Chapter 7 : Algebra

ANSWER KEYS

EXERCISE 7.1

1. (*i*) One-sixth of sum of a and b

$$= \frac{1}{6}(a + b)$$

(*ii*) One-third of x is taken away from one fifth of y.

One-third of $x = \frac{1}{3}x$

One-fifth of $y = \frac{1}{5}y$

Thus, we get, $\frac{1}{5}y - \frac{1}{3}x$

(*iii*) It a is taken away from the sum of b and 17, we get 21.

sum of b and 17 = $b + 17$

Thus, a subtract from the sum, we get

$$(b + 17) - a = 21$$

(*iv*) The product of x and 4 is subtracted from the sum of y and 7.

Product of x and 4 = $x \times 4 = 4x$

Sum of y and 7 = $y + 7$

Thus, the product $4x$ is subtracted from the sum

$(y + 7) = (y + 7) - 4x$

(*v*) 5 taken away from y, we get x

$\Rightarrow \quad y - 5 = x$

(*vi*) 3 times x is divided by 2 times y

3 times $x = 3x$

2 times $y = 2y$

Thus, $3x$ is divided by $2y = \frac{3x}{2y}$

(*vii*) My age is x years. My father's age is 3 years less than four times of my age.

My age = x years

Thus, Father's age =$(4x - 3)$ years

(*viii*) When the product of 6 and m is added to twice n, the result is q.

Product of 6 and $m = 6 \times m = 6m$

twice of $n = 2 \times n = 2n$

As per given condition,

$6m + 2n = q$.

(*ix*) 8 times x is decreased from 10 times y.

8 times $x = 8 \times x = 8x$

10 times $y = 10 \times y = 10y$

Thus, $8x$ is decreased from $10y = 10y - 8x$.

(*x*) The product of 11 and x is 5 less than y.

Product of 11 and $x = 11x$

Thus, $11x = y - 5$.

(*xi*) 6 multiplied by x is decreased by 7.

$\Rightarrow \quad 6x - 7$

(*xii*) One-fourth of x is multiplied by twice the sum of y and z.

One-fourth of $x = \frac{1}{4}x$

Sum of y and $z = y + z$

Thus, $\frac{1}{4}x$ is multiplied by twice of $(y + z)$.

$$= \frac{1}{4}x \times 2(y + z)$$

$$= \frac{1}{2}x\,(y + z)$$

2. Cost of one pen = ₹15

$\because$ Cost of x pens = ₹$(15 \times x)$ = ₹$15x$

Cost of one pencil = ₹3

$\because$ Cost of y pencils = ₹$(3 \times y)$ = ₹$3y$

Hence, cost of x pens = ₹$15x$ and

cost of y pencils = ₹$3y$.

3. Let diameter and radius of a circle be D and r respectively, therefore

"The diameter of a circle is twice its radius".

$\Rightarrow \quad D = 2 \times r$

$\Rightarrow \quad D = 2r.$

4. Four times a number $x = 4 \times x = 4x$

Twice the number $y = 3 \times y = 3y$

Thus, as per condition, $4x = 3y - 15$

5. Side of a square = 13 cm

if each side increased by a cm.

Therefore, new side of new square = $(13 + a)$ cm

Thus, the perimeter of new square P = 4 × side

$$P = 4 \times (13 + a) \text{ cm}$$

$$P = 4\,(13 + a) \text{ cm}$$

6. Number of dots is a row = 13

$\therefore$ Number of dots is p row = $13 \times p = 13p$.

7. Total number of marble pieces = 19

Number of marbles to gave Amrita = x

Number of marbles to gave Zeenat = y.

Remaining number of marble pieces = $19 - (x + y)$.

8. Spended money in a week = ₹x

Daily saved money = ₹y

Saved money in a week = ₹$(y \times 7)$ = ₹$7y$

($\because$ 1 Week = 7 days)

$\therefore$ Income of one week = ₹x + ₹$7y$

= ₹$(x + 7y)$

Income of two weeks = ₹$\{2 \times (x + 7y)\}$

= ₹$2(x + 7y)$

= ₹$(2x + 14y)$

Hence, ₹$(2x + 14y)$ is total income of two weeks.

EXERCISE 1.2

1. (*i*) $a \times a \times a \times b \times b = a^3b^3$

(*ii*) $9 \times p \times p \times q \times q \times q = 9p^2q^3$

(*iii*) $6 \times a \times a \times a \times b \times b \times c \times c \times c = 6a^3b^2c^3$

(*iv*) $2 \times 3 \times a \times a \times b \times b = 6a^2b^2$

(*v*) $x \times x \times x \times y \times y \times z = x^3y^2z$

(*vi*) $2 \times x \times x \times$ ... 10 times $\times y \times y = 2x^{10}y^2$

(*vii*) $5 \times a \times a \times a$ ... 10 times $\times b \times b \times b \times$ ... 12 times $= 5a^{10}b^{12}$

(*viii*) $2 \times x \times x \times 3 \times y \times y \times y \times 4 \times z \times z \times z \times$ ... 5 times

$= (2 \times 3 \times 4)\ x^2y^3z^5$

$= 24\ x^2y^3z^5$

2. (*i*) $a^2b^3 = a \times a \times b \times b \times b$

(*ii*) $4x^3y^4 = 2 \times 2 \times x \times x \times x \times y \times y \times y \times y$

(*iii*) $14a^5b^3 = 2 \times 7 \times a \times a \times$ ... 5 times $\times b \times b \times b$

(*iv*) $15x^3y^2z = 3 \times 5 \times x \times x \times x \times y \times y \times z$

(*v*) $19p^7q^5 = 19 \times p \times p \times p \times$ ... 7 times $\times q \times q \times$ ... 5 times.

(*vi*) $9x^2yz^3 = 3 \times 3 \times x \times x \times y \times z \times z \times z$

(*vii*) $12x^3yz^5 = 2 \times 2 \times 3 \times x \times x \times x \times y \times z \times z \times$ ... 5 times.

(*viii*) $15m^4n^5 = 3 \times 5 \times m \times m \times m \times m \times n \times n \times$ ... 5 times.

3. (*i*) $2a^2 \times a^3 \times b \times b = 2a^5b^2$

(*ii*) $5p \times q \times 3p^2q \times q^2 = 15p^3q^4$

(*iii*) $abc \times a^2 \times b^2c \times c = a^3b^3c^3$

(*iv*) $x^2 \times 2x^3y \times xy^2 = 2x^6y^3$

(*v*) $m^3 \times n^3 \times 2mn \times 4n = 8m^4n^5$

(*vi*) $2p^2 \times q \times p^3 \times q \times q^2 = 2p^5q^4$

(*vii*) $6 \times a \times a \times b \times b \times c \times c \times c \times b \times c = 6a^2b^3c^4$

4. Base of the triangle = $5x$ cm

Altitude of the triangle = $\frac{1}{2} \times (5x)$ cm

Area of the triangle = $\frac{1}{2} \times$ base $\times$ altitude

$= \frac{1}{2} \times 5x \times \frac{1}{2}(5x)$

$= \frac{1}{4} \times (5 \times 5)\ x^2 = \frac{25}{4}x^2$

Area of the triangle = $\frac{25}{4}x^2$ cm^2

5. The cost of each apple = $3p^2q$

$\therefore$ The cost of $12pq$ apples = $3p^2q \times 12pq$

$= (12 \times 3)\ p^3q^2 = 36\ p^3q^2$

Hence, the cost of 12 pq apples is $36p^3q^2$.

EXERCISE 1.3

1. (*i*) $5x^3 - 7x^2 + 11$

Numerical coefficient in $5x^3 = 5$

Numerical coefficient in $-7x^2 = -7$

Numerical coefficient in $11 = 11$

(*ii*) $6x^4 + 5x^3 - 2x + 7$

Numerical coefficient in $6x^4 = 6$

Numerical coefficient in $5x^3 = 5$

Numerical coefficient in $-2x = (-2)x = -2$

Numerical coefficient in $7 = 7$

(*iii*) $4a^3 - 5b^3 + 2c^3 - 6abc$

Numerical coefficient in $4a^3 = 4$

Numerical coefficient in $-5b^3 = (-5)b^3 = -5$

Numerical coefficient in $2c^3 = 2$

Numerical coefficient in $-6abc = -6$

(*iv*) $7y^2 - 8xy$

Numerical coefficient in $7y^2 = 7$

Numerical coefficient in $-8xy = (-8)xy = -8$

2. (*i*) $2x - 3y$

Terms: $2x, -3y$

(*ii*) $ax^2 - bx - c$

Terms: $ax^2, -bx, -c$

(*iii*) $2a - 3b + 4c$

Terms: $2a, -3b, 4c$

(*iv*) $p^2q - pq + 9$

Terms: $p^2q, -pq, 9$

3. (*i*) $6x^3 - 5x^2 + 8x$

Coefficient of x in the given algebraic expression = 8

(*ii*) $2x^2y + 4xy + 6y^2$

Coefficient of x in the expression = $4y$

(*iii*) $-3xy + 4x^2 + 6$

Coefficient of x in $(-3y)x = -3y$

(*iv*) $x^2 - \frac{5}{2}x + 6$

Coefficient of x in $\left(\frac{-5}{2}\right)x = \frac{-5}{2}$

4. (*i*) $2a + 3b - c$ if $a = 3$, $b = -4$, $c = -2$

$2a + 3b - c = 2(3) + 3(-4) - (-2)$

$= 6 - 12 + 2 = -4$

(*ii*) $a^3 + b^3 + c^3 - 3abc$ if $a = -1$, $b = 2$, $c = 3$

$a^3 + b^3 + c^3 - 3abc = (-1)^3 + (2)^3 + (3)^3 - 3(-1)\ (2)\ (3)$

$= -1 + 8 + 27 + 18 = 52$

(*iii*) $a^3 + b^3 + 3ab^2 + 3a^2b$ if $a = 2$, $b = -3$

$a^3 + b^3 + 3ab^2 + 3a^2b$

$= (2)^3 + (-3)^3 + 3(2)\ (-3)^2 + 3(2)^2\ (-3)$

$= 8 - 27 + 54 - 36$

$= 8 - 63 + 54 = -1$

(*iv*) $5 + a^2 + ab - 9c$ if $a = 5$, $b = 4$, $c = 0$

$5 + a^2 + ab - 9c = 5 + (5)^2 + 5 \times 4 - 9 \times 0$

$= 5 + 25 + 20 - 0 = 50$

(*v*) $6a^3 - 5b^2 + 2c^2 - 3a^2bc$ if $a = 1$, $b = 2$, $c = -1$

$6a^3 - 5b^2 + 2c^2 - 3a^2bc$

$= 6(1)^3 - 5(2)^2 + 2(-1)^2 - 3(1)^2(2)(-1)$

$= 6 - 20 + 2 + 6 = -6$

5. (*i*) x^2y, xy^2, y^2x, xy

like terms: xy^2, y^2x,

(*ii*) x^2, y^2, $-3x^2$, y^3, $4x$

like terms: x^2, $-3x^2$

(*iii*) $5a$, $6ab$, $-ac$, $\frac{1}{3}ca$

likte terms: $-ac$, $\frac{1}{3}ca$

(*iv*) $4a^3b$, $6ab^3$, $4b^3a$, $6ab$

like terms: $6ab^3$, $4b^3a$

6. (*i*) 6, $-3x$

Algebraic expression = $6 - 3x$

(*ii*) $2a$, a^2, $3ab$, -4

Algebraic expression = $a^2 + 2a + 3ab - 4$

(*iii*) -5, $4x^2$, $-7x$

Algebraic expression = $4x^2 - 7x - 5$

(*iv*) x^2, $-2y^2$, -8

Algebraic expression = $x^2 - 2y^2 - 8$

(*v*) a^2, $-3b^2$, $2c^2$, 9

Algebraic expression = $a^2 - 3b^2 + 2c^2 + 9$

7. (*i*) $-4ab$

Coefficient of a in $-4ab = (-4b)\ a = -4b$

(*ii*) $3a^2bc$

Coefficient of a in $3a^2bc = 0$

(*iii*) $-a$

Coefficient of a in $-a = (-1)\ a = -1$

(*iv*) $4abc$

Coefficient of a in $4abc = (4bc)\ a = 4bc$

(*v*) $3a^2 - 4a$

Coefficient of a in $3a^2 - 4a = -4$

(*vi*) $2a + \frac{1}{3a}$

Coefficient of a in $2a + \frac{1}{3a} = 2$

(*vii*) $4a^3 + \frac{1}{4}a$

Coefficient of a in $4a^3 + \frac{1}{4}a = \frac{1}{4}$.

EXERCISE 7.4

1. (*i*) A number increased by 11 equal 26.

Let the number be x. Therefore,

$x + 11 = 26$,

(*ii*) Seven times a number is equal to 63.

Let the number be x. Therefore,

$7x = 63$

(*iii*) Twice a number increased by 7 is equal to 19.

Let the number be x. Therefore,

$2x + 7 = 19$

(*iv*) Five more than one third of a number is equalto 9.

Let the number be x. Therefore,

$\frac{1}{3}x + 5 = 9$

(*v*) Three less than three times the number equal to seven.

Let the number be x. Therefore,

$3x - 3 = 7$

(*vi*) A number exceeds seven by three.

Let the number be x. Therefore,

$x - 7 = 3$

(*vii*) A number is divided by three the quotient is added to four and the result is six.

Let the number be x. Therefore,

$\frac{x}{3} + 4 = 6$

(*viii*) Thirty less than twelve times a number gives eighteen.

Let the number be x. Therefore,

$12x - 30 = 80$

2. (*i*) $x - 5 = 8$

$\Rightarrow$ "5 less than a number gives eight".

(*ii*) $\frac{x}{5} = 3$

$\Rightarrow$ "One-fifth of a number equal to 3."

(*iii*) $x + \frac{1}{3} = 3$

$\Rightarrow$ "One-third added to a number gives 3."

(*iv*) $4x = 32$

$\Rightarrow$ "4 times a number gives 32."

(*v*) $2x - 6 = 8$

$\Rightarrow$ "Six less than twice the number is equal to 8."

(*vi*) $4x = x + 9$

$\Rightarrow$ "Four times the number is equal to nine more than the number itself."

(*vii*) $11 - 3x = 14$

$\Rightarrow$ "Three times the number less than eleven gives fourteen"

(*viii*) $2x - 7 = 11$

$\Rightarrow$ "Seven less than twice the number gives eleven."

3. (*i*) The root of $x - 6 = -5$ is 1.

L.H.S. $= x - 6$

Substituting the value of $x = 1$, we get

$= 1 - 6$

$= -5$

$=$ R.H.S.

Hence, L.H.S. = R.H.S.

(*ii*) The root of $2x + 3 = 15$ is 6.

Taking L.H.S. $= 2x + 3$

Substituting the value of $x = 6$, we get

$= 2 \times 6 + 3$

$= 12 + 3$

$= 15$

$=$ R.H.S.

Hence, L.H.S. = R.H.S.

(*iii*) The root of $4x - 1 = 11$ is 3.

Taking L.H.S. $= 4x - 1$

Substituting the value of $x = 3$, we get

$= 4 \times 3 - 1$

$= 12 - 1$

$= 11$

$=$ R.H.S.

Hence, L.H.S. = R.H.S.

(*iv*) The root of $3x - 6 = x + 2$ is 4.

Taking L.H.S. $= 3x - 6$

Substituting the value of $x = 4$, we get

$= 3 \times 4 - 6$

$= 12 - 6$

$= 6$

Now, taking R.H.S. $= x + 2$,

Again, substituting $x = 4$, we get

$= 4 + 2 = 6$

Hence, L.H.S. = R.H.S.

(*v*) The root of $\frac{x}{3} + 8 = 12$ is 12.

Taking L.H.S. $= \frac{x}{3} + 8$

Substituting the value of $x = 12$, we get,

$= \frac{12}{3} + 8$

$= 4 + 8 = 12$

$=$ R.H.S.

Hence, L.H.S. = R.H.S.

(*vi*) The root of $5x - 11 = x + 9$ is 5.

Taking L.H.S. $= 5x - 11$

Substituting the value of $x = 5$, we get

$= 5 \times 5 - 11$

$= 25 - 11 = 14$

Taking R.H.S. $= x + 9$

Again, substituting $x = 5$, we get

$= 5 + 9$

$= 14$

Hence, L.H.S. = R.H.S.

4. (*i*) $a + 4 = 7$

Given equation is $a + 4 = 7$.

If $a = 1$, $1 + 4 = 5 \neq 7$

If $a = 2$, $2 + 4 = 6 \neq 7$

If $a = 3$, $3 + 4 = 7 = 7$

$\because$ $a = 3$ makes L.H.S. = R.H.S.

$\therefore$ $a = 3$ is the solution of the given equation.

(*ii*) $x - 5 = 2$

Given equation is $x - 5 = 2$.

If $x = 4$, $4 - 5 = -1 \neq 2$

If $x = 5$, $5 - 5 = 0 \neq 2$

If $x = 6$, $6 - 5 = 1 \neq 2$

If $x = 7$, $7 - 5 = 2 = 2$

$\therefore$ $x = 7$ is the solution of given equation.

(*iii*) $3y = 15$

Given equation is $3y = 15$.

If $y = 1$, $3 \times 1 = 3 \neq 15$

If $y = 2$, $3 \times 2 = 6 \neq 15$

If $y = 3$, $3 \times 3 = 9 \neq 15$

If $y = 4$, $3 \times 4 = 12 \neq 15$

If $y = 5$, $3 \times 5 = 15 = 15$

$\therefore$ $y = 5$ is the solution of given equation.

(*iv*) $2x - 5 = 1$

Given equation is $2x - 5 = 1$.

If $x = 1$, $2 \times 1 - 5 = 2 - 5 = -3 \neq 1$

If $x = 2$, $2 \times 2 - 5 = 4 - 5 = -1 \neq 1$

If $x = 3$, $2 \times 3 - 5 = 6 - 5 = 1 = 1$

$\therefore$ $x = 3$ is the solution of given equation.

(*v*) $9 + x = 14$

Given equation is $9 + x = 14$

If $x = 1$, $9 + 1 = 10 \neq 14$

If $x = 2$, $9 + 2 = 11 \neq 14$

If $x = 3$, $9 + 3 = 12 \neq 14$

If $x = 4$, $9 + 4 = 13 \neq 14$

If $x = 5$, $9 + 5 = 14 = 14$

$\therefore$ $x = 5$ is the solution of given equation.

(*vi*) $\frac{x}{3} = 2$

If $x = 3$, $\frac{3}{3} = 1 \neq 2$

If $x = 4$, $\frac{4}{3} \neq 2$

If $x = 5$, $\frac{5}{3} \neq 2$

If $x = 6$, $\frac{6}{3} = 2 = 2$

$\therefore$ $x = 6$ is the solution of given equation.

(*vii*) $5x - 6 = x + 6$

The given equation is $5x - 6 = x + 6$.

	L.H.S.	R.H.S.
If $x = 1$,	$5 \times 1 - 6 = 5 - 6 = -1$;	$1 + 6 = 7$
If $x = 2$,	$5 \times 2 - 6 = 10 - 6 = 4$;	$2 + 6 = 8$
If $x = 3$,	$5 \times 3 - 6 = 15 - 6 = 9$;	$3 + 6 = 9$

For $x = 3$, L.H.S. = R.H.S.

$\therefore$ $x = 3$ is the solution of given equation.

(*viii*) $3x + 6 = 9 + 2x$

Given equation is $3x + 6 = 9 + 2x$.

	L.H.S.	R.H.S.
If $x = 1$,	$3 \times 1 + 6 = 3 + 6 = 9$;	$9 + 2 \times 1 = 9 + 3 = 11$
If $x = 2$,	$3 \times 2 + 6 = 6 + 6 = 12$;	$9 + 2 \times 2 = 9 + 4 = 13$
If $x = 3$,	$3 \times 3 + 6 = 9 + 6 = 15$;	$9 + 2 \times 3 = 9 + 6 = 15$

For $x = 3$, L.H.S. = R.H.S.

$\therefore$ $x = 3$ is the solution of given equation.

(*ix*) $2x + 7 = 3x$

Given equation is $2x + 7 = 3x$.

	L.H.S.	R.H.S.
If $x = 1$,	$2 \times 1 + 7 = 2 + 7 = 9$;	$3 \times 1 = 3$
If $x = 2$,	$2 \times 2 + 7 = 4 + 7 = 11$;	$3 \times 2 = 6$
If $x = 3$,	$2 \times 3 + 7 = 6 + 7 = 13$;	$3 \times 3 = 9$
If $x = 4$,	$2 \times 4 + 7 = 8 + 7 = 15$;	$3 \times 4 = 12$
If $x = 5$,	$2 \times 5 + 7 = 10 + 7 = 17$;	$3 \times 5 = 15$
If $x = 6$,	$2 \times 6 + 7 = 12 + 7 = 19$;	$3 \times 6 = 18$
If $x = 7$,	$2 \times 7 + 7 = 14 + 7 = 21$;	$3 \times 7 = 21$

For $x = 7$, L.H.S. = R.H.S.

$\therefore$ $x = 7$ is the solution of given equation.

(*x*) $5x = 2x + 9$

Given equation is $5x = 2x + 9$

	L.H.S.	R.H.S.
If $x = 1$,	$5 \times 1, = 5$;	$2 \times 1 + 9 = 2 + 9 = 11$
If $x = 2$,	$5 \times 2 = 10$;	$2 \times 2 + 9 = 4 + 9 = 13$
If $x = 3$,	$5 \times 3 = 15$;	$2 \times 3 + 9 = 6 + 9 = 15$

For $x = 3$, L.H.S. = R.H.S.

$\therefore$ $x = 3$ is the solution of given equation.

5. Present age of Sunil = x year

After 5 years Sunil's age = $(x + 5)$ year.

Three years ago, Sunil's age = $(x - 3)$ years

As per given condition,

$(x + 5) = 3(x - 3)$

6. Present age of Ravi = y years

After 4 years, Ravi's age = $(y + 4)$ years

and eight years ago, Ravi's age = $(y - 8)$ years

Now, As per given condition

$(y + 4) = 3(y - 8)$.

EXERCISE 7.5

1. (*i*) $3x - 7 = 11$

Taking L.H.S. = $3x - 7$

Substituting the value of $x = 6$, we get

$= 3 \times 6 - 7$

$= 18 - 7$

$= 11$

$=$ R.H.S

Hence, for $x = 6$, L.H.S. = R.H.S.

(*ii*) $2x + 5 = 17$

Taking L.H.S. $= 2x + 5$

Substituting the value of $x = 6$, we get

$= 2 \times 6 + 5$

$= 12 + 5$

$= 17$

$= $ R.H.S.

Hence, for $x = 6$, L.H.S. = R.H.S.

(*iii*) $2x + 8 = 15$

Taking L.H.S. $= 2x + 8$

Substituting the value of $x = 6$, we get,

$= 2 \times 6 + 8$

$= 12 + 8 = 20$

Hence, for $x = 6$, L.H.S. $\neq$ R.H.S.

(*iv*) $2x - 6 = 6$

Taking L.H.S. $= 2x - 6$

Substituting the value of $x = 6$, we get

$= 2 \times 6 - 6$

$= 12 - 6 = 6$

$= $ R.H.S.

Hence, for $x = 6$, L.H.S. = R.H.S.

So, $x = 6$ is the solution of (*i*), (*ii*) and (*iv*).

2. (*i*) $2x - 2 = 6$

Given equation is $2x - 2 = 6$.

	L.H.S.	R.H.S.
If $x = 1$,	$2 \times 1 - 2 = 0$	$\neq 6$
If $x = 2$,	$2 \times 2 - 2 = 2$	$\neq 6$
If $x = 3$,	$2 \times 3 - 2 = 4$	$\neq 6$
If $x = 4$,	$2 \times 4 - 2 = 6$	$= 6$

$\therefore$ $x = 4$ is the solution of given equation

(*ii*) $3x = 15$

Given equation is $3x = 15$.

	L.H.S.	R.H.S.
If $x = 1$,	$3 \times 1 = 3$	$\neq 15$
If $x = 2$,	$3 \times 2 = 6$	$\neq 15$
If $x = 3$,	$3 \times 3 = 9$	$\neq 15$
If $x = 4$,	$3 \times 4 = 12$	$\neq 15$
If $x = 5$,	$3 \times 5 = 15$	$= 15$

$\therefore$ $x = 5$ is the solution of given equation

(*iii*) $2x - 3 = 5$

Given equation is $2x - 3 = 5$.

	L.H.S.	R.H.S.
If $x = 2$,	$2 \times 2 - 3 = 1$	$\neq 5$
If $x = 3$,	$2 \times 3 - 3 = 3$	$\neq 5$
If $x = 4$,	$2 \times 4 - 3 = 5$	$= 5$

$\therefore$ $x = 4$ is the solution of given equation

(*iv*) $t + 3 = 7$

Given equation is $t + 3 = 7$.

	L.H.S.	R.H.S.
If $t = 1$,	$1 + 3 = 4$	$\neq 7$
If $t = 2$,	$2 + 3 = 5$	$\neq 7$
If $t = 3$,	$3 + 3 = 6$	$\neq 7$
If $t = 4$,	$4 + 3 = 7$	$= 7$

$\therefore$ $t = 4$ is the solution of given equation

3. (*i*) $\frac{x}{4} + 6 = 11$

Transposing 6 to other side, we get

$$\frac{x}{4} = 11 - 6$$

$$\Rightarrow \quad \frac{x}{4} = 5$$

Multiplying both sides by 4, we get

$$\Rightarrow \quad \frac{x}{4} \times 4 = 5 \times 4$$

$$\boxed{x = 20}$$

(*ii*) $3x - 7 = 2x$

Transposing -7 to other side, we get

$3x = 2x + 7$

Again, transposing $2x$ to other side, we get

$\Rightarrow \quad 3x - 2x = 7$

$$\boxed{x = 7}$$

(*iii*) $x + \frac{1}{2} = 2$

Transposing $\frac{1}{2}$ to other side, we get

$$x = 2 - \frac{1}{2}$$

$$\Rightarrow \quad x = \frac{4 - 1}{2}$$

$$\boxed{x = \frac{3}{2}}$$

(*iv*) $7x + 7 = 12x - 3$

Transposing -3 to other side, we get

$7x + 7 + 3 = 12x$

$\Rightarrow \quad 7x + 10 = 12x$

Again, transposing $7x$ to other side,

$\Rightarrow \quad 10 = 12x - 7x$

$\Rightarrow \quad 10 = 5x$

or $\quad 5x = 10$

Dividing both sides by 5, we get

$$\Rightarrow \quad \frac{5x}{5} = \frac{10}{5}$$

$$\boxed{x = 2}$$

(*v*) $7x - 6 - 3x = 14$

Transposing -6 to other side, we get

$$7x - 3x = 14 + 6$$

$$\Rightarrow \quad 4x = 20$$

Dividing both sides by 4, we get

$$\Rightarrow \quad \frac{4x}{4} = \frac{20}{4}$$

$$\boxed{x = 5}$$

4. (*i*) $\frac{x}{5} = \frac{1}{5}$

Multiplying both sides by 5, we get

$$\frac{x}{5} \times 5 = \frac{1}{5} \times 5$$

$$\boxed{x = 1}$$

(*ii*) $x + 21 = 29$

Subtracting 21 from both sides, we get

$$x + 21 - 21 = 29 - 21$$

$$\boxed{x = 8}$$

(*iii*) $\frac{2}{5}x = 10$

Multiplying both sides by 5, we get

$$\left(\frac{2}{5}x\right) \times 5 = 10 \times 5$$

$$\Rightarrow \quad 2x = 50$$

Dividing both side by 2, we get

$$\Rightarrow \quad \frac{2x}{2} = \frac{50}{2}$$

$$\boxed{x = 25}$$

(*iv*) $x - 12 = -14$

Adding 12 to both sides, we get

$$x - 12 + 12 = -14 + 12$$

$$\boxed{x = -2}$$

(*v*) $12 - x = 6$

Subtracting 12 from both sides, we get,

$$12 - x - 12 = 6 - 12$$

$$\Rightarrow \quad -x = -6$$

or $\boxed{x = 6}$

(*vi*) $6x = x + 20$

Transposing $+x$ to other side, we get

$$6x - x = 20$$

$$\Rightarrow \quad 5x = 20$$

Dividing both sides by 5, we get

$$\frac{5x}{5} = \frac{20}{5}$$

$$\Rightarrow \quad \boxed{x = 4}$$

(*vii*) $3x - 5 = 7$

Adding 5 to both sides, we get

$$3x - 5 + 5 = 7 + 5$$

$$\Rightarrow \quad 3x = 12$$

Dividing both sides by 3, we get

$$\frac{3x}{3} = \frac{12}{3}$$

$$\Rightarrow \quad \boxed{x = 4}$$

(*viii*) $21 - x = 7$

Subtracting 21 from both sides, we get

$$21 - x - 21 = 7 - 21$$

$$\Rightarrow \quad -x = -14$$

or $\boxed{x = 14}$

(*ix*) $9x - 3 = 15$

Adding 3 to both sides, we get

$$9x - 3 + 3 = 15 + 3$$

$$\Rightarrow \quad 9x = 18$$

Dividing both sides by 9, we get

$$\frac{9x}{9} = \frac{18}{9}$$

$$\Rightarrow \quad \boxed{x = 2}$$

(*x*) $2x + 3 = 13$

Subtracting 3 from both sides, we get

$$2x + 3 - 3 = 13 - 3$$

$$\Rightarrow \quad 2x = 10$$

Dividing both sides by 2, we get

$$\frac{2x}{2} = \frac{10}{2}$$

$$\Rightarrow \quad \boxed{x = 5}$$

(*xi*) $-2x - 3 = 5$

Adding 3 to both sides, we get

$$-2x - 3 + 3 = 5 + 3$$

$$\Rightarrow \quad -2x = 8$$

Dividing both sides by 2, we get,

$$\frac{-2x}{2} = \frac{8}{2}$$

$$\Rightarrow \quad -x = 4 \quad \text{or} \quad x = -4$$

(*xii*) $\frac{x}{2} - 3 = 5$

Adding 3 to both sides, we get

$\frac{x}{2} - 3 + 3 = 5 + 3$

$\Rightarrow \quad \frac{x}{2} = 8$

Multiplying both sides by 2, we get,

$\frac{x}{2} \times 2 = 8 \times 2$

$\Rightarrow \quad \boxed{x = 16}$

(*xiii*) $x + \frac{3}{2} = 5$

Transposing + $\frac{3}{2}$ to other side, we get,

$x = 5 - \frac{3}{2}$

$\Rightarrow \quad x = \frac{10 - 3}{2}$

$\Rightarrow \quad \boxed{x = \frac{7}{2}}$

(*xiv*) $7x - 11 = 13$

Adding 11 to both sides, we get

$7x - 11 + 11 = 3 + 11$

$\Rightarrow \quad 7x = 14$

Dividing both sides by 7, we get

$\frac{7x}{7} = \frac{14}{7}$

$\Rightarrow \quad \boxed{x = 2}$

(*xv*) $3(x + 2) = 9$

Dividing both sides by 3, we get

$\frac{3(x+2)}{3} = \frac{9}{3}$

$\Rightarrow \quad x + 2 = 3$

Subtracting 2 from both sides, we get

$x + 2 - 2 = 3 - 2$

$\Rightarrow \quad \boxed{x = 1}$

MULTIPLE CHOICE QUESTIONS

1. Let the number be x. Therefore,

$x = 3 \times (4 + 6)$

$x = 3 \times 10$

$x = 30$

Thus, the number is 30.

Hence option (*a*) is correct.

2. Let the number be x. Therefore,

$x - 11 = 19$

Adding 11 to both sides, we get

$x - 11 + 11 = 19 + 11$

$\Rightarrow \quad x = 30$

Hence, option (*b*) is correct.

3. $5a + 2 = 22$

Subtracting 2 from both sides, we get

$5a + 2 - 2 = 22 - 2$

$\Rightarrow \quad 5a = 20$

Dividing both sides by 5, we get,

$\frac{5a}{5} = \frac{20}{5}$

$\Rightarrow \quad \boxed{a = 4}$

Hence, option (*b*) is correct

4. Seven more than twice a number x.

$\Rightarrow \quad 2x + 7$

Hence, option (*b*) is correct.

5. Eight taken away from the sum of x and y.

$\Rightarrow (x + y) - 8$

Hence, option (*c*) is correct.

6. The cost of one book = ₹b

$\therefore$ The cost of 4 books = ₹($b \times 4$)

= ₹$4b$

Hence option (*b*) is correct.

7. "Six times a number is equal to 48".

Let number be x. Therefore,

$\Rightarrow \quad 6x = 48$

Hence, option (*c*) is correct.

8. $5x + 10 = 15$

Subtracting 10 from both sides, we get

$5x + 10 - 10 = 15 - 10$

$\Rightarrow \quad 5x = 5$

Dividing both side, by 5, we get

$\frac{5x}{5} = \frac{5}{5}$

$\Rightarrow \quad \boxed{x = 1}$

Hence, option (*a*) is correct.

9. Number of rows of chairs = a^2

Number of chairs in each row = $3a$

Thus, total number of chairs = $a^2 \times 3a = 3a^3$

Hence, option (*d*) is correct.

10. Length = $2a^2b$, breadth = $3ab$

Area of a rectangular room = length × breadth

$= (2a^2b) \times (3ab)$

$= 6a^3b^2$

Thus, area of a rectangular room = $6a^3b^2$

Hence, option (*b*) is correct.

11. $x + 11 = 15$

Transposing + 11 to other sides, we get

$$x \pm 5 - 11$$

$$\Rightarrow \quad \boxed{x = -6}$$

Hence, option (*d*) is correct.

12. Let the number be x.

As per given condition,

$$\frac{x}{6} + 5 = 8$$

Subtracting 5 from both sides, we get

$$\frac{x}{6} + 5 - 5 = 8 - 5$$

$$\Rightarrow \quad \frac{x}{6} = 3$$

Multiplying both sides by 6, we get

$$\frac{x}{6} \times 6 = 3 \times 6$$

$$\boxed{x = 18}$$

Thus, the number is 18.

Hence, option (*c*) is correct.

13. Given that

$$2x^2 + 5x + 6 = 6.$$

Substituting the value of $x = 0$ in L.H.S., we get R.H.S.

$$\text{L.H.S.} = 2 \times (0)^2 + 5 \times (0) + 6$$
$$= 0 + 0 + 6$$
$$= 6$$
$$= \text{R.H.S.}$$

Thus, for $x = 0$, L.H.S. = R.H.S.

Hence, option (*b*) is correct.

14. Gives that

$$x^b = 8$$

Substituting the value of $x = 2$, we get,

$$(2)^b = 8$$
$$(2)^b = (2)^3 \qquad (\because \quad 8 = 2 \times 2 \times 2)$$
$$\Rightarrow \quad b = 3 \qquad [\because \ a^m = a^n, \ a > 0 \Rightarrow m = n]$$

Hence, option (*a*) is correct.

15. In the given expression

$$\frac{2}{3}x^2y - 6xy^2 + 4xy - 8x + 5$$

Number of terms = 5

Hence, option (*b*) is correct.

16. Let the number be x. Therefore,

$$3x = 42$$

Dividing both sides by 3, we get

$$\frac{3x}{3} = \frac{42}{3}$$

$$\Rightarrow \quad \boxed{x = 14}$$

Thus, the number is 14.

Hence, option (*c*) is correct.

17. Let the Son's age be x years.

$\therefore$ Father's age = $3x$ years

As per given condition,

$$x + 3x = 48$$
$$\Rightarrow \quad 4x = 48$$

Dividing both sides by 4, we get

$$\frac{4x}{4} = \frac{48}{4}$$
$$\Rightarrow \quad x = 12$$

Thus, the Son's age = 12 years,

Hence, option (*b*) is correct.

18. Length of a rectangle = 9 cm

Breadth of a rectangle = y cm

Perimeter of a rectangle = 2 × (length + breadth)

$$= 2 \times (9 + y)$$
$$= 2 \times (y + 9)$$

Hence, option (*b*) is correct.

19. Let the number be x.

Therefore,

$$4x - 3x = 17$$
$$\Rightarrow \quad x = 17$$

Thus, the number is 17.

Hence, option (*a*) is correct.

20. Let the number be x. Therefore,

$$2x + 6 = 24$$

Subtracting 6 from both sides, we get

$$2x + 6 - 6 = 24 - 6$$
$$\Rightarrow \quad 2x = 18$$

Dividing both sides by 2, we get

$$\frac{2x}{2} = \frac{18}{2}$$
$$\Rightarrow \quad x = 9$$

Thus, the number is 9.

Hence, option (*b*) is correct.

MENTAL MATHS CORNER

Fill in the blanks:

1. Six added to the product of 3 and x is $\mathbf{3x + 6}$.

2. $15 - x = 4$, then $x =$ **11.**

$\because \quad 15 - x = 4$

Subtracting 15 from both sides, we get

$15 - x - 15 = 4 - 15$

$\Rightarrow \quad -x = -11$

or $\boxed{x = 11}$

3. Letters used to represent numbers are called **variables.**

4. If present age of Ritesh is x years, after five years his age will be $\boldsymbol{x + 5}$ **years.**

5. A symbol having fixed numerical value is called **constant.**

6. Exponents form the $7 \times a \times a \times a \times b \times b = \mathbf{7a^3b^2}$.

7. $x =$ **4**, is the solution of the equation $2x + 6 = 14$.

$\because \quad 2x + 6 = 14$

Subtracting 6 from both sides, we get

$2x + 6 - 6 = 14 - 6$

$\Rightarrow \quad 2x = 8$

$$\frac{2x}{2} = \frac{8}{2}$$

$\Rightarrow \quad x = 4$

8. The algebraic expression $9x$ has **one** terms.

9. The value of $2x - 12$ is zero when $x =$ **6.**

$\because \quad 2x - 12 = 0$

Transposing -12 to other side,

$2x = 0 + 12$

$\Rightarrow \quad 2x = 12$

dividing both sides by 2, we get

$$\frac{2x}{2} = \frac{12}{2}$$

$\Rightarrow \quad x = 6$

10. The value of $x°$ is **1**.

11. The product of 2 and x is being added to the product of 3 and y is expressed as $\mathbf{2x + 3y}$.

12. The sum of three consecutive numbers is 42. The numbers are **13, 14,** and **15.**

$\because$ Let the three consecutive numbers be x, $x + 1$ and $x + 2$.

Therefore, $x + x + 1 + x + 2 = 42$

$\Rightarrow \quad 3x = 42 - 3$ (Transposing 3 to other side)

$\Rightarrow \quad 3x = 39$

$$\Rightarrow \quad \frac{3x}{3} = \frac{39}{3}$$

$\Rightarrow \quad x = 13.$

Thus, the three consecutive numbers are 13, 14 and 15.

REVIEW EXERCISE

1. An equation has two sides, L.H.S. and R.H.S. having equal (=) sign between them. So,

(*i*) $15 = x + 3$ is an equation, in variable x.

(*iv*) $\frac{6}{2} + 8 = 2x$ is an equation, in variable x.

(*vi*) $x - 7 = 0$ is an equation in variable x.

(*viii*) $20 = 4p$ is an equation in variable p.

(*ix*) $4 - x = 6$ is an equation in variable x.

(*x*) $3 = (2 \times 7) - q$ is an equation in variable q.

So, (*i*), (*iv*), (*vi*), (*viii*), (*ix*) and (*x*) are the equations.

2. (*i*) $x - 3 = 7$ (0, 10, – 10, 4)

	L.H.S.	R.H.S.
if $x = 0$,	$0 - 3 = 3$	$\neq 7$
if $x = 10$,	$10 - 3 = 7$	$= 7$
if $x = -10$,	$-10 - 3 = -13$	$\neq 7$
if $x = 4$,	$4 - 3 = 1$	$\neq 7$

Hence, $x = 10$ is the solution of given equation.

(*ii*) $3m = 18$ (2, 6, 3, 15)

	L.H.S.	R.H.S.
if $m = 2$,	$3 \times 2 = 6$	$\neq 18$
if $m = 6$,	$3 \times 6 = 18$	$= 18$
if $m = 3$,	$3 \times 3 = 9$	$\neq 18$
if $m = 15$,	$3 \times 15 = 45$	$\neq 18$

Hence, $m = 6$ is the solution of given equation.

(*iii*) $\frac{t}{5} = 3$ (12, 15, 0, 18)

	L.H.S.	R.H.S.
if $t = 12$,	$\frac{12}{5}$	$\neq 3$
if $t = 15$,	$\frac{15}{5} = 3$	$= 3$
if $t = 0$,	$\frac{0}{5} = 0$	$\neq 3$
if $t = 18$,	$\frac{18}{5}$	$\neq 3$

Hence, $t = 15$, is the solution of the given equation.

(*iv*) $y + 6 = 8$ (0, 3, 2, 6)

	L.H.S.	R.H.S.
if $y = 0$	$0 + 6 = 6$	$\neq 8$
if $y = 3$	$3 + 6 = 9$	$\neq 8$
if $y = 2$	$2 + 6 = 8$	$= 8$
if $y = 6$	$6 + 6 = 12$	$\neq 8$

Hence, $y = 2$ is the solution of given equation.

(*v*) $x + 7 = 14$ (7, – 7, 3, – 3)

	L.H.S.	R.H.S.
If $x = 7$,	$7 + 7 = 14$	$= 14$
If $x = -7$,	$-7 + 7 = 0$	$\neq 14$
If $x = 3$,	$3 + 7 = 10$	$\neq 14$
If $x = -3$,	$-3 + 7 = 4$	$\neq 14$

Hence, $x = 7$, is the solution of given equation.

(*vi*) $2q - 4 = 0$ (4, 2, – 4, – 2)

	L.H.S.	R.H.S.
If $q = 4$,	$2 \times 4 - 4 = 4$	$\neq 0$
If $q = 2$,	$2 \times 2 - 4 = 0$	$= 0$
If $q = -4$,	$2 \times (-4) - 4 = -12$	$\neq 0$
If $q = -2$,	$2 \times (-2) - 4 = -8$	$\neq 0$

Hence, $q = 2$, is the solution of given equation.

3. The given algebraic expression

$$3x^3y - 4x^2y^2 + \frac{1}{2}xy^2 - 5x$$

(*i*) There are 4 terms, $3x^3y$, $-4x^2y^2$, $+\frac{1}{2}xy^2$, $-5x$.

(*ii*) The numerical coefficient of the term $\frac{1}{2}xy^2 = \frac{1}{2}$.

(*iii*) The literal coefficient of the term $(-4x^2y^2) = (-4)(x^2y^2) = x^2y^2$.

(*iv*) The coefficient of x^3 in the term $3x^3y = 3y$.

4. If $a = 2$, $b = -3$, $c = -1$

(*i*) $3a + 5b - 2c = 3(2) + 5(-3) - 2(-1)$
$= 6 - 15 + 2 = -7$

(*ii*) $a^3 + b^3 + c^3 - 3abc = (2)^3 + (-3)^3 + (-1)^3 - 3(2)(-3)(-1)$
$= 8 - 27 - 1 - 18$
$= -38$

5. (*i*) The product of 5 and x is subtracted from the sum of y and 3.
$\Rightarrow (y + 3) - 5x$

(*ii*) Half of x is taken away from the two fifth of y.
$\Rightarrow \frac{2}{5}y - \frac{1}{2}x$

(*iii*) If p is taken away from the sum of q and 7, we get 12
$\Rightarrow (q + 17) - p = 12$

(*iv*) 12 times x is divided by 5 times $y = \frac{12x}{5y}$

(*v*) The quotient when p is divided by 2 times q is 6.
$\Rightarrow \frac{p}{2q} = 6$

(*vi*) a times b is added to 4 times $c = ab + 4c$

6. (*i*) $2ab, 2a^2b, 6ba, 3abc, 5ba^2$
like terms: $2ab, 6ba$ and $2a^2b, 5ba^2$

(*ii*) $5pq, 3pqr, 6qp, 2pr$
like terms: $5pq, 6qp$

(*iii*) $3abc^2, 4ab^2c, -2ac^2b, 3a^2bc$
like terms: $3abc^2, -2ac^2b$

(*iv*) $3a^2, 4b^2, b^3, a^2, 9a^2$
like terms: $3a^2, a^2, 9a^2$

7. (*i*) $3x + 2 = 17$
Subtracting 2 from both sides, we get
$3x + 2 - 2 = 17 - 2$
$\Rightarrow 3x = 15$
Dividing both sides by 3, we get
$\frac{3x}{3} = \frac{15}{3}$
$\Rightarrow \boxed{x = 5}$

(*ii*) $9x - 6 = 7x + 8$
Adding 6 to both sides, we get
$9x - 6 + 6 = 7x + 8 + 6$
$\Rightarrow 9x = 7x + 14$
Subtracting $7x$ from both sides, we get
$9x - 7x = 7x - 14 - 7x$
$\Rightarrow 2x = 14$
Dividing both sides by 2, we get
$\frac{2x}{2} = \frac{14}{2}$
$\Rightarrow \boxed{x = 7}$

(*iii*) $3x + 3 = 7x - 9$
or $7x - 9 = 3x + 3$
$7x - 9 + 9 = 3x + 3 + 9$ (adding 9 to both sides)
$\Rightarrow 7x = 3x + 12$
Transposing $3x$ to other side, we get
$7x - 3x = 12$
$\Rightarrow 4x = 12$
Dividing both sides by 4, we get
$\frac{4x}{4} = \frac{12}{4}$
$\Rightarrow \boxed{x = 3}$

(*iv*) $\frac{x}{3} - 2 = 5$
Adding 2 to both sides, we get
$\frac{x}{3} - 2 + 2 = 5 + 2$
$\Rightarrow \frac{x}{3} = 7$

Multiplying both sides by 3, we get

$$\frac{x}{3} \times 3 = 7 \times 3$$

$\Rightarrow$ $\boxed{x = 21}$

(*v*) $6x - 4 = 4x + 12$

Transposing $4x$ to other side, we get

$6x - 4x - 4 = 12$

$\Rightarrow$ $2x - 4 = 12$

Adding 4 to both sides, we get

$2x - 4 + 4 = 12 + 4$

$\Rightarrow$ $2x = 16$

$\Rightarrow$ $\frac{2x}{2} = \frac{16}{2}$ (Dividing both sides by 2)

$\Rightarrow$ $\boxed{x = 8}$

(*vi*) $\frac{2}{3}x = 6$

Multiplying both sides by 3, we get

$$\frac{2}{3}x \times 3 = 6 \times 3$$

$\Rightarrow$ $2x = 18$

Dividing both sides by 2, we get

$$\frac{2x}{2} = \frac{18}{2}$$

$\Rightarrow$ $\boxed{x = 9}$

8. $a^2 + 5a - 4$

when $a = 1$,

$a^2 + 5a - 4 = (1)^2 + 5(1) - 4$

$= 1 + 5 - 4 = 2$

when $a = -1$,

$a^2 + 5a - 4 = (-1)^2 + 5(-1) - 4$

$= 1 - 5 - 4 = 1 - 9 = -8$

when $a = 2$,

$a^2 + 5a - 4 = (2)^2 + 5(2) - 4$

$= 4 + 10 - 4 = 10$

9. Let the number be x. Therefore,

$3x + 5 = 20$

Subtracting 5 from both sides,

$3x + 5 - 5 = 20 - 5$

$\Rightarrow$ $3x = 15$

Dividing both sides by 3, we get

$$\frac{3x}{3} = \frac{15}{3}$$

$\Rightarrow$ $\boxed{x = 5}$

Hence, the required number is 5.

10. Let breadth of a rectangle be x.

Therefore, length = $(x + 3)$ cm

Perimeter of rectangle = 34 cm

$\Rightarrow$ 2 × (length + breadth) = 34

$\Rightarrow$ $2 \times (x + 3 + x) = 34$

Dividing both sides by 2, we get

$$\frac{2(2x+3)}{2} = \frac{34}{2}$$

$\Rightarrow$ $2x + 3 = 7$

Subtracting 3 from both sides, we get

$2x + 3 - 3 = 17 - 3$

$\Rightarrow$ $2x = 14$

Dividing both sides by 2, we get

$$\frac{2x}{2} = \frac{14}{2}$$

$\Rightarrow$ $x = 7$

Hence, length of a rectangle = 7 + 3 = 10 cm

Breadth of a rectangle = 7 cm

HOTS QUESTIONS

1. Marks scored in Mathematics = x

Marks scored in English = y

Marks scored in G.Sc. = z

Sum of the marks in English and G.Sc. = $(y + z)$.

Therefore, as per given condition,

$y + z = x + 18$

2. Total number of watches he had = 260

Number of watches sells in a day = x

$\therefore$ Number of watches sells in 7 days (1 week) = $7 \times x$

$= 7x$

$\therefore$ Number of watches sells in t weeks = $7x \times t$

$= 7xt$

Therefore, Number of watches left after of t weeks

$= 260 - 7xt$.