Linear Equations and Inequalities

EXERCISE 9.1

1

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

$6 - 4x = 13$

$-4x = 13 - 6$

$-4x = 7$

$\boxed{x = -7/4}$

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

$\frac{3}{5}y = \frac{7}{10} + 2$

$\frac{3}{5}y = \frac{27}{10}$

$y = \frac{27}{10_2} \times \frac{8}{3} = 9/2$

$\boxed{y = 9/2}$

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

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

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

$x = 5 \times 6$

$\boxed{x = 30}$

(ii) $2(x - 3/2) = 11$

$2x - 2 \times 3/2 = 11$

$2x - 3 = 11$

$2x = 3 + 11$

$x = 14/2$

$\boxed{x = 7}$

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

$7x - 14 = 4x - 8$

$7x - 4x = 14 - 8$

$3x = 6$

$x = 6/3$

$\boxed{x = 2}$

(iii)

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

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

$4x = 42 - 20$

$4x = 22$

$x = 22/4$

$\boxed{x = 11/2}$

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

$$\frac{9x-1}{3} = \frac{2(2x-1)}{2} + 5$$

$$\frac{9x-1}{3} = 2x - 1 + 5$$

$$\frac{9x-1}{3} = 2x + 4$$

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

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

$$3x = 13$$

$$\boxed{x = 13/3}$$

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

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

$$\frac{10m - 3m}{15} = 7$$

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

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

$$\boxed{m = 15}$$

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

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

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

$$-3x = 10 - 35 - 2$$

$$-3x = -27$$

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

$$\boxed{x = 9}$$

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

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

$$\frac{12p - 8 - 7p + 14}{28} = 2$$

$$5p + 6 = 56$$

$$5p = 56 - 6$$

$$5p = 50$$

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

$$\boxed{p = 10}$$

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

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

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

$$x + 19 = 24$$

$$x = 24 - 19$$

$$\boxed{x = 5}$$

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

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

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

$$-2x + 24 = 2x$$

$$4x = 24$$

$$x = \frac{24}{4}$$

$$\boxed{x = 6}$$

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

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

$$5x - 20 - 7x - 28 = \left(\frac{x+3}{7}\right) 35$$

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

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

$$7x = -63$$

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

$$\boxed{x = -9}$$

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

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

$$\frac{2x - 2 + 5x - 10}{10} = \frac{x+3}{3}$$

$$\frac{7x - 12}{10} = \frac{x+3}{3}$$

$$3(7x - 12) = 10(x+3)$$

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

$$11x = 66$$

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

$$\boxed{x = 6}$$

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

$2.2y = 4.4$

$y = \frac{4.4}{2.2}^{2}$

$\boxed{y = 2}$

(ii) 15% of $x = 21$

$\frac{15}{100} \times x = 21$

$x = \frac{21^{7} \times 100^{20}}{15_{1}}$

$\boxed{x = 140}$

9 (i) $2p + 20\%$ of $(2p-1) = 7$

$2p + \frac{20}{100_{5}} (2p-1) = 7$

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

$5 \times 2p + 2p - 1 = 35$

$10p + 2p = 1 + 35$

$12p = 36$

$p = {}^{3}36/_{12}$

$\boxed{p = 3}$

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

$$3(2x-1) + \frac{25}{4\cancel{100}} \times x = 97$$

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

$$\frac{4(6x-3) + x}{4} = 97$$

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

$$25x = 388 + 12$$

$$25x = 400$$

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

$$\boxed{x = 16}$$

10 $x^4 - 3x^3 - px - 5 = 23$

Given $x = -2$

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

$$16 - 3(-8) + 2p - 5 = 23$$

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

$$2p = 23 - 35$$

$$2p = -12$$

$$p = -\cancel{12}^{6}/_{\cancel{2}}$$

$$\boxed{p = -6}$$

Exercise 9.2

① Let the required number = x

5 times the number $= 5x$

7 added to 5 times the number $= 5x + 7$

According to the problem

$$5x + 7 = 57$$

$$5x = 50$$

$$x = \frac{50}{5}^{10}$$

$$\boxed{x = 10}$$

②

Let the required number $= x$

$\frac{1}{4}^{th}$ of the number is 3 more than 7

$$\frac{1}{4}x = 7 + 3$$

$$\frac{1}{4}x = 10$$

$$\boxed{x = 40}$$

③ Let required number = x

A number is greater than 15 and it is less than 51 then

$$x - 15 = 51 - x$$

$$2x = 66$$

$$\boxed{x = 33}$$

④ Let required number = x

$\frac{1}{2}$ is subtracted from a number $= x - \frac{1}{2}$

multiplied by $4 = 4\left(x - \frac{1}{2}\right)$

Given result = 5

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

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

$$4x - 2 = 5$$

$$4x = 5 + 2$$

$$4x = 7$$

$$\boxed{x = 7/4}$$

⑤ Let the required numbers $= x,\ 80-x$

The greater number exceeds twice the smaller by 11 is

$$x = 2(80-x) + 11$$

$$x = 160 - 2x + 11$$

$$3x = 171$$

$$x = 171/3$$

$$\boxed{x = 57}$$ and other number is $80 - 57 = 23$

⑥

Three consecutive odd natural numbers are

$2x+1,\quad 2x+3,\quad 2x+5$.

Given sum is $= 87$

$$2x+1 + 2x+3 + 2x+5 = 87$$

$$6x = 87 - 9$$

$$6x = 78$$

$$x = 78/6$$

$$\boxed{x = 13}$$

Required numbers are. 27, 29, 31

(7) Let number of boys = x

number of girls = $\frac{2}{5}x$

Total no of students = 35

$$x + \frac{2}{5}x = 35$$

$$5x + 2x = 35 \times 5$$

$$7x = 35 \times 5$$

$$x = \frac{35 \times 5}{7}$$

$$\boxed{x = 25}$$

number of girls in the class is = $\frac{2}{5} \times 25$

$= 10$

(8)

Let number of chairs = x

A Hausa wife purchased certain number of chairs and two tables = 2800

$$(250 \times x) + (2 \times 400) = 2800$$

$$(250 \times x) + (800) = 2800$$

$$250 \times x = 2800 - 800$$

$$x = \frac{2000}{250}^{8}$$

$$x = 8$$

number of chairs she purchased = 8

(9)

Let Aparna's monthly salary = x.

Then over time payment = $x - 16560$

According to the problem

$$x + x - 16560 = 27840$$

$$2x = 44,400$$

$$x = \frac{44,400}{2}$$

$$\boxed{x = 22,200}$$

Aparna monthly salary = 22,200

(10) Let 5 rupee coins = x

2 rupees coins = $80-x$

According to the problem total amount is 232 rupees

$$5x + 2(80-x) = 232$$

$$5x + 160 - 2x = 232$$

$$3x = 232 - 160$$

$$3x = 72$$

$$x = 72/3$$

$$x = 24$$

number of 5 rupees coins = 24

(11)

Let purse contains 10 rupees notes = x

50 rupees notes is one less = $x-1$

According to the problem total amount in purse is = 550

$$10x + 50(x-1) = 550$$

$10x + 50x - 50 = 550$

$60x = 600$

$x = 600/60$

$x = 10$

number of 50 rupees note $= 10 - 1 = 9$

(12)

Let present age $= x$.

After 12 years $= x + 12$

3 times as old was 4 years ago

$x + 12 = 3(x - 4)$

$x + 12 = 3x - 12$

$2x = 24$

$x = 24/2$

$x = 12$

present age is 12

(13) Given sides of isosceles triangle are

$3x-1,\ 2x+2,\ 2x$

Two equal sides are

$3x-1 = 2x+2$

$3x-2x = 2+1$

$x = 3$

perimeter of triangle $= 3x-1+2x+2+2x$

$= 7x+1$

$= 7(3)+1$

$= 22$

(14)

Let breadth $= x$

length of the rectangular $= 3x-6$

According to the problem perimeter is $= 148$

$2(x+3x-6) = 148$

$2(4x-6) = 148$

$8x-12 = 148$

$8x = 160$

$x = 20$

length 54, breadth $= 20$

(15) Difference of each angle = 20°

Let the angles be = x and $x+20$

Sum of Two complementary angle is 90°

$$x + x + 20 = 90$$

$$2x = 90 - 20$$

$$2x = 70$$

$$x = 35$$

one angle 35°, other angle is $(35+20) = 55$

Exercise 9.3

1

(i) $x < -2$

Replacement set $\{-5, -3, -1, 0, 1, 3, 4\}$

Solution Set $\{-5, -3\}$

(ii) $x > 1$

Replacement set $\{-5, -3, -1, 0, 1, 3, 4\}$

Solution set $\{3, 4\}$

(iii) $x \geq -1$

Replacement set $\{-5, -3, -1, 0, 1, 3, 4\}$

Solution set $\{-1, 0, 1, 3, 4\}$

(iv) $-5 < x < 3$

Replacement set $\{-5, -3, -1, 0, 1, 3, 4\}$

Solution set $\{-3, -1, 0, 1\}$

(v) $-3 \leq x < 4$

Replacement set $\{-5, -3, -1, 0, 1, 3, 4\}$

Solution set $\{-3, -1, 0, 1, 3\}$

(vi) $0 \leq x < 7$

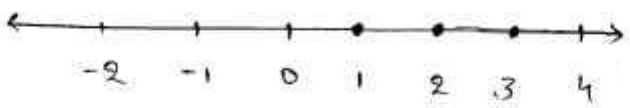
Replacement set $\{-5, -3, -1, 0, 1, 3, 4\}$

Solution set $\{0, 1, 3, 4\}$

2

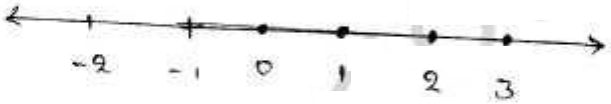
(i) $x \leq 3$

Solution set = $\{1, 2, 3\}$



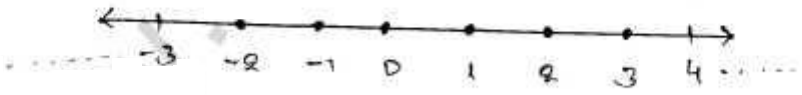
(ii) $x < 4$

Solution set = $\{0, 1, 2, 3\}$



(iii) $-2 \leq x < 4$

Solution set = $\{-2, -1, 0, 1, 2, 3\}$



(iv) $-3 \leq x < 2$

Solution set = $\{-3, -2, -1, 0, 1\}$

3

(i) $4 - x > -2$

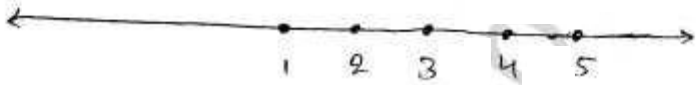
$-4 + 4 - x > -2 + (-4)$ Add both side (-4)

$-x > -6$

$x < 6$

Solution set : $\{1, 2, 3, 4, 5\}$

(ii)



(ii) $3x + 1 \leq 8$

$3x + 1 - 1 \leq 8 - 1$

$3x \leq 7$

$x \leq 7/3$

Solution set : $\{0, 1, 2\}$

④ $3-4x < x-12$ $\quad x \in \{-1, 0, 1, 2, 3, 4, 5, 6, 7\}$

$3-4x-3 < x-12-3$ Add (-3) on both side

$-4x < x-15$

$-4x-x < x-15-x$ Add (-x) on both side

$-5x < -15$

$x > 15/5$

$x > 3$

Solution set = $\{4, 5, 6, 7\}$

⑤ $-7 < 4x+1 \leq 23$

$-7-1 < 4x+1-1 \leq 23-1$ Add (-1) on both side

$-8 < 4x \leq 22$

$\frac{-8}{4} < \frac{4x}{4} \leq \frac{22}{4}$ Divide (4) on both side

$-2 < x \leq 11/2$

Solution set $\{-1, 0, 1, 2, 3, 4, 5\}$