

# Chapter 9 Linear Equations and Inequalities

## Ex 9.1

Solve the following (1 to 9) equations:

Question 1.

(i)  $2(3 - 2x) = 13$

(ii)  $35y - 2 = 710$

Solution:

(i)  $2(3 - 2x) = 13$  (Remove group symbol)

$6 - 4x = 13$  (Transposing 6 to R.H.S.)

$-4x = 13 - 6$

$-4x = 7$

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

(ii)  $\frac{3}{5}y - 2 = \frac{7}{10}$

Multiplying both sides by 5, we get

$$3y - 10 = \frac{7}{10} \times 5$$

$$3y - 10 = \frac{7}{2}$$

$$3y = \frac{7}{2} + 10$$

(Transposing  $-10$  to R.H.S.)

$$3y = \frac{7 + 20}{2}$$

$$3y = \frac{27}{2}$$

$$y = \frac{27^9}{2 \times 3} = \frac{9}{2} = 4\frac{1}{2}$$

Question 2.

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

$$(ii) 2\left(x - \frac{3}{2}\right) = 11$$

Solution:

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

Multiplying both sides by 6, we get

$$6 \times \frac{x}{2} = 6\left(5 + \frac{x}{3}\right)$$

$$3x = 30 + 2x$$

$$3x - 2x = 30 \quad (\text{Transposing } 2x \text{ to L.H.S.})$$

$$x = 30$$

$$(ii) 2\left(x - \frac{3}{2}\right) = 11$$

Removing group symbols,

$$2x - 3 = 11$$

$$\Rightarrow 2x = 11 + 3$$

(Transposing  $-3$  to R.H.S)

$$\Rightarrow 2x = 14$$

$$x = \frac{14}{2} = 7$$

Question 3.

$$(i) 7(x - 2) = 2(2x - 4)$$

$$(ii) 21 - 3(x - 7) = x + 20$$

Solution:

$$(i) 7(x - 2) = 2(2x - 4)$$

Removing group symbols,

$$7x - 14 = 4x - 8$$

$$7x - 4x = -8 + 14$$

(Transposing  $4x$  to L.H.S. and  $-14$  to R.H.S.)

$$3x = 6$$

$$x = 2.$$

$$(ii) 21 - 3(x - 7) = x + 20$$

Removing group symbols,

$$21 - 3x + 21 = x + 20$$

$$\Rightarrow 42 - 3x = x + 20$$

$$\Rightarrow -3x - x = 20 - 42$$

(Transposing  $x$  to L.H.S. and  $42$  to R.H.S.)

$$\Rightarrow -4x = -22$$

$$\Rightarrow x = \frac{22}{4} = \frac{11}{2} = 5\frac{1}{2}$$

Question 4.

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

$$(ii) \frac{2m}{3} - \frac{m}{5} = 7$$

Solution:

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

Removing group symbols,

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

Multiplying both sides by 3, we get

$$9x - 1 = 6x - 3 + 15$$

$$9x - 1 = 6x + 12$$

$$9x - 6x = 12 + 1$$

(Transposing  $6x$  to L.H.S and  $-1$  to R.H.S)

$$3x = 13$$

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

$$(ii) \frac{2m}{3} - \frac{m}{5} = 7$$

Multiplying both sides by 15, LCM of 3 and 5,

$$15 \times \frac{2m}{3} - 15 \times \frac{m}{5} = 7 \times 15$$

$$10m - 3m = 105$$

$$7m = 105$$

$$m = \frac{105}{7} = 15$$

Question 5.

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

$$(ii) \frac{3p-2}{7} - \frac{p-2}{4} = 2$$

Solution:

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

Multiplying both sides by 10, we get

$$10 \times \frac{(x+1)}{5} - 10 \frac{(x-7)}{2} = 1 \times 10$$

$$2x + 2 - 5x + 35 = 10$$

$$2x - 5x + 37 = 10$$

$$-3x = 10 - 37$$

$$-3x = -27$$

$$x = \frac{27}{3} = 9$$

$$(ii) \frac{3p-2}{7} - \frac{p-2}{4} = 2$$

Multiplying both sides by 28, we get

$$\frac{28(3p-2)}{7} - \frac{28(p-2)}{4} = 2 \times 28$$

$$4(3p-2) - 7(p-2) = 56$$

Removing group symbols,

$$12p - 8 - 7p + 14 = 56$$

$$5p + 6 = 56$$

$$5p = 56 - 6$$

$$5p = 50$$

$$p = \frac{50}{5} = 10$$

Question 6.

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

$$(ii) \frac{2x-3}{6} - \frac{x-5}{2} = \frac{x}{6}$$

Solution:

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

Removing group symbols,

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

Multiplying both sides by 6, L.C.M. of 2 and 3,

$$\frac{6}{2}x + \frac{30}{2} - \frac{6}{3}x + \frac{12}{3} = 4 \times 6$$

$$3x + 15 - 2x + 4 = 4 \times 6$$

$$x + 19 = 24$$

$$x = 24 - 19 = 5$$

$$(ii) \frac{2x-3}{6} - \frac{x-5}{2} = \frac{x}{6}$$

Multiplying both sides by 6, LCM of 6 and 2,

$$\frac{6(2x-3)}{6} - \frac{6(x-5)}{2} = \frac{x}{6} \times 6$$

$$2x - 3 - 3x + 15 = x$$

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

$$-x - x = -12$$

$$-2x = -12$$

$$x = 6$$

Question 7.

$$(i) \frac{x-4}{7} - \frac{x+4}{5} = \frac{x+3}{7}$$

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

Solution:

$$(i) \frac{x-4}{7} - \frac{x+4}{5} = \frac{x+3}{7}$$

Multiplying both sides by 35, the L.C.M. of 7 and 5,

$$\frac{35(x-4)}{7} - \frac{35(x+4)}{5} = \frac{35(x+3)}{7}$$

$$5x - 20 - 7x - 28 = 5x + 15$$

$$-2x - 48 = 5x + 15$$

$$-2x - 5x = 15 + 48$$

$$-7x = 63$$

$$x = \frac{63}{-7} = -9.$$

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

Multiplying both sides by 30, the L.C.M. of 5, 2 and 3,

$$\frac{30(x-1)}{5} + \frac{30(x-2)}{2} = \frac{30x}{3} + 30$$

$$6x - 6 + 15x - 30 = 10x + 30$$

$$21x - 36 = 10x + 30$$

$$21x - 10x = 30 + 36$$

$$11x = 66$$

$$x = \frac{66}{11} = 6$$

Question 8.

(i)  $y + 1.2y = 4.4$

(ii) 15% of  $x = 21$

Solution:

$$(i) y + 1.2 y = 4.4$$

$$2.2 y = 4.4$$

$$y = \frac{4.4}{2.2} = \frac{44 \times 10}{10 \times 22} = 2$$

$$(ii) 15\% \text{ of } x = 21$$

$$\Rightarrow \frac{15x}{100} = 21 \Rightarrow \frac{3x}{20} = 21$$

By cross multiplication, we have

$$3x = 21 \times 20$$

$$3x = 420$$

$$x = \frac{420}{3} = 140.$$

Question 9.

$$(i) 2p + 20\% \text{ of } (2p - 1) = 7$$

$$(ii) 3(2x - 1) + 25\% \text{ of } x = 97$$

Solution:



$$(i) 2p + 20\% \text{ of } (2p - 1) = 7$$

$$\Rightarrow 2p + \frac{20}{100} \times (2p - 1) = 7$$

$$\Rightarrow 2p + \frac{1}{5}(2p - 1) = 7$$

Multiplying both sides by 5, we get

$$5 \times 2p + \frac{5 \times 1(2p - 1)}{5} = 7 \times 5$$

$$10p + 2p - 1 = 35$$

$$12p = 35 + 1$$

$$12p = 36$$

$$p = \frac{36}{12} = 3$$

$$(ii) 3(2x - 1) + 25\% \text{ of } x = 97$$

$$\Rightarrow 6x - 3 + \frac{25}{100} \times x = 97$$

$$\Rightarrow 6x - 3 + \frac{1}{4}x = 97$$

Multiplying both sides by 4, we get

$$24x - 12 + x = 97 \times 4$$

$$25x - 12 = 388$$

$$25x = 388 + 12$$

$$25x = 400$$

$$x = \frac{400}{25} = 16$$

Question 10.

Find the value of p if the value of  $x^4 - 3x^3 - px - 5$  is equal to 23 when  $x = -2$ .

Solution:

$$x = -2$$

$$x^4 - 3x^3 - px - 5 = 23$$

$$\Rightarrow (-2)^4 - 3(-2)^3 - p(-2) - 5 = 23$$

$$\Rightarrow 16 + 24 + 2p - 5 = 23$$

$$\Rightarrow 35 + 2p = 23$$

$$\Rightarrow 2p = 23 - 35 = -12$$

$$\Rightarrow p = -6$$