

Board – CBSE

Class – 8th

Topic – Linear Equation 2.5

**Q.1** Solve the following linear equations,  $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$ .

**Sol:** The given linear equation is

$$\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$$

$$\Rightarrow \frac{x}{2} - \frac{x}{3} = \frac{1}{4} + \frac{1}{5} \quad \left(\text{Transposing } \frac{x}{3} \text{ to L.H.S. and } \frac{1}{5} \text{ to R.H.S.}\right)$$

$$\Rightarrow \frac{3x-2x}{6} = \frac{5+4}{20} \Rightarrow \frac{x}{6} = \frac{9}{20}$$

$$\Rightarrow \frac{x}{6} = \frac{9}{20}$$

$$\Rightarrow \frac{x \times 6}{6} = \frac{9 \times 6}{20} \quad \left(\text{Multiplying both sides by 6}\right)$$

$$\text{or } x = \frac{27}{10}$$

To check:

On putting  $x = \frac{27}{10}$  in L.H.S. and R.H.S. of the given equation,

$$\text{L.H.S.} = \frac{x}{2} - \frac{1}{5} = \frac{27}{2 \times 10} - \frac{1}{5} = \frac{27}{20} - \frac{1}{5} = \frac{27-4}{20} = \frac{23}{20}$$

$$\text{R.H.S.} = \frac{x}{3} + \frac{1}{4} = \frac{27}{3 \times 10} + \frac{1}{4} = \frac{9}{10} + \frac{1}{4} = \frac{18+5}{20} = \frac{23}{20}$$

$$\Rightarrow \text{L.H.S.} = \text{R.H.S.}$$

Hence, the value of  $x = \frac{27}{10}$  is the required solution.

**Q.2** Solve the following linear equations,  $\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$ .

**Sol:** The given linear equation is  $\frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} = 21$

$$\frac{6n-9n+10n}{12} = 21 \quad \left(\text{L.C.M. of 2, 4 and 6 is 12}\right)$$

$$\Rightarrow \frac{7n}{12} = \frac{21}{1}$$

$$\Rightarrow 7n = 21 \times 12 \quad \left(\text{By cross multiplication}\right)$$

$$\Rightarrow \frac{7n}{7} = \frac{21 \times 12}{7} \quad \left(\text{Dividing both sides by 7}\right)$$

$$\text{or } n = 36$$

To check:

On putting  $n = 36$  in L.H.S. of the given equation,

L.H.S.:

$$\begin{aligned} &= \frac{n}{2} - \frac{3n}{4} + \frac{5n}{6} \\ &= \frac{36}{2} - \frac{3 \times 36}{4} + \frac{5 \times 36}{6} \\ &= 18 - 3 \times 9 + 5 \times 6 \\ &= 18 - 27 + 30 = 21 = \text{R.H.S.} \end{aligned}$$

Hence, the value of  $n = 36$  is the required solution.

**Q.3** Solve the following linear equation,  $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$ .

**Sol:** The given linear equation is

$$x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{2}$$

$\Rightarrow$

$$\frac{x}{1} - \frac{8x}{3} + \frac{5x}{2} = \frac{17}{6} - \frac{7}{1} \quad \left( \text{Transposing } \frac{5x}{2} \text{ to L.H.S. and } 7 \text{ to R.H.S.} \right)$$

$$\Rightarrow \frac{6x - 16x + 15x}{6} = \frac{17 - 42}{6}$$

$$\Rightarrow \left( \frac{21x - 16x}{6} \right) = \frac{-25}{6}$$

$$\Rightarrow \frac{5x}{6} = \frac{-25}{6}$$

$$\Rightarrow 5x \times 6 = 6 \times -25 \quad \text{(By cross multiplication)}$$

$$\Rightarrow 30x = -150$$

$$\Rightarrow x = \frac{-150}{30} \quad \text{(Dividing both sides by 30)}$$

$$\text{or } x = -5$$

To check:

On putting,  $x = -5$  in L.H.S. and R.H.S. of the given equation,

$$\text{L.H.S.} = x + 7 - \frac{8x}{3} = -5 + 7 - \frac{8 \times (-5)}{3} = 2 + \frac{40}{3} = \frac{6+40}{3} = \frac{46}{3}$$

$$\text{R.H.S.} = \frac{17}{6} - \frac{5x}{2} = \frac{17}{6} - \frac{5 \times (-5)}{2} = \frac{17}{6} + \frac{25}{2} = \frac{17+75}{6} = \frac{92}{6}$$

$$= \frac{46}{3} = L.H.S.$$

$$\Rightarrow L.H.S. = R.H.S.$$

Hence, the value of  $x = -5$  is the required solution.

**Q.4** Solve the following linear equations,  $\frac{x-5}{3} = \frac{x-3}{5}$ .

**Sol:** The given linear equation is

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

$$\Rightarrow 5 \times (x - 5) = 3 \times (x - 3) \quad (\text{By cross multiplication})$$

$$\Rightarrow 5x - 25 = 3x - 9$$

$$\Rightarrow 5x - 3x = -9 + 25 \quad (\text{Transposing } 3x \text{ to L.H.S. and } 25 \text{ to R.H.S.)}$$

$$\Rightarrow 2x = 16$$

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

$$\text{or } x = 8$$

To check:

On putting  $x = 8$  in L.H.S. and R.H.S. of the given equation,

$$L.H.S. = \frac{x-5}{3} = \frac{8-5}{3} = \frac{3}{3} = 1$$

$$R.H.S. = \frac{x-3}{5} = \frac{8-3}{5} = \frac{5}{5} = 1$$

$$\Rightarrow L.H.S. = R.H.S.$$

Hence, the value of  $x = 8$  is the required solution.

**Q.5** Solve the following linear equations,  $\frac{3t-2}{4} - \frac{2t+3}{3} = \frac{2}{3} - t$ .

**Sol:** The given linear equation is

$$\frac{3t-2}{4} - \frac{2t+3}{3} = \frac{2}{3} - t$$

$$\Rightarrow \frac{3(3t-2) - 4(2t+3)}{12} = \frac{2-3t}{3} \quad (\text{L.C.M. of 4 and 3 is 12})$$

$$\Rightarrow \frac{9t-6-8t-12}{12} = \frac{2-3t}{3}$$

$$\Rightarrow \frac{t-18}{12} = \frac{2-3t}{3}$$

$$\Rightarrow t - 18 = 12 \times \frac{(2-3t)}{3} = 4(2 - 3t) \quad (\text{Multiplication both sides by 12})$$

$$\Rightarrow t - 18 = 8 - 12t$$

$$\Rightarrow t + 12t = 8 + 18$$

(Transposing 12t to L.H.S. and 18 to

R.H.S.)

$$\Rightarrow 13t = 26$$

$$\Rightarrow t = \frac{26}{13}$$

(Dividing both sides by 13)

$$\text{or } t = 2$$

To check;

On putting  $t = 2$  in L.H.S. and R.H.S. of the given equation,

L.H.S.:

$$= \frac{3t-2}{4} - \frac{2t+3}{3} = \frac{3 \times 2 - 2}{4} - \frac{2 \times 2 + 3}{3}$$

$$= \frac{6-2}{4} - \frac{4+3}{3} = \frac{4}{4} - \frac{7}{3}$$

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

R.H.S.:

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

$$= \frac{2-6}{3} = \frac{-4}{3}$$

$$\Rightarrow \text{L.H.S.} = \text{R.H.S.}$$

Hence, the value of  $t = 2$  is the required solution.

**Q.6** Solve the following linear equations,  $m - \frac{m-1}{2} = 1 - \frac{m-2}{3}$ .

**Sol:** The given linear equation is

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

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

(Transposing  $\frac{m-2}{3}$  to R.H.S.)

$$\Rightarrow \frac{6m-3(m-1)+2(m-2)}{6} = 1$$

(L.C.M. of 1, 2 and 3 is 6)

$$\Rightarrow \frac{6m-3m+3+2m-4}{6} = 1$$

$$\Rightarrow \frac{5m-1}{6} = 1$$

$$\Rightarrow 5m - 1 = 6 \text{ (Multiplying both sides by 6)}$$

$$\Rightarrow 5m = 6 + 1 \text{ (Transposing 1 to R.H.S.)}$$

$$\Rightarrow 5m = 7$$

$$\Rightarrow m = \frac{7}{5} \text{ (Dividing both sides by 5)}$$

To check:

On putting  $m = \frac{7}{5}$  in L.H.S. and R.H.S. of the given equation,

L.H.S.:

$$= m - \frac{m-1}{2} = \frac{7}{5} - \frac{\frac{7}{5}-1}{2} = \frac{7}{5} - \frac{\frac{7-5}{5}}{2} = \frac{7}{5} - \frac{2}{5}$$

$$= \frac{7}{5} - \frac{2}{5} = \frac{7-2}{5} = \frac{5}{5} = 1$$

R.H.S. :

$$= 1 - \frac{m-2}{3} = 1 - \frac{\frac{7}{5}-2}{3}$$

$$= 1 - \frac{\frac{7-10}{5}}{3} = 1 - \frac{(-3)}{15}$$

$$= 1 + \frac{3}{15} = 1 + \frac{1}{5} = \frac{5+1}{5} = \frac{6}{5}$$

$\Rightarrow$  L.H.S. = R.H.S.

Hence, the value of  $m = \frac{7}{5}$  is the required solution.

**Q.7** Simplify and solve the following linear equations,  $3(t - 3) = 5(2t + 1)$ .

**Sol:** The given linear equation is  $3(t - 3) = 5(2t + 1)$

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

$$\Rightarrow 3t - 10t = 9 + 5 \quad \text{(Transposing 9 to R.H.S. and 10t to L.H.S.)}$$

$$\Rightarrow -7t = 14$$

$$\Rightarrow t = \frac{14}{-7} \quad \text{(Dividing both sides by -7)}$$

$$\text{Or } t = -2$$

To check:

$$\text{L.H.S.} = 3(t - 3) = 3(-2 - 3) = 3(-5) = -15$$

$$\text{R.H.S.} = 5(2t + 1) = 5\{2 \times (-2) + 1\} = 5\{-4 + 1\} = 5(-3) = -15$$

$\Rightarrow$  L.H.S. = R.H.S.

Hence,  $t = -2$  is the required solution.

**Q.8** Simplify and solve the following linear equations,  $15(y - 4) - 2(y - 9) + 5(y + 6) = 0$ .

**Sol:**  $15(y - 4) - 2(y - 9) + 5(y + 6) = 0$

$$\Rightarrow 15y - 60 - 2y + 18 + 5y + 30 = 0$$

$$\Rightarrow 15y + 5y - 2y - 60 + 30 + 18 = 0$$

$$\Rightarrow 18y - 12 = 0$$

$$\Rightarrow 18y = 12 \quad \text{(Transposing 12 to R.H.S.)}$$

$$\Rightarrow y = \frac{12}{18} \quad \text{(Dividing both sides by 18)}$$

$$\text{or } y = \frac{2}{3}$$

For checking:

On putting  $y = \frac{2}{3}$  in L.H.S. of the given equation,

L.H.S.:

$$= 15(y - 4) - 2(y - 9) + 5(y + 6)$$

$$= 15\left(\frac{2}{3} - 4\right) - 2\left(\frac{2}{3} - 9\right) + 5\left(\frac{2}{3} + 6\right)$$

$$= 15\left(\frac{2-12}{3}\right) - 2\left(\frac{2-27}{3}\right) + 5\left(\frac{2+18}{3}\right)$$

$$= 15 \times \left(\frac{-10}{3}\right) - 2 \times \left(\frac{-25}{3}\right) + 5 \times \left(\frac{20}{3}\right)$$

$$= \frac{(-150)}{3} + \frac{50}{3} + \frac{100}{3} = \frac{-150+50+100}{3}$$

$$= \frac{-150+150}{3} = \frac{0}{3} = 0 = R.H.S.$$

Hence,  $y = \frac{2}{3}$  is the required solution.

**Q.9:** Simplify and solve the following linear equation,  $3(5z - 7) - 2(9z - 11) = 4(8z - 13) - 17$ .

**Sol:** The given linear equation is  $3(5z - 7) - 2(9z - 11) = 4(8z - 13) - 17$

$$\Rightarrow 15z - 21 - 18z + 22 = 32z - 52 - 17$$

$$\Rightarrow -3z + 1 = 32z - 69$$

$$\Rightarrow -3z - 32z = -69 - 1 \quad (\text{Transposing 1 to R.H.S. and } 32z \text{ to L.H.S.})$$

$$\Rightarrow -35z = -70$$

$$\Rightarrow z = \frac{-70}{-35} \quad (\text{Dividing both sides by } -35)$$

$$\text{Or } z = 2$$

To check:

On putting  $z = 2$  in L.H.S. and R.H.S. of the given equation,

L.H.S.:

$$= 3(5z - 7) - 2(9z - 11)$$

$$= 3(5 \times 2 - 7) - 2(9 \times 2 - 11)$$

$$= 3(10 - 7) - 2(18 - 11) = 3 \times 3 - 2 \times 7$$

$$= 9 - 14 = -5$$

R.H.S.:

$$= 4(8z - 13) - 17 = 4(8 \times 2 - 13) - 17$$

$$= 4(16 - 13) - 17$$

$$= 4 \times 3 - 17 = 12 - 17 = -5$$

$$\Rightarrow \text{L.H.S.} = \text{R.H.S.}$$

Hence,  $z = 2$  is the required solution.

**Q.10** Simplify and solve the following linear equation,  $0.25(4f - 3) = 0.05(10f - 9)$ .

**Sol:** The given equation is  $0.25(4f - 3) = 0.05(10f - 9)$

$$\Rightarrow 1.00f - 0.75 = 0.50f - 0.45$$

$$\Rightarrow 1.00f - 0.50f = -0.45 + 0.75 \quad (\text{Transposing } 0.50f \text{ to L.H.S. and } 0.75 \text{ to R.H.S.})$$

$$\Rightarrow 0.50f = 0.3$$

$$\Rightarrow f = \frac{0.3}{0.50} \quad (\text{Dividing both sides by } 0.50.)$$

$$\Rightarrow \text{or } f = 0.6$$

To check:

On putting  $f = 0.6$  in L.H.S. and R.H.S. of the given equation,

L.H.S.:

$$= 0.25 (4f - 3) = 0.25 (4 \times 0.6 - 3)$$

$$= 0.25 (2.4 - 3) = 0.25 \times (-0.6) = -0.150$$

R.H.S.:

$$= 0.05 (10f - 9) = 0.05 (10 \times 0.6 - 9)$$

$$= 0.05 \times (6.0 - 9) = 0.05 \times -3 = -0.15$$

$\Rightarrow$  L.H.S. = R.H.S.

Hence,  $f = 0.6$  is the required solution.