

ATOMIC ENERGY EDUCATION SOCIETY
DISTANCE LEARNING PROGRAMME

CLASS 8 – MATHEMATICS

CHAPTER 2
LINEAR EQUATIONS IN ONE VARIABLE

MODULE 4/4

Reducing Equations to Simpler Form
Equations Reducible to the Linear Form

Linear Equations in One Variable

Reducing Equations to Simpler Form

Example 18: Solve $\frac{6x+1}{3} + 1 = \frac{x-3}{6}$

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

Multiplying both sides of the equation by 6,

$$6 \times \left(\frac{6x+1}{3} + 1 \right) = 6 \times \left(\frac{x-3}{6} \right)$$

$$\frac{6(6x+1)}{3} + 6 \times 1 = \frac{6(x-3)}{6}$$

$$2(6x+1) + 6 = x-3$$

$$12x + 2 + 6 = x - 3$$

$$12x + 8 = x - 3$$

$$12x - x + 8 = -3$$

$$11x + 8 = -3$$

$$11x = -3 - 8$$

$$11x = -11$$

$$x = -1$$

Example 19: Solve $5x - 2(2x - 7) = 2(3x - 1) + \frac{7}{2}$

$$5x - 2(2x - 7) = 2(3x - 1) + \frac{7}{2}$$

$$5x - 4x + 14 = 6x - 2 + \frac{7}{2}$$

$$x + 14 = 6x - 2 + \frac{7}{2}$$

$$x - 6x = -2 + \frac{7}{2} - 14$$

$$\begin{aligned}
 -5x &= -16 + \frac{7}{2} \\
 -5x &= \frac{-32 + 7}{2} \\
 -5x &= \frac{-25}{2} \\
 x &= \frac{-25}{2} \times \left(\frac{1}{-5} \right) \\
 x &= \frac{5}{2}
 \end{aligned}$$

Example 20: Solve the given linear equation $\frac{3t-2}{4} - \frac{2t+3}{3} = \frac{2}{3} - t$ and

check the result

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

Multiplying both the sides by 12

$$\begin{aligned}
 12 \left(\frac{3t-2}{4} - \frac{2t+3}{3} \right) &= 12 \left(\frac{2}{3} - t \right) \\
 12 \left(\frac{3t-2}{4} \right) - 12 \left(\frac{2t+3}{3} \right) &= 12 \left(\frac{2}{3} \right) - 12t \\
 3(3t-2) - 4(2t+3) &= 8 - 12t \\
 9t - 6 - 8t - 12 &= 8 - 12t \\
 t - 18 &= 8 - 12t \\
 t + 12t &= 8 + 18 \\
 13t &= 26 \\
 t &= \frac{26}{13} \\
 t &= 2
 \end{aligned}$$

Checking:

$$\begin{aligned} \text{LHS} &= \frac{3t-2}{4} - \frac{2t+3}{3} \\ &= \frac{3(2)-2}{4} - \frac{2(2)+3}{3} \\ &= \frac{6-2}{4} - \frac{4+3}{3} \\ &= \frac{4}{4} - \frac{7}{3} \\ &= \frac{12}{12} - \frac{28}{12} \\ &= \frac{-16}{12} = \frac{-4}{3} \end{aligned}$$

$$\begin{aligned} \text{RHS} &= \frac{2}{3} - t \\ &= \frac{2}{3} - 2 \\ &= \frac{2-6}{3} = \frac{-4}{3} \end{aligned}$$

LHS=RHS
Hence checked

Equations Reducible to the Linear Form

Example 21: Solve $\frac{3y+4}{2-6y} = \frac{-2}{5}$

$$\frac{3y+4}{2-6y} = \frac{-2}{5}$$

Cross-multiplication gives

$$5(3y+4) = -2(2-6y)$$

$$15y + 20 = -4 + 12y$$

$$15y - 12y = -4 - 20$$

$$3y = -24$$

$$y = \frac{-24}{3} = -8$$

$$y = -8$$

Example 22:

The present ages of Hari and Harry are in the ratio 5:7. Four years from now the ratio of their ages will be 3:4. Find their present ages.

Let the present ages of Hari be $5x$ and Harry be $7x$.

4 years later,

$$\text{Age of Hari} = 5x + 4$$

$$\text{Age of Harry} = 7x + 4$$

According to the question,

$$\frac{5x + 4}{7x + 4} = \frac{3}{4}$$

$$4(5x + 4) = 3(7x + 4)$$

$$20x + 16 = 21x + 12$$

$$20x - 21x = 12 - 16$$

$$-x = -4$$

$$x = 4$$

$$\text{Hari's present age} = 5x = 5 \times 4 = 20 \text{ years}$$

$$\text{Harry's present age} = 7x = 7 \times 4 = 28 \text{ years}$$
