Exercise 8.1

Q 1. Verify by substitution that :

(i). x = 4 is the root of 3x − 5 = 7

(ii). x = 3 is the root of 5 + 3x = 14

(iii). x = 2 is the root of 3x − 2 = 8x − 12

(iv). x = 4 is the root of 3x/2 = 6

(v). y = 2 is the root of y − 3 = 2y − 5

(vi). x = 8 is the root of $\frac{1}{2}x + 7$ = 11

SOLUTION :

(i). x = 4 is the root of 3x − 5 = 7.

Now, substituting x = 4 in place of 'x' in the given equation 3x − 5 = 7,

3(4) − 5 = 7

12 − 5 = 7

7 = 7

Since, LHS = RHS

Hence, x = 4 is the root of 3x − 5 = 7.

(ii). x = 3 is the root of 5 + 3x = 14.

Now, substituting x = 3 in place of 'x' in the given equation 5 + 3x = 14,

5 + 3(3) = 14

5 + 9 = 14

14 = 14

Since, LHS = RHS

Hence, x = 3 is the root of 5 + 3x = 14.

(iii). x = 2 is the root of 3x − 2 = 8x − 12.

Now, substituting x = 2 in place of 'x' in the given equation 3x − 2 = 8x − 12,

3(2) − 2 = 8(2) − 12

6 − 2 = 16 − 12

4 = 4

Since , LHS = RHS

Hence, x = 2 is the root of 3x − 2 = 8x − 12.

(iv). x = 4 is the root of 3x/2 = 6.

Now, substituting x = 4 in place of 'x' in the given equation 3x/2 = 6,

(3×4)/2 = 6

12/2 = 6

6 = 6

Since, LHS = RHS

Hence, x = 4 is the root of 3x/2 = 6.

(v). y = 2 is the root of y − 3 = 2y − 5.

Now, substituting y = 2 in place of 'y' in the given equation y − 3 = 2y − 5,

2 − 3 = 2(2) − 5

-1 = 4 − 5

-1 = -1

Since, LHS = RHS

Hence, y = 2 is the root of y − 3 = 2y − 5.

(vi). x = 8 is the root of $\frac{1}{2}x + 7 = 11$.

Now, substituting x = 8 in place of 'x' in the given equation $\frac{1}{2}x + 7 = 11$,

$\frac{1}{2}(8) + 7 = 11$

$4 + 7 = 11$

$11 = 11$

Since, LHS = RHS

Hence, x = 8 is the root of $\frac{1}{2}x + 7 = 11$.

Q 2. Solve each of the following equations by trial and error method :

(i). x + 3 = 12

(ii). x − 7 = 10

(iii). 4x = 28

(iv). $\frac{x}{2} + 7 = 11$

(v). 2x + 4 = 3x

(vi). $\frac{x}{4} = 12$

(vii). $\frac{15}{x} = 3$

(viii). $\frac{x}{18} = 20$

SOLUTION :

(i). x + 3 = 12

Here, LHS = x + 3 and RHS = 12

X	LHS	RHS	Is LHS = RHS
1	1 + 3 = 4	12	No
2	2 + 3 = 5	12	No
3	3 + 3 = 6	12	No
4	4 + 3 = 7	12	No
5	5 + 3 = 8	12	No
6	6 + 3 = 9	12	No
7	7 + 3 = 10	12	No
8	8 + 3 = 11	12	No
9	9 + 3 = 12	12	Yes

Therefore, if x = 9, LHS = RHS.

Hence, x = 9 is the solution to this equation.

(ii). x − 7 = 10

Here, LHS = x − 7 and RHS = 10.

x	LHS	RHS	Is LHS = RHS
9	9 -7 = 2	10	No
10	10 − 7 = 3	10	No
11	11 − 7 =4	10	No
12	12 − 7 =5	10	No
13	13 − 7 = 6	10	No
14	14 − 7 = 7	10	No
15	15 − 7 = 8	10	No
16	16 − 7 = 9	10	No
17	17 − 7 = 10	10	Yes

Therefore, if x = 17, LHS = RHS.

Hence, x = 17 is the solution to this equation.

(iii). 4x = 28

Here, LHS = 4x and RHS = 28.

x	LHS	RHS	Is LHS = RHS
1	4 x 1 = 4	28	No
2	4 x 2 = 8	28	No
3	4 x 3 = 12	28	No
4	4 x 4 = 16	28	No
5	4 x 5 = 20	28	No
6	4 x 6 = 24	28	No
7	4 x 7 = 28	28	Yes

Therefore, if x = 7, LHS = RHS

Hence, x = 7 is the solution to this equation.

(iv). $\frac{x}{2} + 7$ = 11

Here, LHS = $\frac{x}{2} + 7$ and RHS = 11.

Since RHS is a natural number, $\frac{x}{2}$ must also be a natural number, so we must substitute values of x that are multiples of 2.

x	LHS	RHS	Is LHS = RHS
2	$\frac{2}{2} + 7 = 8$	11	No
4	$\frac{4}{2} + 7 = 9$	11	No
6	$\frac{6}{2} + 7 = 10$	11	No
8	$\frac{8}{2} + 7 = 11$	11	Yes

Therefore, if x = 8, LHS = RHS.

Hence, x = 8 is the solution to this equation.

(v). 2x + 4 = 3x

Here, LHS = 2x + 4 and RHS = 3x.

x	LHS	RHS	Is LHS = RHS
1	2(1) + 4 =6	3(1) = 3	No
2	2(2) + 4 = 8	3(2) = 6	No
3	2(3) + 4 =10	3(3) = 9	No
4	2(4) + 5 = 12	3(4)= 12	Yes

Therefore, if x = 4, LHS = RHS.

Hence, x = 4 is the solution to this equation.

(vi). $\frac{x}{4}$ = 12

Here, LHS = $\frac{x}{4}$ and RHS = 12.

Since RHS is a natural number, $\frac{x}{4}$ must also be a natural number, so we must substitute values of x that are multiples of 4.

X	LHS	RHS	Is LHS = RHS
16	$\frac{16}{4}$=4	12	NO
20	$\frac{20}{4}$=5	12	NO
24	$\frac{24}{4}$=6	12	NO
28	$\frac{28}{4}$=7	12	NO
32	$\frac{32}{4}$=8	12	NO
36	$\frac{36}{4}$=9	12	NO
40	$\frac{40}{4}$=10	12	NO
44	$\frac{44}{4}$=11	12	NO
48	$\frac{48}{4}$=12	12	Yes

Therefore, if x = 48, LHS = RHS.

Hence, x = 48 is the solution to this equation.

(vii). $\frac{15}{x}$ = 3

Here, LHS = $\frac{15}{x}$ and RHS = 3.

Since RHS is a natural number, $\frac{15}{x}$ must also be a natural number , so we must substitute values of x that are factors of 15.

x	LHS	RHS	Is LHS = RHS
1	$\frac{15}{1}$ =15	3	No
3	$\frac{15}{3}$ =5	3	No
5	$\frac{15}{5}$ =3	3	Yes

Therefore, if x = 5, LHS = RHS.

Hence, x = 5 is the solution to this equation.

(viii). $\frac{x}{18}$ = 20

Here, LHS = $\frac{x}{18}$ and RHS = 20.

Since RHS is a natural number, $\frac{x}{18}$ must also be a natural number, so we must substitute values of x that are multiples of 18.

X	LHS	RHS	Is LHS = RHS
324	$\frac{324}{18}$ =18	20	No
342	$\frac{342}{18}$ =19	20	No
360	$\frac{360}{18}$ =20	20	Yes

Therefore, if x = 360, LHS = RHS.

Hence, x = 360 is the solution to this equation.

Exercise 8.2

Q1. x − 3 = 5

SOLUTION :

$x - 3 = 5$

Adding 3 to both sides, we get

$x - 3 + 3 = 5 + 3$

$x = 8$

Verification :

Substituting $x = 8$ in LHS, we get

LHS = $x - 3$ and RHS = 5

LHS = $8 - 3 = 5$ and RHS = 5

LHS = RHS

Hence, verified.

Q2. x + 9 = 13

SOLUTION :

$x + 9 = 13$

Subtracting 9 from both sides, we get

$\Rightarrow x + 9 - 9 = 13 - 9$

$\Rightarrow x = 4$

Verification :

Substituting $x = 4$ on LHS, we get

LHS = $4 + 9 = 13$ = RHS

LHS = RHS

Hence, verified.

Q3. $x - \frac{3}{5} = \frac{7}{5}$

SOLUTION :

$x - \frac{3}{5} = \frac{7}{5}$

Adding 3/5 to both sides, we get

$\Rightarrow x - \frac{3}{5} + \frac{3}{5} = \frac{7}{5} + \frac{3}{5}$

$\Rightarrow x = \frac{7}{5} + \frac{3}{5}$

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

$\Rightarrow x = 2$

Verification :

Substituting x = 2 in LHS, we get

LHS $= 2 - \frac{3}{5} = 10 - \frac{3}{5} = \frac{7}{5}$. and RHS $= \frac{7}{5}$

LHS = RHS

Hence, verified.

Q4. 3x = 0

SOLUTION :

3x = 0

Dividing both sides by 3, we get

$\frac{3x}{3} = \frac{0}{3}$

x = 0

Verification :

Substituting x = 0 in LHS = 3x, we get LHS $= 3 \times 0 = 0$ and RHS = 0

LHS = RHS

Hence, verified.

Q5. $\frac{x}{2} = 0$

SOLUTION :

$\frac{x}{2} = 0$

Multiplying both sides by 2, we get

$\Rightarrow \frac{x}{2} \times 2 = 0 \times 2$

$\Rightarrow x = 0$

Verification :

Substituting x = 0 in LHS, we get

LHS = $\frac{0}{2}$ = 0 and RHS = 0

LHS = 0 and RHS = 0

LHS = RHS

Hence, verified.

Q6. $x - \frac{1}{3} = \frac{2}{3}$

SOLUTION :

$x - \frac{1}{3} = \frac{2}{3}$

Adding $\frac{1}{3}$ to both sides, we get

$x - \frac{1}{3} + \frac{1}{3} = \frac{2}{3} + \frac{1}{3}$

$\Rightarrow x = \frac{2}{3} + \frac{1}{3}$

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

$x = 1$

Verification :

Substituting x = 1 in LHS, we get

LHS = $1 - \frac{1}{3} = \frac{3-1}{3} = \frac{2}{3}$, and RHS = $\frac{2}{3}$

LHS = RHS

Hence, verified.

Q7. $x + \frac{1}{2} = \frac{7}{2}$

SOLUTION :

$x + \frac{1}{2} = \frac{7}{2}$

Subtracting $\frac{1}{2}$ from both sides, we get

$x + \frac{1}{2} - \frac{1}{2} = \frac{7}{2} - \frac{1}{2}$

$x = \frac{7}{2} - \frac{1}{2} = \frac{6}{2}$

$x = 3$

Verification :

Substituting $x = 3$ in LHS, we get LHS = $3 + \frac{1}{2} = \frac{6+1}{2}$ =72. and RHS = 72

LHS = RHS

Hence, verified.

Q8. $10 - y = 6$

SOLUTION :

$10 - y = 6$

Subtracting 10 from both sides, we get

$10 - y - 10 = 6 - 10$

$-y = -4$

Multiplying both sides by -1, we get

$-y \times -1 = -4 \times -1$

$y = 4$

Verification :

Substituting $y = 4$ in LHS, we get

LHS = $10 - y = 10 - 4 = 6$ and RHS = 6

LHS = RHS

Hence, verified.

Q9. $7 + 4y = -5$

SOLUTION :

$7 + 4y = -5$

Subtracting 7 from both sides, we get

$7 + 4y - 7 = -5 - 7$

$4y = -12$

Dividing both sides by 4, we get

$y = -12/4$

$y = -3$

Verification :

Substituting $y = -3$ in LHS, we get

LHS $= 7 + 4y = 7 + 4(-3) = 7 - 12 = -5$, and RHS $= -5$

LHS = RHS

Hence, verified.

Q10. $\frac{4}{5} - x = \frac{3}{5}$

SOLUTION :

$\frac{4}{5} - x = \frac{3}{5}$

Subtracting $\frac{4}{5}$ from both sides, we get

$\frac{4}{5} - x - \frac{4}{5} = \frac{3}{5} - \frac{4}{5}$

$- x = \frac{3}{5} - \frac{4}{5}$

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

Multiplying both sides by -1, we get

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

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

Verification :

Substituting $x = \frac{1}{5}$ in LHS, we get

LHS $= \frac{4}{5} - \frac{1}{5} = \frac{4-1}{5} = \frac{3}{5}$, and RHS $= \frac{3}{5}$

LHS = RHS

Hence, verified.

Q11. $2y - \frac{1}{2} = -\frac{1}{3}$

SOLUTION :

$2y - \frac{1}{2} = -\frac{1}{3}$

Adding $\frac{1}{2}$ to both sides, we get

$2y - \frac{1}{2} + \frac{1}{2} = -\frac{1}{3} + \frac{1}{2}$

$2y = \frac{-2+3}{6}$

$2y = \frac{1}{6}$

Dividing both sides by 2, we get

$2y/2 = 16/2$

$y = \frac{1}{12}$

Verification :

Substituting $y = \frac{1}{12}$ in LHS, we get

LHS $= 2\frac{1}{12} - \frac{1}{2} = \frac{1}{6} - \frac{1}{2} = \frac{1-3}{6} = \frac{-2}{6} = -\frac{1}{3}$, and RHS $= -\frac{1}{3}$

LHS = RHS

Hence, verified.

Q12. $14 = \frac{7x}{10} - 8$

SOLUTION :

$14 = \frac{7x}{10} - 8$

Adding 8 to both sides, we get

$14 + 8 = \frac{7x}{10} - 8 + 8$

$22 = \frac{7x}{10}$

Multiplying both sides by 10, we get

$22 \times 10 = \frac{7x}{10} \times 10$

$220 = 7x$

Dividing both sides by 7, we get

$\frac{220}{7} = \frac{7x}{7}$

$x = \frac{220}{7}$

Verification:

Substituting $x = \frac{220}{7}$ in RHS, we get

LHS $= 14$. and RHS $= \frac{\frac{220}{7}}{\frac{7}{10}} 10 - 8 = \frac{220}{10} - 8 = 22 - 8 = 14$

LHS = RHS

Hence, verified.

Q13. 3(x + 2) = 15

SOLUTION :

$3(x + 2) = 15$

Dividing both sides by 3, we get

$$\frac{3(x+2)}{3} = \frac{15}{3}$$

$(x+2) = 5$

Subtracting 2 from both sides, we get

$x + 2 - 2 = 5 - 2$

$x = 3$

Verification :

Substituting x = 3 in LHS, we get

LHS = $3(x + 2) = 3(3+2) = 3(5) = 15$, and RHS = 15

LHS = RHS

Hence, verified.

Q14. $\frac{x}{4} = \frac{7}{8}$

SOLUTION :

$\frac{x}{4} = \frac{7}{8}$

Multiplying both sides by 4, we get

$\frac{x}{4} \times 4 = \frac{7}{8} \times 4$

$x = \frac{7}{2}$

Verification :

Substituting $x = \frac{7}{2}$ in LHS, we get

LHS $= \frac{7}{2}/4 = \frac{7}{8}$, and RHS $= \frac{7}{8}$

LHS = RHS

Hence, verified.

Q15. $\frac{1}{3} - 2x = 0$

SOLUTION :

$\frac{1}{3} - 2x = 0$

Subtracting $\frac{1}{3}$ from both sides, we get

$\frac{1}{3} - 2x - \frac{1}{3} = 0 - \frac{1}{3}$

$-2x = -\frac{1}{3}$

Multiplying both sides by -1, we get

$-2x \times (-1) = -\frac{1}{3} \times (-1)$

$2x = \frac{1}{3}$

Dividing both sides by 2, we get $\frac{2x}{2} = \frac{1}{3}/2$

$x = \frac{1}{6}$

Verification :

Substituting $x = \frac{1}{6}$ in LHS, we get

LHS $= \frac{1}{3} - 2 \times \frac{1}{6} = \frac{1}{3} - \frac{1}{3} = 0$, and RHS = 0

LHS = RHS

Hence, verified.

Q16. 3(x + 6) = 24

SOLUTION :

$3(x + 6) = 24$

Dividing both sides by 3, we get

$$\frac{3(x+6)}{3} = \frac{24}{3}$$

$(x + 6) = 8$

Subtracting 6 from both sides, we get

$x + 6 - 6 = 8 - 6$

$x = 2$

Verification :

Substituting x = 2 in LHS , we get

LHS = 3 (x + 6) = 3 (2 + 6) = 24 , and RHS = 24

LHS = RHS

Hence, verified.

Q17. 3(x + 2)-2(x − 1) = 7

SOLUTION :

$3(x + 2) - 2(x - 1) = 7$

On expanding the brackets, we get

$3 \times x + 3 \times 2 - 2 \times x + 2 \times 1 = 7$

$3x + 6 - 2x + 2 = 7$

$3x - 2x + 6 + 2 = 7$

$x + 8 = 7$

Subtracting 8 from both sides, we get

$x + 8 - 8 = 7 - 8$

$x = -1$

Verification :

Substituting x = -1 in LHS, we get

LHS = 3 (x + 2) -2(x -1) = 3 (-1 + 2) -2(-1-1) = (3×1) − (2×-2) = 3 + 4 = 7, and RHS = 7

LHS = RHS

Hence, verified .

Q18. $8(2x - 5) - 6(3x - 7) = 1$

SOLUTION :

$8(2x - 5) - 6(3x - 7) = 1$

On expanding the brackets, we get $(8 \times 2x) - (8 \times 5) - (6 \times 3x) + (-6) \times (-7) = 1$

$16x - 40 - 18x + 42 = 1$

$16x - 18x + 42 - 40 = 1$

$-2x + 2 = 1$

Subtracting 2 from both sides, we get

$-2x + 2 - 2 = 1 - 2$

$-2x = -1$

Multiplying both sides by -1, we get

$-2x \times (-1) = -1 \times (-1)$

$2x = 1$

Dividing both sides by 2, we get

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

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

Verification :

Substituting $x = \frac{1}{2}$ in LHS, we get

$= 8(2 \times \frac{1}{2} - 5) - 6(3 \times \frac{1}{2} - 7)$

$= 8(1 - 5) - 6(32 - 7)$

$= 8 \times (-4) - (6 \times 32) + (6 \times 7) = -32 - 9 + 42 = -41 + 42 = 1 = RHS$

LHS = RHS

Hence, verified .

Q19. $6(1 - 4x) + 7(2 + 5x) = 53$

SOLUTION :

$6(1 - 4x) + 7(2 + 5x) = 53$

On expanding the brackets, we get $(6 \times 1) - (6 \times 4x) + (7 \times 2) + (7 \times 5x) = 53$

$6 - 24x + 14 + 35x = 53$

$6 + 14 + 35x - 24x = 53$

$20 + 11x = 53$

Subtracting 20 from both sides, we get $20 + 11x - 20 = 53 - 20$

$11x = 33$

Dividing both sides by 11, we get

$\frac{11x}{11} = \frac{33}{11}$

$x = 3$

Verification :

Substituting $x = 3$ in LHS, we get

$= 6(1 - 4 \times 3) + 7(2 + 5 \times 3)$

$= 6(1 - 12) + 7(2 + 15)$

$= 6(-11) + 7(17)$

$= -66 + 119$

$= 53 = $ RHS

LHS = RHS

Hence, verified.

Q20. $5(2 - 3x) - 17(2x - 5) = 16$

SOLUTION :

$5(2 - 3x) - 17(2x - 5) = 16$

On expanding the brackets , we get $(5 \times 2) - (5 \times 3x) - (17 \times 2x) + (17 \times 5) = 16$

$10 - 15x - 34x + 85 = 16$

$10 + 85 - 34x - 15x = 16$

$95 - 49x = 16$

Subtracting 95 from both sides, we get $- 49x + 95 - 95 = 16 - 95$

$-49x = -79$

Dividing both sides by -49, we get

$$\frac{-49x}{-49} = \frac{-79}{-49}$$

$$x = \frac{79}{49}$$

Verification :

Substituting $x = \frac{79}{49}$ in LHS, we get

$$= 5(2 - 3 \times \frac{79}{49}) - 17(2 \times \frac{79}{49} - 5)$$

$$= (5 \times 2) - (5 \times 3 \times \frac{79}{49}) - (17 \times 2 \times \frac{79}{49}) + (17 \times 5)$$

$$= 10 - \frac{1185}{49} - \frac{2686}{49} + 85$$

$$= \frac{490 - 1185 - 2686 + 4165}{49} = \frac{784}{49} = 16 = RHS$$

LHS = RHS

Hence, verified.

Q21. $\frac{x-3}{5} - 2 = -1$

SOLUTION :

$$\frac{x-3}{5} - 2 = -1$$

Adding 2 to both sides, we get

$$\frac{x-3}{5} - 2 + 2 = -1 + 2$$

$$\frac{x-3}{5} = 1$$

Multiplying both sides by 5, we get

$$\frac{x-3}{5} \times 5 = 1 \times 5$$

$$x - 3 = 5$$

Adding 3 to both sides, we get

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

$$x = 8$$

Verification :

Substituting $x = 8$ in LHS, we get

$$= \frac{8-3}{5} - 2 = \frac{5}{5} - 2 = 1 - 2 = -1 = RHS$$

LHS = RHS

Hence, verified.

Q22. $5(x - 2) + 3(x + 1) = 25$

SOLUTION :

$5(x - 2) + 3(x + 1) = 25$

On expanding the brackets, we get

$(5 \times x) - (5 \times 2) + 3 \times x + 3 \times 1 = 25$

$5x - 10 + 3x + 3 = 25$

$5x + 3x - 10 + 3 = 25$

$8x - 7 = 25$

Adding 7 to both sides, we get

$8x - 7 + 7 = 25 + 7$

$8x = 32$

Dividing both sides by 8, we get

$\frac{8x}{8} = \frac{32}{8}$

$x = 4$

Verification :

Substituting x= 4 in LHS, we get

$= 5(4 - 2) + 3(4 + 1) = 5(2) + 3(5) = 10 + 15 = 25 = RHS$

LHS = RHS

Hence, verified.

Q1. 6x + 5 = 2x + 17

SOLUTION :

We have

$6x + 5 = 2x + 17$

Transposing 2x to LHS and 5 to RHS, we get

$6x - 2x = 17 - 5$

$4x = 12$

Dividing both sides by 4, we get

$$\frac{4x}{4} = \frac{12}{4}$$

$x = 3$

Verification :

Substituting x = 3 in the given equation, we get

$6 \times 3 + 5 = 2 \times 3 + 17$

$18 + 5 = 6 + 17$

$23 = 23$

LHS = RHS

Hence, verified.

Q2. 2(5x − 3)-3(2x − 1)= 9

SOLUTION :

We have

$2(5x - 3) - 3(2x - 1) = 9$

Expanding the brackets, we get

$2 \times 5x - 2 \times 3 - 3 \times 2x + 3 \times 1 = 9$

$10x - 6 - 6x + 3 = 9$

$10x - 6x - 6 + 3 = 9$

$4x - 3 = 9$

Adding 3 to both sides, we get

$4x - 3 + 3 = 9 + 3$

$4x = 12$

Dividing both sides by 4, we get

$$\frac{4x}{4} = \frac{12}{4}$$

Thus, $x = 3$.

Verification :

Substituting $x = 3$ in LHS, we get

$= 2(5 \times 3 - 3) - 3(2 \times 3 - 1)$

$= 2 \times 12 - 3 \times 5$

$= 24 - 15$

$= 9$

LHS = RHS

Hence, verified.

Q3 . $\frac{x}{2} = \frac{x}{3} + 1$

SOLUTION :

$\frac{x}{2} = \frac{x}{3} + 1$

Transposing $\frac{x}{2}$ to LHS , we get

$\frac{x}{2} - \frac{x}{3} = 1$

$\frac{3x - 2x}{6} = 1$

$\frac{x}{6} = 1$

Multiplying both sides by 6, we get

$\frac{x}{6} \times 6 = 1 \times 6$

$x = 6$

Verification :

Substituting x = 6 in the given equation, we get

$$\frac{6}{2} = \frac{6}{3} + 1$$

$$3 = 2 + 1$$

$$3 = 3$$

LHS = RHS

Hence, verified.

Q4. $\frac{x}{2} + \frac{3}{2} = \frac{2x}{5} - 1$

SOLUTION :

$$\frac{x}{2} + \frac{3}{2} = \frac{2x}{5} - 1$$

Transposing $\frac{2x}{5}$ to LHS and $\frac{3}{2}$ to RHS, we get

$$\Rightarrow \frac{x}{2} - \frac{2x}{5} = -1 - \frac{3}{2}$$

$$\Rightarrow \frac{5x - 4x}{10} = \frac{-2 - 3}{2}$$

$$\Rightarrow \frac{x}{10} = \frac{-5}{2}$$

Multiplying both sides by 10, we get

$$\Rightarrow \frac{x}{10} \times 10 = \frac{-5}{2} \times 10$$

$$\Rightarrow x = -25$$

Verification :

Substituting x = -25 in the given equation, we get

$$\frac{-25}{2} + \frac{3}{2} = \frac{2(-25)}{5} - 1$$

$$\frac{-22}{2} = -10 - 1$$

$$-11 = -11$$

LHS = RHS

Hence, verified.

Q5. $\frac{3}{4}(x - 1) = x - 3$

SOLUTION :

$\frac{3}{4}(x - 1) = x - 3$

On expanding the brackets on both sides, we get

$\Rightarrow \frac{3x}{4} - \frac{3}{4} = x - 3$

Transposing $\frac{3x}{4}$ to RHS and 3 to LHS, we get

$\Rightarrow 3 - \frac{3}{4} = x - \frac{3x}{4}$

$\Rightarrow \frac{12-3}{4} = \frac{4x-3x}{4}$

$\Rightarrow \frac{9}{4} = \frac{x}{4}$

Multiplying both sides by 4, we get

$\Rightarrow x = 9$

Verification :

Substituting x = 9 on both sides, we get

$\frac{3}{4}(9 - 1) = 9 - 3$

$\frac{3}{4}$ [/latex] $\times 8 = 6$

$6 = 6$

LHS = RHS

Hence, verified.

Q6. $3(x - 3) = 5(2x + 1)$

SOLUTION :

$3(x - 3) = 5(2x + 1)$

On expanding the brackets on both sides, we get

$\Rightarrow 3 \times x - 3 \times 3 = 5 \times 2x + 5 \times 1$

$\Rightarrow 3x - 9 = 10x + 5$

Transposing 10x to LHS and 9 to RHS, we get

$\Rightarrow 3x - 10x = 9 + 5$

$\Rightarrow -7x = 14$

Dividing both sides by 7, we get

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

$$\Rightarrow x = -2$$

Verification :

Substituting x = -2 on both sides, we get

$$3(-2 - 3) = 5\{2(-2) + 1\}$$

$$3(-5) = 5(-3)$$

$$-15 = -15$$

LHS = RHS

Hence, verified.

Q7. 3x − 2(2x − 5) = 2(x + 3) − 8

SOLUTION :

$$3x - 2(2x - 5) = 2(x + 3) - 8$$

On expanding the brackets on both sides, we get

$$\Rightarrow 3x - 2 \times 2x + 2 \times 5 = 2 \times x + 2 \times 3 - 8$$

$$\Rightarrow 3x - 4x + 10 = 2x + 6 - 8$$

$$\Rightarrow -x + 10 = 2x - 2$$

Transposing x to RHS and 2 to LHS, we get

$$\Rightarrow 10 + 2 = 2x + x$$

$$\Rightarrow 3x = 12$$

Dividing both sides by 3, we get

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

$$\Rightarrow x = 4$$

Verification :

Substituting x = 4 on both sides, we get

$$3(4) - 2\{2(4) - 5\} = 2(4 + 3) - 8$$

$$12 - 2(8 - 5) = 14 - 8$$

$$12 - 6 = 6$$

$$6 = 6$$

LHS = RHS

Hence, verified.

Q8. $x - \frac{x}{4} - \frac{1}{2} = 3 + \frac{x}{4}$

SOLUTION :

$x - \frac{x}{4} - \frac{1}{2} = 3 + \frac{x}{4}$

Transposing $\frac{x}{4}$ to LHS and $-\frac{1}{2}$ to RHS, we get

$\Rightarrow x - \frac{x}{4} - \frac{x}{4} = 3 + \frac{1}{2}$

$\Rightarrow \frac{4x - x - x}{4} = \frac{6+1}{2}$

$\Rightarrow \frac{2x}{4} = \frac{7}{2}$

Multiplying both sides by 4, we get

$\Rightarrow \frac{2x}{4} \times 4 = \frac{7}{2} \times 4$

$\Rightarrow 2x = 14$

Dividing both sides by 2, we get

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

$\Rightarrow x = 7$

Verification :

Substituting x = 7 on both sides, we get

$7 - \frac{7}{4} - \frac{1}{2} = 3 + \frac{7}{4}$

$\frac{28 - 7 - 2}{4} = \frac{12 + 7}{4}$

$\frac{19}{4} = \frac{19}{4}$

LHS = RHS

Hence, verified.

Q9. $\dfrac{6x-2}{9} + \dfrac{3x+5}{18} = \dfrac{1}{3}$

SOLUTION :

$$\dfrac{6x-2}{9} + \dfrac{3x+5}{18} = \dfrac{1}{3}$$

$$\Rightarrow \dfrac{6x(2)-2(2)+3x+5}{18} = \dfrac{1}{3}$$

$$\Rightarrow \dfrac{12x-4+3x+5}{18} = \dfrac{1}{3}$$

$$\Rightarrow \dfrac{15x+1}{18} = \dfrac{1}{3}$$

Multiplying both sides by 18, we get

$$\Rightarrow \dfrac{15x+1}{18} \times 18 = \dfrac{1}{3} \times 18$$

$$\Rightarrow 15x + 1 = 6$$

Transposing 1 to RHS, we get

$$\Rightarrow 15x = 6 - 1$$

$$\Rightarrow 15x = 5$$

Dividing both sides by 15, we get

$$\Rightarrow \dfrac{15x}{15} = \dfrac{5}{15}$$

$$\Rightarrow x = \dfrac{1}{3}$$

Verification :

Substituting $x = \dfrac{1}{3}$ on both sides, we get

$$\dfrac{6(\frac{1}{3})-2}{9} + \dfrac{3(\frac{1}{3})+5}{18} = \dfrac{1}{3}$$

$$\dfrac{2-2}{9} + \dfrac{1+5}{18} = \dfrac{1}{3}$$

$$0 + \dfrac{6}{18} = \dfrac{1}{3}$$

$$\dfrac{1}{3} = \dfrac{1}{3}$$

LHS = RHS

Hence, verified.

Q10. $m - \frac{m-1}{2} = 1 - \frac{m-2}{3}$

SOLUTION :

$m - \frac{m-1}{2} = 1 - \frac{m-2}{3}$

$\Rightarrow \frac{2m-m+1}{2} = \frac{3-m+2}{3}$

$\Rightarrow \frac{m+1}{2} = \frac{5-m}{3}$

$\Rightarrow \frac{m+1}{2} = \frac{5}{3} - \frac{m}{3}$

$\Rightarrow \frac{m}{2} + \frac{1}{2} = \frac{5}{3} - \frac{m}{3}$

Transposing $\frac{m}{3}$ to LHS and 1/2 to RHS, we get

$\Rightarrow \frac{m}{2} + -\frac{m}{3} = \frac{5}{3} - \frac{1}{2}$

$\Rightarrow \frac{3m+2m}{6} = \frac{10-3}{6}$

Multiplying both sides by 6, we get

$\Rightarrow \frac{5m}{6} \times 6 = \frac{7}{6} \times 6$

$\Rightarrow 5m = 7$

Dividing both sides by 5, we get

$\Rightarrow \frac{5m}{5} = \frac{7}{5}$

$\Rightarrow m = \frac{7}{5}$

Verification :

Substituting $m = \frac{7}{5}$ on both sides, we get

$\frac{7}{5}$ − [Missing close brace]) − 1}{2}[/latex] = 1 − [Missing close brace]) − 2}{3}[/latex]

$\frac{7}{5} - \frac{7-5}{10} = 1 - \frac{7-10}{15} \quad \frac{7}{5} - \frac{2}{10} = \frac{15+3}{15} \quad \frac{14-2}{10} = \frac{15+3}{15} \quad \frac{12}{10} = \frac{18}{15} \quad \frac{6}{5} = \frac{6}{5}$

LHS = RHS

Hence, verified.

Q11. $\dfrac{5x-1}{3} - \dfrac{2x-2}{3} = 1$

SOLUTION :

$$\frac{5x-1}{3} - \frac{2x-2}{3} = 1$$

$$\frac{5x-1-2x+2}{3} = 1$$

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

Multiplying both sides by 3, we get 3

$$\frac{3x+1}{3} \times 3 = 1 \times 3$$

$$\Rightarrow 3x + 1 = 3$$

Subtracting 1 from both sides, we get

$$\Rightarrow 3x + 1 - 1 = 3 - 1$$

$$\Rightarrow 3x = 2$$

Dividing both sides by 3, we get

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

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

Verification:

Substituting $x = \dfrac{2}{3}$ in LHS, we get

Missing close brace)-1}{3}[/latex]− Missing close brace)-2}{3}[/latex] = 1

$$= \frac{5\left(\frac{2}{3}\right)-1}{3} - \frac{2\left(\frac{2}{3}\right)-2}{3}$$

$$= \frac{\left(\frac{10}{3}\right)-1}{3} - \frac{\left(\frac{4}{3}\right)-2}{3}$$

$$= \frac{\frac{10-3}{3}}{3} - \frac{\frac{4-6}{3}}{3}$$

$$= \frac{10-3}{9} - \frac{4-6}{9}$$

$$= \frac{7}{9} + \frac{2}{9}$$

$$= \frac{9}{9}$$

$$= \text{RHS}$$

LHS = RHS Hence, verified.

Q12. $0.6x + \frac{4}{5} = 0.28x + 1.16$

SOLUTION :

$0.6x + \frac{4}{5} = 0.28x + 1.16$

Transposing $0.28x$ to LHS and $\frac{4}{5}$ to RHS, we get

$\Rightarrow 0.6x - 0.28x = 1.16 - \frac{4}{5}$

$\Rightarrow 0.32x = 1.16 - 0.8$

$\Rightarrow 0.32x = 0.36$

Dividing both sides by 0.32, we get

$\Rightarrow \frac{0.32x}{0.32} = \frac{0.36}{0.32}$

$\Rightarrow x = \frac{9}{8}$

Verification:

Substituting $x = \frac{9}{8}$ on both sides, we get

$0.6\left(\frac{9}{8}\right) + \frac{4}{5} = 0.28\left(\frac{9}{8}\right) + 1.16$

$\frac{5.4}{8} + \frac{4}{5} = \frac{2.52}{8} + 1.16$

$0.675 + 0.8 = 0.315 + 1.16$

$1.475 = 1.475$

LHS = RHS

Hence, verified.

Q13. $0.5x + \frac{x}{3} = 0.25x + 7$

SOLUTION :

$0.5x + \frac{x}{3} = 0.25x + 7$

$\frac{5}{10}x + \frac{x}{3} = \frac{25x}{100} + 7$

$\frac{x}{2} + \frac{x}{3} = \frac{x}{4} + 7$

Transposing $\frac{x}{4}$ to LHS , we get

$\frac{x}{2} + \frac{x}{3} - \frac{x}{4} = 7$

$\frac{6x+4x-3x}{12} = 7$

$\frac{7x}{12} = 7$

Multiplying both sides by 12, we get

$\frac{7x}{12} \times 12 = 7 \times 12$

=> 7x = 84

Dividing both sides by 7, we get

=> $\frac{7x}{7} = \frac{84}{7}$

=> x = 12

Verification:

Substituting x = 12 on both sides, we get

0.5(12) + (12)3 = 0.25(12) + 7

6 + 4 = 3 + 7

10 = 10

LHS = RHS

Hence, verified.

Exercise 8.4

Q 1. If 5 is subtracted from three times a number, the result is 16. Find the number.

SOLUTION :

Let the required number be 'x'. Then, 5 subtracted from 3 times x = 3x − 5.

=> 3x − 5 = 16

Adding 5 to both sides, we get = 3x − 5 + 5 = 16 + 5

=> 3x = 21

Dividing both sides by 3, we get

$$\frac{3x}{3} = \frac{21}{3}$$

x = 7

Thus, the required number is 7.

Q 2. Find the number which when multiplied by 7 is increased by 78.

SOLUTION :

Let the required number be 'x'. Thus, when multiplied by 7, it gives 7x, and x increases by 78.

7x = x + 78

Transposing x to LHS, we get

7x − x = 78

6x = 78

Dividing both sides by 6, we get

$$\frac{6x}{6} = \frac{78}{6}$$

x = 13

Thus, the required number is 13.

Q 3. Find three consecutive natural numbers such that the sum of the first and second is 15 more than the third.

SOLUTION :

Let the first number be 'x'. Hence, the second number = x + 1 and the third number = x + 2.

=> Sum of first and second numbers = (x) + (x + 1).

According to question:

(x) + (x + 1) = 15 + (x + 2)

=> 2x + 1 = 17 + x

Transposing x to LHS and 1 to RHS, we get

=> 2x − x = 17 − 1

=> x = 16

So, first number = x = 16, second number = x + 1 = 16 + 1 = 17 and third number = x + 2 = 16 + 2 = 18

Thus, the required consecutive natural numbers are 16, 17 and 18.

Q 4. The difference between two numbers is 7. Six times the smaller plus the larger is 77. Find the numbers.

SOLUTION :

Let the smaller number be 'x'. So, the larger number = x + 7.

According to question:

6x + (x + 7) = 77

6x + x + 7 = 77

7x + 7 = 77

Subtracting 7 from both sides, we get

7x + 7 − 7 = 77 − 7

7x = 70

Dividing both sides by 7, we get

$\frac{7x}{7} = \frac{70}{7}$

x = 10

Thus, the smaller number = x = 10, and the larger number = x + 7 = 10 + 7 = 17.

The two required numbers are 10 and 17.

Q 5. *A man says, "I am thinking of a number. When I divide it by 3 and then add 5, my answer is twice the number I thought of ". Find the number.*

SOLUTION :

Let the number thought of by the man be 'x'.

So, According to question:

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

Transposing $\frac{x}{3}$ to RHS, we get

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

$5 = 6x - \frac{x}{3}$

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

Multiplying both sides by 3, we get

$5 \times 3 = \frac{5x}{3} \times 3$

$15 = 5x$

Dividing both sides by 5, we get

$\frac{15}{5} = \frac{5x}{5}$

$x = 3$

Thus, the number thought of by the man is 3.

Q 6. If a number is tripled and the result is increased by 5, we get 50. Find the number.

SOLUTION :

Let the required number be 'x'.

So, According to question:

=> 3x + 5 = 50

Subtracting 5 from both sides, we get

=> 3x + 5 − 5 = 50 − 5

=> 3x = 45

Dividing both sides by 3, we get

$\frac{3x}{3} = \frac{45}{3}$

x = 15

Thus, the required number is 15.

Q 7. Shikha is 3 years younger to her brother Ravish. If the sum of their ages is 37 years, what are their present ages?

SOLUTION :

Let the present age of Shikha = 'x' years.

So, the present age of Shikha's brother Ravish = (x + 3) years.

So, sum of their ages = x + (x+ 3)

=> x +(x + 3)= 37

=> 2x + 3 = 37

Subtracting 3 from both sides, we get

=> 2x+ 3 − 3 = 37 − 3

=> 2x = 34

Dividing both sides by 2, we get

=> $\frac{2x}{2} = \frac{34}{2}$

=> x = 17

So, the present age of Shikha = 17 years, and the present age of Ravish = x + 3 = 17 + 3 = 20 years.

Q 8. Mrs. Jain is 27 years older than her daughter Nilu . After 8 years she will be twice as old as Nilu. Find their present ages .

SOLUTION :

Let the present age of Nilu = 'x' years.

Therefore, the present age of Nilu's mother, Mrs. Jain = (x + 27) years.

So, after 8 years,

Nilu's age = (x + 8), and Mrs. Jain's age = (x + 27 + 8) = (x + 35) years

=> x + 35 = 2(x + 8)

Expanding the brackets, we get

=> x + 35 = 2x + 16

Transposing x to RHS and 16 to LHS, we get

=> 35 − 16 = 2x − x

=> x = 19

So, the present age of Nilu = x = 19 years, and the present age of Nilu's mother = x+ 27 = 19 + 27 = 46 years.

Q 9. A man is 4 times as old as his son . After 16 years, he will be only twice as old as his son . Find the their present ages.

SOLUTION :

Let the present age of the son = 'x' years.

Therefore, the present age of his father = '4x' years.

So, after 16 years,

Son's age = (x + 16) and father's age = (4x + 16) years

According to question:

=> 4x + 16 = 2(x + 16)

=> 4x + 16 = 2x + 32

Transposing 2x to LHS and 16 to RHS, we get

=> 4x − 2x = 32 − 16

=> 2x = 16

Dividing both sides by 2, we get

$$\frac{2x}{2} = \frac{16}{2}$$

=>x = 8

So, the present age of the son = x = 8 years, and the present age of the father = 4x = 4(8) = 32 years.

Q 10. The difference in age between a girl and her younger sister is 4 years. The younger sister in turn is 4 years older than her brother. The sum of the ages of the younger sister and her brother is 16. How old are the three children?

SOLUTION :

Let the age of the girl = 'x' years.

So, the age of her younger sister = (x − 4) years.

Thus, the age of the brother = (x − 4 − 4) years = (x − 8) years.

According to question:

(x − 4) + (x − 8) = 16

x + x − 4 − 8 = 16

2x − 12 = 16

Adding 12 to both sides, we get

2x − 12 + 12 = 16 + 12

2x = 28

Dividing both sides by 2, we get

$\frac{2x}{2} = \frac{28}{2}$

x = 14

Thus, the age of the girl = x = 14 years, the age of the younger sister = x − 4 = 14 − 4 = 10 years, and the age of the younger brother = x − 8 = 14 − 8 = 6 years.

Q 11. *One day, during their vacation at a beach resort, Shelia found twice as many sea shells as Anita and Anita found 5 shells more than sandy. Together sandy and Sheila found 16 sea shells. How many did each of them find?*

SOLUTION :

Let the number of sea shells found by Sandy = 'x'.

So, the number of sea shells found by Anita = (x + 5).

The number of sea shells found by Shelia = 2 (x + 5).

According to the question,

=> x + 2(x + 5) = 16

=> x + 2x +10 = 16 = 3x + 10 = 16

Subtracting 10 from both sides, we get

=> 3x + 10 − 10 = 16 − 10

=> 3x = 6

Dividing both sides by 3, we get

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

=> x = 2

Thus, the number of sea shells found by Sandy = x = 2, the number of sea shells found by Anita = x + 5 = 2 + 5 = 7,

and the number of sea shells found by Shelia = 2(x + 5) = 2(2 + 5) = 2(7) = 14.

Q 12. Andy has twice as many marbles as Pandy, and Sandy has half as many has Andy and Pandy put together. If Andy has 75 marbles more than Sandy. How many does each of them have?

SOLUTION :

Let the number of marbles with Pandy = 'x'.

So, the number of marbles with Andy = '2x'.

Thus, the number of marbles with Sandy = $\frac{x}{2} + \frac{2x}{2} = \frac{3x}{2}$.

According to the question,

$2x + 75 = \frac{3x}{2}$

$2x - \frac{3x}{2} = -75$

$\frac{4x - 3x}{2} = -75$

$\frac{x}{2} = -75$

$x = -150$

Since, no. of marbles cannot be negative.

Therefore, x = 150

So, Pandy has 150 marbles, Andy has 2x = 2(150) = 300 marbles,

and Sandy has $\frac{3x}{2}$ = 225 marbles.

Q 13. A bag contains 25 paise and 50 paise coins whose total value is Rs 30. If the number of 25 paise coins is four times that of 50 paise coins, find the number of each type of coins.

SOLUTION :

Let the number of 50 paise coins = 'x'.

So, the money value contribution of 50 paise coins = 0.5x.

The number of 25 paise coins = '4x'.

The money value contribution of 25 paise coins = 0.25(4x) = x.

According to the question,

0.5x + x = 30

=> 1.5x = 30

Dividing both sides by 1.5, we get

=> $\frac{1.5x}{1.5} = \frac{30}{1.5}$

=> x = 20

Thus, the number of 50 paise coins = 'x' = 20, and the number of 25 paise coins = '4x' = 4 (20) = 80.

Q 14. The length of a rectangular field is twice its breadth. If the perimeter of the field is 228 metres, find the dimensions of the field.

SOLUTION :

Let the breadth of the rectangle = 'x' metres.

According to the question,

Length of the rectangle = '2x' metres

Perimeter of a rectangle = 2 (length + breadth)

So,   2 (2x + x) = 228

=> 2 (3x) = 228

=> 6x = 228

Dividing both sides by 6, we get

=> $\frac{6x}{6} = \frac{228}{6}$

=> x = 38

So, the breadth of the rectangle = x = 38 metres,

and the length of the rectangle = 2x = 2(38) = 76 metres.

Q 15. There are only 25 paise coins in a purse. The value of money in the purse is Rs 17.50. Find the number of coins in the purse.

SOLUTION :

Let the number of 25-paise coins in the purse be 'x'.

So, the value of money in the purse = 0.25x.

But 0.25x = 17.5.

Dividing both sides by 0.25, we get

=> $\frac{0.25x}{0.25} = \frac{17.5}{0.25}$

=> x = 70

Thus, the number of 25-paise coins in the purse = 70.

Q 16. In a hostel mess, 50 kg rice are consumed everyday. If each student gets 400 gm of rice per day, find the number of students who take meals in the hostel mess.

SOLUTION :

Let the number of students in the hostel be 'x'.

Quantity of rice consumed by each student = 400 gm.

So, daily rice consumption in the hostel mess = 400(x).

But, daily rice consumption = 50 kg = 50 × 1000 = 50000 gm [since 1 kg = 1000 gm].

According to the question,

400x = 50000

Dividing both sides by 400, we get

=> $\frac{400x}{400} = \frac{50000}{400}$

=> x = 125

Thus, 125 students have their meals in the hostel mess.