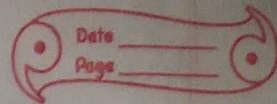


ca
13.05.21

Simple (Linear) Equations



Rules for Solving a Linear Equation

1. Solve: $x + 5 = 3$.

a) Find the value of x .

Sol- Subtracting 5 from both sides, we get
 $x + 5 - 5 = 3 - 5$ Check: $LHS = x + 5$
 $\Rightarrow x = -2$ $= -2 + 5 = 3$

Example (b)

$$3x = 5$$

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

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

Example (c)

$$2x + 3^2 = x + 4$$

$$\Rightarrow 2x - x = 4 - 3^2$$

$$x = 4 - 3 \times 3$$
$$= 4 - 9 = -5$$

So, $x = -5$

Example (d)

$$x - 5 = 3$$

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

$$= x = 8$$

Example (e)

$$2x = 6$$

$$\Rightarrow \frac{2x}{2} = \frac{6}{2}$$

So, $x = 3$

Example (f)

$$7x = 8$$

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

So, $x = \frac{8}{7} = 1\frac{1}{7}$

Example (g)

Inverse Method

$$3y + 2 = 9$$

Sol- $3y + 2 - 2 = 9 - 2$

$$= 3y = 7$$

$$\Rightarrow \frac{3y}{3} = \frac{7}{3}$$

$$\Rightarrow y = \frac{7}{3}$$

Transposition Method

$$3y + 2 = 9$$

Sol- $3y = 9 - 2 = 7$

$$= y = \frac{7}{3}$$

Exercise 22(A)

1. Solve:

i) $x + 2 = 6$

Sol- $x + \cancel{2} - \cancel{2} = 6 - 2$
 $\Rightarrow x = 4$

ii) $x + 6 = 2$

Sol- $x + \cancel{6} - \cancel{6} = 2 - 6$
 $= x = -4$

iii) $y + 8 = 5$

Sol- $y + \cancel{8} - \cancel{8} = 5 - 8$
 $= y = -3$

iv) $x + 4 = -3$

Sol- $x + \cancel{4} - \cancel{4} = -3 - 4$
 $= x = -7$

v) $y + 2 = -8$

Sol- $y + \cancel{2} - \cancel{2} = -8 - 2$
 $= y = -10$

vi) $b + 2.5 = 4.2$

Sol- $b + \cancel{2.5} - \cancel{2.5} = 4.2 - 2.5$
 $= b = 1.7$

vii) $P + 4.6 = 8.5$

Sol- $P + \cancel{4.6} - \cancel{4.6} = 8.5 - 4.6$
 $P = 3.9$

Transposition Method

OR $P + 4.6 = 8.5$

Sol- $P = 8.5 - 4.6 = 3.9$

viii) $y + 3.2 = -6.5$

Sol- $y + \cancel{3.2} - \cancel{3.2} = -6.5 - 3.2$
 $\Rightarrow y = -6.5 - 3.2$
 $\Rightarrow y = -9.7$

OR $y + 3.2 = -6.5$

Sol- $y = -6.5 - 3.2$
 $\Rightarrow y = -9.7$

ix) $a + 8.9 = -12.6$

Sol- $a + \cancel{8.9} - \cancel{8.9} = -12.6 - 8.9$
 $\Rightarrow a = -12.6 - 8.9$
 $\Rightarrow a = -21.5$

OR $a + 8.9 = -12.6$

Sol- $a = -12.6 - 8.9$
 $\Rightarrow a = -21.5$

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

Sol- $x + \frac{7}{3} = 5$
 $\Rightarrow x + \frac{7}{3} - \frac{7}{3} = 5 - \frac{7}{3}$
 $\Rightarrow x = 5 - \frac{7}{3}$
 $\Rightarrow x = \frac{15-7}{3}$
 $\Rightarrow x = \frac{8}{3} = 2\frac{2}{3}$
 $\Rightarrow x = 2\frac{2}{3}$

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

Sol- $x + \frac{7}{3} = 5$
 $\Rightarrow x = 5 - \frac{7}{3}$
 $\Rightarrow x = \frac{15-7}{3}$
 $\Rightarrow x = \frac{8}{3} = 2\frac{2}{3}$
 $\Rightarrow x = 2\frac{2}{3}$

Transposition Method

xi) $z+2=4\frac{1}{5}$ OR $z+2=4\frac{1}{5}$

Sol- $z+x-x=4\frac{1}{5}-2$ OR $Sol= z+2=4\frac{1}{5}$
 $\Rightarrow z = \frac{21}{5} - 2$ $\Rightarrow z = \frac{21}{5} - 2$
 $\Rightarrow z = \frac{21-10}{5} = \frac{11}{5}$ $\Rightarrow z = \frac{21-10}{5}$
 $\Rightarrow z = 2\frac{1}{5}$ $\Rightarrow z = \frac{11}{5} = 2\frac{1}{5}$

xii) $m+3\frac{1}{2}=4\frac{1}{4}$ OR $m+3\frac{1}{2}=4\frac{1}{4}$

Sol- $m+\frac{7}{2}-\frac{7}{2}=\frac{17}{4}-\frac{7}{2}$ OR $Sol= m+\frac{7}{2}=\frac{17}{4}$
 $\Rightarrow m = \frac{17}{4} - \frac{7}{2}$ $\Rightarrow m = \frac{17}{4} - \frac{7}{2}$
 $\Rightarrow m = \frac{17-14}{4} = \frac{3}{4}$ $\Rightarrow m = \frac{17-14}{4}$
 $\Rightarrow m = \frac{3}{4}$ $\Rightarrow m = \frac{3}{4}$

xiii) $x+2=1\frac{1}{4}$ OR $x+2=1\frac{1}{4}$

Sol- $x+x-x=\frac{5}{4}-2$ OR $Sol= x+2=\frac{5}{4}$
 $\Rightarrow x = \frac{5}{4} - 2$ $\Rightarrow x + \frac{5}{4} - 2$
 $\Rightarrow x = \frac{5-8}{4} = \frac{-3}{4}$ $\Rightarrow x = \frac{5-8}{4}$
 $\Rightarrow x = \frac{-3}{4}$ $\Rightarrow x = \frac{-3}{4}$

xiv) $y+5\frac{1}{3}=4$ OR $y+5\frac{1}{3}=4$

Sol- $y+\frac{16}{3}=4$ OR $Sol= y+\frac{16}{3}=4$
 $\Rightarrow y + \frac{16}{3} - \frac{16}{3} = 4 - \frac{16}{3}$ $\Rightarrow y = 4 - \frac{16}{3}$
 $\Rightarrow y = \frac{12-16}{3}$ $\Rightarrow y = \frac{12-16}{3}$
 $\Rightarrow y = \frac{-4}{3} = -1\frac{1}{3}$ $\Rightarrow y = \frac{-4}{3} = -1\frac{1}{3}$

xv) $a+3\frac{1}{5}=1\frac{1}{2}$ OR $a+3\frac{1}{5}=1\frac{1}{2}$

Sol- $a+\frac{14}{5}-\frac{16}{5}=\frac{3}{2}-\frac{16}{5}$ OR $Sol= a+\frac{16}{5}=\frac{3}{2}$
 $\Rightarrow a = \frac{3}{2} - \frac{16}{5}$ $\Rightarrow a = \frac{3}{2} - \frac{16}{5}$
 $\Rightarrow a = \frac{15-32}{10} = \frac{-17}{10} = -1\frac{7}{10}$ $\Rightarrow a = \frac{15-32}{10}$
 $\Rightarrow a = -1\frac{7}{10}$ $\Rightarrow a = \frac{-17}{10} = -1\frac{7}{10}$
 $\Rightarrow a = 1\frac{7}{10}$

3. Solve:

Inverse Method

Transposition Method

i) $x - 3 = 2$

OR

$x - 3 = 2$

Sol- $x - 3 + 3 = 2 + 3$

Sol- $x = 2 + 3$

$\Rightarrow x = 2 + 3$

$\Rightarrow x = 5$

$\Rightarrow x = 5$

ii) $m - 2 = -5$

OR

$m - 2 = -5$

Sol- $m - 2 + 2 = -5 + 2$

Sol- $m = -5 + 2$

$\Rightarrow m = -5 + 2$

$\Rightarrow m = -3$

$\Rightarrow m = -3$

iii) $b - 5 = 7$

OR

$b - 5 = 7$

Sol- $b - 5 + 5 = 7 + 5$

Sol- $b = 7 + 5$

$\Rightarrow b = 7 + 5$

$\Rightarrow b = 12$

$\Rightarrow b = 12$

iv) $a - 2.5 = -4$

OR

$a - 2.5 = -4$

Sol- $a - 2.5 + 2.5 = -4 + 2.5$

Sol- $a = -4 + 2.5$

$\Rightarrow a = -4 + 2.5$

$\Rightarrow a = -1.5$

$\Rightarrow a = -1.5$

v) $y - 3\frac{1}{2} = 6$

OR

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

Sol- $y - \frac{7}{2} + \frac{7}{2} = 6 + \frac{7}{2}$

Sol- $y - \frac{7}{2} = 6$

$\Rightarrow y = 6 + \frac{7}{2}$

$\Rightarrow y = 6 + \frac{7}{2}$

$\Rightarrow y = \frac{12+7}{2} = \frac{19}{2}$

$\Rightarrow y = \frac{12+7}{2} = \frac{19}{2}$

$\Rightarrow y = 9\frac{1}{2}$

$\Rightarrow y = 9\frac{1}{2}$

vi) $z - 2\frac{1}{3} = -6$

OR

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

Sol- $z - \frac{7}{3} + \frac{7}{3} = -6 + \frac{7}{3}$

Sol- $z = \frac{7}{3} = -6$

$\Rightarrow z = -6 + \frac{7}{3}$

$\Rightarrow z = -6 + \frac{7}{3}$

$\Rightarrow z = \frac{-18+7}{3} = \frac{-11}{3}$

$\Rightarrow z = \frac{-18+7}{3} = \frac{-11}{3}$

$\Rightarrow z = -3\frac{2}{3}$

$\Rightarrow z = -3\frac{2}{3}$

Inverse Method

Transposition Method

vii) $P - 5.4 = 2.7$ OR

$P - 5.4 = 2.7$

Sol- $P - 5.4 + 5.4 = 2.7 + 5.4$

Sol- $P = 2.7 + 5.4$

$\Rightarrow P = 2.7 + 5.4$

$\Rightarrow P = 8.1$

$\Rightarrow P = 8.1$

viii) $x - 1.5 = -4.9$ OR

$x - 1.5 = -4.9$

Sol- $x - 1.5 + 1.5 = -4.9 + 1.5$

Sol- $x = -4.9 + 1.5$

$\Rightarrow x = -4.9 + 1.5$

$\Rightarrow x = -3.4$

$\Rightarrow x = -3.4$

ix) $n - 4 = -4\frac{1}{5}$ OR

$n - 4 = -4\frac{1}{5}$

Sol- $n - 4 + 4 = -\frac{21}{5} + 4$

Sol- $n - 4 = -\frac{21}{5}$

$\Rightarrow n = \frac{-21 + 20}{5} = \frac{-1}{5}$

$\Rightarrow n = -\frac{21}{5} + 4$

$\Rightarrow n = \frac{-1}{5}$

$\Rightarrow n = \frac{-21 + 20}{5} = \frac{-1}{5}$

$\Rightarrow n = \frac{-1}{5}$

3. Solve:

i) $3x = 12$

ii) $2y = 9$

iii) $5z = 8.5$

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

Sol- $\frac{2y}{2} = \frac{9}{2}$

Sol- $\frac{5z}{5} = \frac{8.5}{5}$

$\Rightarrow x = 4$

$\Rightarrow y = \frac{9}{2} = 4\frac{1}{2}$

$\Rightarrow z = 1.7$

iv) $2.5m = 7.5$

v) $3.2p = 16$

vi) $2a = 4.6$

Sol- $\frac{2.5m}{2.5} = \frac{7.5}{2.5}$

Sol- $\frac{3.2p}{3.2} = \frac{16}{3.2}$

Sol- $\frac{2a}{2} = \frac{4.6}{2}$

$\Rightarrow m = \frac{7.5}{2.5}$

$\Rightarrow p = \frac{16}{3.2}$

$\Rightarrow a = \frac{4.6}{2}$

$\Rightarrow m = 3$

$\Rightarrow p = 2$

$\Rightarrow a = 2.3$

4. Solve:

i) $\frac{x}{2} = 5$

OR

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

Sol- $\frac{x}{2} \times 2 = 5 \times 2$

Sol- $x = 5 \times 2$

$\Rightarrow x = 5 \times 2$

$\Rightarrow x = 10$

$\Rightarrow x = 10$

Inverse Method

Transposition Method

ii) $\frac{y}{3} = -2$

OR

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

Sol- $\frac{y}{3} \times 3 = -2 \times 3$

Sol- $y = -2 \times 3$
 $\Rightarrow y = -6$

$\Rightarrow y = -2 \times 3$

$\Rightarrow y = -6$

iii) $\frac{a}{5} = -15$

OR

$\frac{a}{5} = -15$

Sol- $\frac{a}{5} \times 5 = -15 \times 5$

Sol- $a = -15 \times 5$
 $\Rightarrow a = -75$

$\Rightarrow a = -15 \times 5$

$\Rightarrow a = -75$

iv) $\frac{z}{4} = 3\frac{1}{4}$

OR

$\frac{z}{4} = 3\frac{1}{4} = \frac{z}{4} = \frac{13}{4}$

Sol- $\frac{z}{4} \times 4 = \frac{13}{4} \times 4$

Sol- $z = \frac{13}{4} \times 4$
 $\Rightarrow z = 13$

$\Rightarrow z = 13$

v) $\frac{m}{6} = 2\frac{1}{2}$

OR $\frac{m}{6} = 2\frac{1}{2}$

Sol- $\frac{m}{6} = \frac{5}{2}$

Sol- $\frac{m}{6} = \frac{5}{2}$

$= \frac{m}{6} \times 6 = \frac{5}{2} \times 6^3$

$\Rightarrow m = \frac{5}{2} \times 6^3$

$\Rightarrow m = 5 \times 3$

$\Rightarrow m = 5 \times 3$

$\Rightarrow m = 15$

$\Rightarrow m = 15$

vi) $\frac{n}{7} = -2.8$

OR

$\frac{n}{7} = -2.8$

Sol- $\frac{n}{7} \times 7 = -2.8 \times 7$

Sol- $n = -2.8 \times 7$
 $\Rightarrow n = 19.6$

$\Rightarrow n = -2.8 \times 7$

$\Rightarrow n = 19.6$

5. Solve:

i) $-2x = 8$

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

$\Rightarrow -x = 4$

$\Rightarrow x = -4$

OR $-2x = 8$

Sol = $x = \frac{8}{-2} \Rightarrow x = \frac{-4}{1}$

$\Rightarrow x = -4$

ii) $-3.5y = 14$

Sol- $y = \frac{14}{-3.5} = \frac{-14}{3.5}$

$= -14 \div 3.5$

$= -14 \div \frac{35}{10} = \frac{-14 \times 10}{35}$

$= -2 \times 2$

$= -4$

iii) $-5z = 4$

Sol- $\frac{-5z}{-5} = \frac{4}{-5}$

$\Rightarrow z = \frac{4}{-5}$

$\Rightarrow z = \frac{-4}{5}$

OR $-5z = 4$

Sol = $z = \frac{4}{-5}$

$\Rightarrow z = \frac{-4}{5}$

iv) $-5 = a + 3$

Sol- $-5 - 3 = a + 3 - 3$

$\Rightarrow -5 - 3 = a$

$\Rightarrow -8 = a$

$\Rightarrow a = -8$

v) $2 = p + 5$

Sol $2 - 5 = p + 5 - 5$

$\Rightarrow 2 - 5 = p$

$\Rightarrow -3 = p$

$\Rightarrow p = -3$

vi) $4.5 = m - 2.7$

Sol- $4.5 + 2.7 = m - 2.7 + 2.7$

$\Rightarrow 4.5 + 2.7 = m$

$\Rightarrow 7.2 = m$

$\Rightarrow m = 7.2$

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

Sol- $\frac{17}{5} = x - \frac{7}{3}$

$\Rightarrow \frac{17}{5} + \frac{7}{3} = x = \frac{7}{3} + \frac{7}{3}$

$\Rightarrow \frac{17}{5} + \frac{7}{3} = x$

$\Rightarrow \frac{51 + 35}{15} = \frac{86}{15} = 5\frac{11}{15} = x$

$\Rightarrow x = 5\frac{11}{15}$

viii) $5 = m + 3\frac{4}{7}$

Sol- $5 = m + \frac{25}{7}$

$\Rightarrow 5 - \frac{25}{7} = m$

$\Rightarrow \frac{35 - 25}{7} = m$

$\Rightarrow \frac{10}{7} = m$

$\Rightarrow m = \frac{10}{7}$

ix) $-2\frac{1}{5} = y - 4$

Sol- $-\frac{11}{5} = y - 4$

$\Rightarrow -\frac{11}{5} + 4 = y - 4 + 4$

$\Rightarrow -\frac{11}{5} + 4 = y$

$\Rightarrow \frac{-11 + 20}{5} = -\frac{9}{5} = -1\frac{4}{5} = y$

$\Rightarrow -1\frac{4}{5} = y$

$\Rightarrow y = -1\frac{4}{5}$