LINEAR EQUATION IN ONE VARIABLE

THE TRANSPOSITION METHOD STEPS

TRANSPOSITION METHOD FOR SOLVING LINEAR EQUATIONS IN ONE VARIABLE

The transposition method involves the following steps:

Step-I Obtain the linear equation.

Step-II Identify the variable (unknown quantity) and constants(numerals).

Step-III Simplify the L.H.S. and R.H.S. to their simplest forms by removing brackets.

Step-IV Transpose all terms containing variable on L.H.S. and constant terms on R.H.S. Note that the sign of the terms will change in shifting them from L.H.S. to R.H.S. and vice-versa.

Step-V Simplify L.H.S. and R.H.S. in the simplest form so that each side contains just one term.

Step-VI Solve the equation obtained in step V by dividing both sides by the coefficient of the variable on L.H.S.

Ex.1 Solve : $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

Sol. We have, $\frac{x}{2} - \frac{1}{5} = \frac{x}{3} + \frac{1}{4}$

The denominators on two sides are 2, 5, 3 and 4. Their LCM is 60. Multiplying both sides of the given equation by 60, we get

$$60 \times \left(\frac{x}{2} - \frac{1}{5}\right) = 60 \left(\frac{x}{3} + \frac{1}{4}\right)$$

$\Rightarrow \quad 60 \times \frac{x}{2} - 60 \times \frac{1}{5} = 60 \times \frac{x}{3} + 60 \times \frac{1}{4}$

$\Rightarrow \quad 30x - 12 = 20x + 15$

$\Rightarrow \quad 30x - 20x = 15 + 12$ [On transposing 20x to LHS and –12 to RHS]

$\Rightarrow \quad 10x = 27 \Rightarrow x = \frac{27}{10}$

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

Check Substituting $x = \frac{27}{10}$ in the given equation, we get

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

$= \frac{27 - 1 \times 4}{20} = \frac{27 - 4}{20} = \frac{23}{20}$ and,

R.H.S. $= \frac{x}{3} + \frac{1}{4} = \frac{27}{10} \times \frac{1}{3} + \frac{1}{4}$

$= \frac{9}{10} + \frac{1}{4} = \frac{9 \times 2 + 1 \times 5}{20} = \frac{18 + 5}{20} = \frac{23}{20}$

Thus, for $x = \frac{27}{10}$, we have L.H.S. = R.H.S.

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

Sol. We have, $x + 7 - \frac{8x}{3} = \frac{17}{6} - \frac{5x}{8}$

The denominators on two sides are 3, 6 and 8. Their LCM is 24.

Multiplying both sides of the given equation 24, we get

$24\left(x + 7 - \frac{8x}{3}\right) = 24\left(\frac{17}{6} - \frac{5x}{8}\right)$

$\Rightarrow \quad 24x + 24 \times 7 - 24 \times \frac{8x}{3}$

$= 24 \times \frac{17}{6} - 24 \times \frac{5x}{8}$

$\Rightarrow \quad 24x + 168 - 64x = 68 - 15x$

$\Rightarrow \quad 168 - 40x = 68 - 15x$

$\Rightarrow \quad -40x + 15x = 68 - 168$ [Transposing –15x to LHS and 168 to RHS]

$\Rightarrow \quad -25x = -100$

$\Rightarrow \quad 25x = 100$

$\Rightarrow \quad x = \frac{100}{25}$ [Dividing both sides by 25]

$\Rightarrow \quad x = 4$

Thus, $x = 4$ is the solution of the given equation.

Check Substituting $x = 4$ in the given equation, we get

L.H.S. $= x + 7 - \frac{8x}{3} = 4 + 7 - \frac{8\times4}{3}$

$= 11 - \frac{32}{3} = \frac{33-32}{3} = \frac{1}{3}$

and, R.H.S. $= \frac{17}{6} - \frac{5x}{8} = \frac{17}{6} - \frac{5\times4}{8} = \frac{17}{6} - \frac{5}{2}$

$= \frac{17-15}{6} = \frac{2}{6} = \frac{1}{3}$

Thus, for $x = 4$, we have L.H.S. = R.H.S.

Ex.3 Solve : $x - \frac{2x+8}{3} = \frac{1}{4}\left(x - \frac{2-x}{6}\right) - 3$

Sol. We have, $x - \frac{2x+8}{3} = \frac{1}{4}\left(x - \frac{2-x}{6}\right) - 3$

$\Rightarrow \quad x - \frac{2x+8}{3} = \frac{x}{4} - \frac{2-x}{24} - 3$

The denominators on the two sides of this equation are 3, 4 and 24. Their LCM is 24.

Multiplying both sides of this equation by 24, we get

$24x - 24\left(\frac{2x+8}{3}\right)$

$= 24 \times \frac{x}{4} - 24\left(\frac{2-x}{24}\right) - 3 \times 24$

$\Rightarrow \quad 24x - 8(2x + 8) = 6x - (2 - x) - 72$

$\Rightarrow \quad 24x - 16x - 64 = 6x - 2 + x - 72$

$\Rightarrow \quad 8x - 64 = 7x - 74$

$\Rightarrow \quad 8x - 7x = 64 - 74$ [Transposing 7x to LHS and – 64 to RHS]

$\Rightarrow \quad x = -10$

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

Check Putting $x \equiv 10$ in LHS $= -10 - \frac{2\times(-10)+8}{3}$

$= -10 - \frac{-20+8}{3} = -10 - \left(\frac{-12}{3}\right) = -10 + 4 = -6$

and, R.H.S. $= \frac{1}{4}\left(x - \frac{2-x}{6}\right) - 3 = \frac{1}{4}\left(-10 - \frac{2+10}{6}\right) - 3$

$= \frac{1}{4}(-10 - 2) - 3 = -3 - 3 = -6$

Thus, L.H.S. = R.H.S. for $x = -10$.