Q.5 Find the maximum and minimum values of $P = 3x + y$ from the shaded region alongside.

Q.6 Find the maximum and minimum values of $P = 4x - y$ from the shaded region alongside.

Q.7 Shade the region described by the given inequalities $x > 3$ and $x - y \geq 3$.

Q.8 Draw the graph of inequalities $x + y \leq 3$, $x \geq 2$, $y \leq 1$ and find the vertex of the polygon region.

- Q.9 Draw the graph of inequalities $y - 2x \leq 0$, $2y + x \geq 5$, $x \leq 5$ and find the vertex of the polygonal region.
- Q.10 Draw the graph of inequalities $x - 2y \leq 8$, $-x + 2y \leq 8$, $y \geq 0$ and find the vertex of the polygon region.
- Q.11 Draw the graph of inequalities $y \leq -x - 2$, $y \leq 2x + 4$, $y \leq 4 - 4x$ and find the vertex of the polygon region.
- Q.12 Draw the graph of inequalities $2x + 5y \leq 16$, $2x + y \leq 8$, $x \geq 0$, $y \geq 0$ and find the vertex of the polygonal region.
- Q.13 Draw the graph of inequalities $y - x \geq 1$, $y - x \geq 3$, $2 \leq x \leq 5$ and find the vertex of the polygonal region.
- Q.14 Draw the graph of inequalities $x + 2y \geq 8$, $0 \leq x \leq 6$, $0 \leq y \leq 3$ and find the vertex of the polygonal region.
- Q.15 Maximize the objective function $P = x + 2y$ subject to the constraints:
 $2x + y \leq 8$, $2x + 3y \leq 12$, $x \geq 0$, $y \geq 0$
- Q.16 Maximize the objective function $P = 2x + 3y$ subject to the constraints:
 $x + y \geq 6$, $x - y \geq 4$, $x \leq 6$
- Q.17 Maximize the objective function $P = 14x + 16y$ subject to the constraints:
 $3x + 2y \leq 12$, $7x + 5y \leq 28$, $x \geq 0$, $y \geq 0$
- Q.18 Maximize the objective function $P = 5x + 4y$ subject to the constraints:
 $2x + 5y \leq 16$, $2x + y \leq 8$, $x \geq 0$, $y \geq 0$
- Q.19 Maximize the objective function $P(x, y) = 3x + 5y$ subject to the constraints:
 $x + y \leq 6$, $x - y \leq 4$, $y \geq 0$, $x \geq 0$
- Q.20 Maximize the objective function $P = 6x + 5y$ subject to the constraints:
 $x + y \leq 6$, $x - y \geq -2$, $x \geq 0$, $y \geq 0$
- Q.21 Maximize the objective function $P = 9x + 7y$ subject to the constraints:
 $x + 2y \leq 7$, $x - y \geq 4$, $x \geq 0$, $y \geq 0$
- Q.22 Maximize the objective function $F = x + y$ subject to the constraints:
 $2x + y \leq 20$, $2x + 3y \leq 24$, $x \geq 0$, $y \geq 0$
- Q.23 Maximize the objective function $P = x + 7y$ subject to the constraints:
 $-x + 2y \leq 8$, $x - y \leq 4$, $x, y \geq 0$
- Q.24 Maximize the objective function $F(x) = 3x + 4y$ subject to the constraints:

$$x + 3y \leq 12, x + 2y \geq 8, x + 4y \leq 12$$

Q.25 Maximize the objective function $P = 3x + 5y$ subject to the constraints:

$$x + y \leq 6, x - y \leq 4, x \geq 0, y \geq 0$$

Q.26 Maximize the objective function $P = 10x + 12y$ subject to the constraints:

$$x + 2y \leq 12, 3x + 2y \leq 24, x \geq 0, y \geq 0$$

Q.27 Maximize the objective function $P = 2x + y$ subject to the constraints:

$$x + y \geq 6, x - y \geq 4, x \leq 6, x \geq 0$$

Q.28 Maximize the objective function $F = 5x + 6y$ subject to the constraints:

$$x + 2y \leq 6, 3x + 2y \leq 12, x \geq 0, y \geq 0$$

Q.29 Minimize the objective function $P = 5x + 4y$ subject to the constraints:

$$2x + 4y \geq 8, 3x + y \leq 3, x \geq 0, y \geq 0$$

Q.30 Minimize the objective function $L = x + y$ subject to the constraints:

$$3x + 4y \leq 21, 2x + y \geq 4, x \geq 0, y \geq 0$$

Q.31 Minimize the objective function $L = x + y$ subject to the constraints:

$$4x + 3y \leq 12, x + 2y \leq 4, x \geq 0, y \geq 0$$

Q.32 Minimize the objective function $P = 3x + 2y + 5$ subject to the constraints:

$$x + 2y \geq 1, x + y \leq 10, x \geq 0, y \geq 0$$

Q.33 Minimize the objective function $Z = 10x + 20y$ subject to the constraints:

$$3x + 4y \geq 19, 2x + 5y \leq 15, x, y \geq 0$$

Q.34 Minimize the objective function $Z = 12x + 5y$ subject to the constraints:

$$5x + 3y \geq 15, 7x - 2y \leq 14, x \geq 0, y \geq 0$$

Q.35 Minimize the objective function $L = 2x - 10y$ subject to the constraints:

$$x - y \geq 0, x - 5y \geq -5, x \geq 0, y \geq 0$$

Q.36 Minimize the objective function $P(x, y) = 4x - y$ subject to the constraints:

$$x + y \leq 5, x + 2y \leq 8, x \geq 0, y \geq 0$$

Q.37 Maximize the objective function $P = 2x + 3y$ subject to the constraints:

$$2x + 3y \geq 6, 2x - 3y \leq 6, y \geq 0$$

Q.38 Maximize the objective function $P = 9x + 40y$ subject to the constraints:

$$x + y \geq 0, x - y \leq 0, y \geq 2, x \geq 1$$

Q.39 Maximize the objective function $F = 5x + 6y$ subject to the constraints:

$$y - x \geq 1, y - x \leq 3, 2 \leq x \leq 1$$

- Q.40 Maximize the objective function $P = 34x + 6y$ subject to the constraints:
 $x + y \leq 6$, $x + y \geq 1$, $1 \leq x \leq 3$
- Q.41 Maximize the objective function $L = 16x - 2y + 40$ subject to the constraints:
 $3x + 4y \leq 24$, $0 \leq y \leq 4$, $0 \leq x \leq 7$
- Q.42 Maximize the objective function $F = 9x + 7y$ subject to the constraints:
 $x + 2y \leq 7$, $x - y \leq 4$, $x \geq 0$, $y \geq 0$
- Q.43 Maximize the objective function $G(x) = 10x + 15y$ subject to the constraints:
 $x + 2y \leq 20$, $x + y \leq 16$, $x \geq 0$, $y \geq 0$
- Q.44 Maximize the objective function $Z = 4x + 5y$ subject to the constraints:
 $2x + 5y \leq 25$, $6x + 5y \leq 45$, $x \geq 0$, $y \geq 0$
- Q.45 Maximize the objective function $F = 5x + 7y$ subject to the constraints:
 $3x + 2y \leq 12$, $2x + 3y \geq 13$, $x \leq 0$, $y \leq 0$
- Q.46 Maximize the objective function $F = 6x + 3y$ subject to the constraints:
 $x + y \leq 10$, $5x + 2y \leq 30$, $x \geq 0$, $y \geq 0$
- Q.47 Find the maximum value of $P = 5x + 3y$ under the following constraints:
 $2x + y \leq 20$, $2x + 3y \leq 24$, $x \geq 0$ and $y \geq 0$
- Q.48 In the given figure, the co-ordinates of B and C are $(-2, -1)$ and $(-2, 8)$ respectively, the shaded region inside the triangle ABC is represented by three inequalities, one of these is $x + y \leq 6$, write down the co-ordinates of A and other two inequalities. Also calculate the maximum value of $x + 2y$ from the values which satisfy all three inequalities.
- Q.49 In the given diagram, the coordinates of A, B and C are $(3, 2)$, $(-3, 6)$ and $(-3, -4)$ respectively. The shaded region inside the $\triangle ABC$ is represented by three inequalities. Write down the equations of these three inequalities and also calculate the minimum value of $4x - 5y$ from the values which satisfy all three inequalities.
- Q.50 Maximize: $P = 5x + 3y$ subject to the constraints $2x + y \geq 8$, $y \leq 2x$, $x \leq 4$.

Exercise: 1.9

Q.1 Draw the graph of quadratic equation: $y = 2x^2$

Q.2 Draw the graph of quadratic equation: $y = x^2$

Q.3 Draw the graph of quadratic equation: $y = -3x^2$

Q.4 Draw the graph of quadratic equation: $y = \frac{1}{2}x^2$

Q.5 Draw the graph of quadratic equation: $y = 2x^2 - 1$

Q.6 Draw the graph of quadratic equation: $y = 3x^2 + 1$

Q.7 Draw the graph of quadratic equation: $y = x^2 + x + 6$

Q.8 Draw the graph of quadratic equation: $y = 4x^2 - 8x - 3$

Q.9 Draw the graph of quadratic equation: $y = x^2 + 4x - 1$

Q.10 Draw the graph of quadratic equation: $y = 4x^2 + 2x - 1$

Q.11 Draw the graph of quadratic equation: $y = x^2 + x - 1$

Q.12 Draw the graph of quadratic equation: $y = x^2 + 2x - 8$

Q.13 Draw the graph of quadratic equation: $y = x^2 - 5x + 6$

Q.14 Draw the graph of the cubic equation: $y = x^3$

Q.15 Draw the graph of the cubic equation: $y = 2x^3$

Q.16 Draw the graph of the cubic equation: $y = -4x^3$

Q.17 Draw the graph of the cubic equation: $y = \frac{2}{3}x^3$

Q.18 Draw the graph of the cubic equation: $y = x^3 + 1$

Q.19 Draw the graph of the cubic equation: $y = x^{3-1}$

Q.20 Draw the graph of the cubic equation: $y = x^3 + x$

Q.21 Draw the graph of the cubic equation: $y = \frac{1}{3}x^3 - x^2$

Q.22 Draw the graph of the cubic equation: $y = x^3 + 3x^2$

- Q.23 Solve: $y = x^2$ and $y = 2 - 2x$ by graphical method and substitution method.
- Q.24 Solve: $y = 4x^2$ and $y = 2-2x$ by graphical method and substitution method.
- Q.25 Solve: $y = -5x^2$ and $y = 3x + 2$ by graphical method and substitution method.
- Q.26 Solve: $y = -x^2 - x + 2$ and $x + y = -2$ by graphical method and substitution method.
- Q.27 Solve: $y = x^2 - 2x$ and $x + y = -2$ by graphical method and substitution method.
- Q.28 Solve: $y = x^2 - 2x - 8$ and $y = -5$ by geographical method and substitution method.
- Q.29 Solve: $y = x^2 + 3x - 10$ and $x = y$ by graphical method and substitution method.
- Q.30 Solve: $x^2 + y^2 = 100$ and $x + y + 10$ by graphical method and substitution method.
- Q.31 Solve: $x^2 + y^2 = 4$ and $x = y$ by graphical method and substitution method.
- Q.32 Solve $x^2 + y^2 = 25$ and $y = x + 1$ by graphical method and substitution method.
- Q.33 Solve $y = x^2 - 5x + 6$ and $xy = 1$ by graphical method and substitution method.
- Q.34 Solve $y = 4x^2 + 8x + 5$ and $x + y = 3$ by graphical method and substitution method.
- Q.35 Solve the quadratic equation: $x^2 + 2x - 3 = 0$ graphically.
- Q.36 Solve the quadratic equation: $x^2 - x - 2 = 0$ graphically.
- Q.37 Solve the quadratic equation: $x^2 - 5x + 6 = 0$ graphically.
- Q.38 Solve the quadratic equation: $x^2 - 2x - 3 = 0$ graphically.
- Q.39 Solve the quadratic equation: $x^2 + 5x + 4 = 0$ graphically.
- Q.40 Solve the quadratic equation: $3x^2 + 5x + 2 = 0$ graphically.
- Q.41 Solve the quadratic equation: $x^2 + 7x + 12 = 0$ graphically.
- Q.42 Solve the quadratic equation: $2x^2 + 4x + 2 = 0$ graphically.
- Q.43 Solve the quadratic equation: $2x^2 - 5x + 3 = 0$ graphically.
- Q.44 Solve the quadratic equation: $x^2 + 5x - 6 = 0$ graphically.
- Q.45 Solve the quadratic equation: $3x^2 - 7x + 4 = 0$ graphically.

Q.46 Solve the quadratic equation: $x^2 + 3x + 2 = 0$ graphically.

Q.47 Solve graphically the quadratic equation $x^2 - 3x - 10 = 0$. Also find the intersecting points of parabola and straight line.

Q.48 Solve by equations $y = -x^2 + x + 3$.

Q.49 Solve by graphical method: $0 = -x^2 + x + 3$

Q.50 Solve graphically the quadratic equation: $x^2 + x - 6 = 0$.