Linear Equations and Inqualities In one Variable

EXERCISE : 12.1

1.

i. $5x-3 = 3x-5$

$5x = 3x-5+3$

$5x = 3x-2$

$5x-3x = -2$

$2x = -2$

$\boxed{x=-1}$

ii) $3x-7 = 3(5-x)$

$3x-7 = 15-3x$

$3x = 15+7-3x$

$3x+3x = 22$

$6x = 22$

$\boxed{x = \frac{22}{6}}$

2

i) $4(2x+1) = 3(x-1)+7$

$8x+4 = 3x-3+7$

$8x = 3x-3+7-4$

$8x-3x = -3+3 = 0$

$5x = 0 \Rightarrow \boxed{x=0}$

ii) $3(2p-1) = 5-(3p-2)$

$6p-3 = 5-3p+2$

$6p = 5-3p+2+3$

$6p+3p = 10$

$9p = 10$

$p = \frac{10}{9} = 1\frac{1}{9}$

3.

i) $5y-2[y-3(y-5)] = 6$.

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

$3y+6y-30 = 6$

$9y = 6+30 = 36$

$y = \frac{36}{9} = 4$

ii) $0.3(6-x) = 0.4(x+8)$

$1.8-0.3x = 0.4x+3.2$

$0.4x = 1.8-0.3x-3.2$

$0.4x+0.3x = -1.4$

$0.7x = -1.4$

$x = \frac{-1.4}{0.7} = -2$

4

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

Multiply and divide 2 on L.H.S

$$\frac{2(x-1)}{2\times 3} = \frac{x+2}{6} + 3$$

$$\frac{2x-1}{6} - \frac{x+2}{6} = 3$$

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

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

$$x-3 = 3\times 6$$

$$x-3 = 18$$

$$x = 18+3$$

$$\boxed{x = 21}$$

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

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

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

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

Cross Multiplying

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

$5x + 35 = 9x + 9$

$9x = 5x + 35 - 9$

$9x - 5x = 26$

$4x = 26$

$x = \frac{26}{4} = \frac{13}{2} = 6\frac{1}{2}$

5 i) $\frac{y+1}{3} - \frac{y-1}{2} = \frac{1+2y}{3}$

Multiplying both sides by 6 i.e L.C.M of 3, 2, 3 we get

$2(y+1) - 3(y-1) = 2(1+2y)$

$2y + 2 - 3y + 3 = 2 + 4y$

$5 - y = 4y + 2$

$4y + y = 5 - 2$

$5y = 3$

$y = 3/5$

ii) $\frac{p}{3} + \frac{p}{4} = 55 - \frac{p+40}{5}$

$\frac{4p+3p}{12} = \frac{55 \times 5}{5} - \frac{p+40}{5}$

$\frac{7p}{12} = \frac{275 - p - 40}{5}$

$$\frac{7p}{12} = \frac{235-p}{5}$$

Cross multiplication

$$7p \times 5 = 12(235-p)$$

$$35p = 12 \times 235 - 12p$$

$$35p + 12p = 12 \times 235$$

$$47p = 12 \times 235$$

$$p = \frac{12 \times 235}{47}$$

$$\boxed{p = 60}$$

6

i) $$n - \frac{n-1}{2} = 1 - \frac{n-2}{3}$$

$$\frac{2n-(n-1)}{2} = \frac{3-(n-2)}{3}$$

$$\frac{2n-n+1}{2} = \frac{3-n+2}{3}$$

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

Cross multiplication

$$3 \times (n+1) = 2(5-n)$$

$$3n+3 = 10-2n$$

$$3n+2n = 10-3$$

$5\eta = 7$

$\boxed{\eta = 7/5}$

ii) $\frac{3t-2}{3} + \frac{2t+3}{2} = t + \frac{7}{6}$.

$\frac{3t-2}{3} + \frac{2t+3}{2} = \frac{6t+7}{6}$

Multiplying 6 on both sides

$2(3t-2) + 3(2t+3) = 1(6t+7)$

$6t - 4 + 6t + 9 = 6t + 7$

$6t + 5 = 7$

$6t = 7 - 5 = 2$

$\boxed{t = 2/6 = 1/3}$

7

i) $4(3x+2) - 5(6x-1) = 2(x-8) - 6(7x-4)$

$12x + 8 - 30x + 5 = 2x - 16 - 42x + 24$

$13 - 18x = 8 - 40x$

$40x - 18x + 13 = 8$

$22x = 8 - 13 = -5$

$\boxed{x = \frac{-5}{22}}$.

ii. $3(5x+7)+5(2x-11) = 3(8x-5)-15$

$15x+21+10x-55 = 24x-15-15$

$25x-34 = 24x-30$

$25x-24x = 34-30$

$x = 4$

8.

i) $\frac{3-2x}{2x+5} = -\frac{3}{11}$

Cross Multiplying both sides

$-11(3-2x) = 3(2x+5)$

$22x-33 = 6x+15$

$22x-6x = 33+15$

$16x = 48$

$\boxed{x=3}$

ii) $\frac{5p+2}{8-2p} = \frac{7}{6}$

Cross Multiplying on both sides

$6(5p+2) = 7(8-2p)$

$30p+12 = 56-14p$

$30p+14p = 56-12$

$44p = 44 \Rightarrow \boxed{p=1}$

9

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

Cross multiplying on both sides

$$5(x-4) = 7x$$

$$7x = 5x - 20$$

$$2x = -20$$

$$\boxed{x = -10}$$

ii) $\frac{4}{2x+3} = \frac{5}{x+4}$

Cross multiplication on both sides

$$5(2x+3) = 4(x+4)$$

$$10x + 15 = 4x + 16$$

$$10x - 4x = 16 - 15$$

$$6x = 1 \Rightarrow \boxed{x = \frac{1}{6}}$$

10

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

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

$$2x^2 - 2x + 5x - 5 - 10x = 2x(x-1)$$

$$2x^2 + 3x - 5 - 10x = 2x^2 - 2x$$

$$-7x - 5 = -2x$$

$$-5 = 7x - 2x$$

$$5x = -5$$

$$\boxed{x = -1}$$

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

$$\frac{1}{5}\left(\frac{1-15x}{3x}\right) = \left(\frac{3x-1}{3x}\right)$$

$$1 - 15x = 5(3x - 1)$$

$$1 - 15x = 15x - 5$$

$$15x + 15x = 1 + 5$$

$$30x = 6$$

$$\boxed{x = \frac{6}{30} = \frac{1}{5}}$$

III.

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

Substracting "-1" on both sides

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

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

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

$$3x+1 = 2x-1$$

$$3x-2x = -1-1$$

$$\boxed{x = -2}$$

ii) $$\frac{2y+3}{3y+2} = \frac{4y+5}{6y+7}$$

Cross Multiplication

$$(2y+3)(6y+7) = (3y+2)(4y+5)$$

$$12y^2 + 14y + 18y + 21 = 12y^2 + 15y + 8y + 10$$

$$32y + 21 = 23y + 10$$

$$32y - 23y = 10 - 21$$

$$9y = -11$$

$$\boxed{y = -\frac{11}{9}}$$

12. $x = p+1$

$$\frac{5x-30}{2} - \frac{3p+1}{3} = \frac{1}{4}$$

Multiplying 12 on both sides

$$6(5x-30) - 4(3p+1) = 3$$

$$30x - 180 - 28p - 4 = 3$$

$$30(p+1) - 180 - 28p - 4 - 3 = 0$$

$$30p + 30 - 180 - 28p - 7 = 0$$

$$2p - 157 = 0$$

$$\boxed{p = \frac{157}{2}}$$

13. $\frac{x+3}{3} - \frac{x-2}{2} = 1$ if $\frac{1}{x} + p = 1$

Multiplying 6 on both sides

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

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

$$\boxed{x = 6}$$

$$\frac{1}{x} + p = 1 \Rightarrow p = 1 - \frac{1}{x} = 1 - \frac{1}{6}$$

$$\boxed{p = \frac{5}{6}}$$

EXERCISE: 12.2

1. Let the number be 'x'

Three more than twice a number is

$= 2x + 3$ — (1)

Four less than the number $= x - 4$ — (2)

(1) = (2)

$$2x + 3 = x - 4$$

$$2x - x = -4 - 3$$

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

The number is "-7"

2. Let the four consecutive integers are $x+1, x+2, x+3, x+4$.

Given sum of them $= 46$

$$x+1 + x+2 + x+3 + x+4 = 46$$

$$4x + 10 = 46$$

$$4x = 46 - 10 = 36$$

$$\boxed{x = 9}$$

The integers are $9+1, 9+2, 9+3, 9+4$.

$= 10, 11, 12, 13.$

3. Let the number be "x"

Manjula substracts $\frac{7}{3}$ from it $= x - \frac{7}{3}$.

The above result is multiplied by 6 i.e $6(x - \frac{7}{3})$

Now it is equal 2 less than twice the number 'x'

i.e $6(x - \frac{7}{3}) = 2x - 2$

$6x - 14 = 2x - 2$

$6x - 2x = 14 - 2$

$4x = 12$

$\boxed{x = 3}$

4. Let the numbers be $x, 7x$

15 is added to both numbers, then

it becomes $x + 15, 7x + 15$

Then one new numbers becomes $\frac{5}{2}$ times the other new number.

$7x + 15 = \frac{5}{2}(x + 15)$

$2(7x + 15) = 5(x + 15)$

$14x + 30 = 5x + 75$

$14x - 5x = 75 - 30$.

$9x = 45$

$\boxed{x = 5}$

Therefore the numbers are 5, 35.

5. Let the three consecutive even integers are $x, x+2, x+4$

Given sum = 0.

$x + x+2 + x+4 = 0$

$3x + 6 = 0$

$3x = -6$

$\boxed{x = -2}$

∴ The integers are $-2, -2+2, -2+4$

$= -2, 0, 2$

6. Let the two consecutive odd integers are $x+1, x+3$.

Given two fifth of smaller exceeds two-ninth of greater by 4.

$$\frac{2}{5}(x+1) + 4 = \frac{2}{9}(x+3)$$

$$\frac{2x+2+20}{5} = \frac{2x+6}{9}$$

Cross multiplication.

$$(2x+22)9 = 5(2x+6)$$

$$18x + 198 = 10x + 30$$

$$18x - 10x = 30 - 198$$

$$8x = -168$$

$$\boxed{x = -21}$$

$x+1 = -21+1 = -20$
$x+3 = -21+3 = -18$

The consecutive odd integers are $-20, -18$

7. Given the denominator of a fraction is 1 more than twice its numerator.

If is written as $\frac{x}{2x+1}$

Given numerator and denominator are both increased by 5 if becomes $\frac{3}{5}$.

$$\text{i.e } \frac{x+5}{2x+1+5} = \frac{3}{5}$$

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

Cross multiplication

$$5(x+5) = 3(2x+6)$$

$$5x + 25 = 6x + 18$$

$6x - 5x = 25 - 18$

$\boxed{x = 7}$

$\therefore \frac{x}{2x+1} = \frac{7}{2(7)+1} = \frac{7}{14+1}$

$= \frac{7}{15}$

Therefore the original fraction is $\frac{7}{15}$.

8. Let the two numbers are $2x$, $5x$

Given their difference is 15

i.e $5x - 2x = 15$

$3x = 15$

$x = 15/3 = 5$

$\boxed{x = 5}$

Therefore the two positive numbers are 10, 25

9. Let the number added to each be "x"

on adding "x" to each of the numbers, it becomes

$12+x$, $22+x$, $42+x$, $72+x$

For the numbers to be in proportion

$$\frac{12+x}{22+x} = \frac{42+x}{72+x}$$

Cross Multiplication

$$(x+12)(x+72) = (x+22)(x+42)$$

$$x^2 + 72x + 12x + 864 = x^2 + 22x + 42x + 924$$

$$84x + 864 = 64x + 924$$

$$84x - 64x = 924 - 864$$

$$20x = 60$$

$$\boxed{x = 3}$$

So the number that must be added is $x = 3$

10. Let the unit's digit be x.

As the difference of both digits is 3, the ten's digit is $x+3$

∴ The number is $10x(x+3) + x$

On reversing the digits, we have ten's digit 'x' and $(x+3)$ at unit's place.

The new number $= 10x + (x+3)$

By adding both number, we get 143.

$$10(x+3) + x + 10x + (x+3) = 143$$

$$10x + 30 + x + 10x + x + 3 = 143.$$

$$22x + 33 = 143$$

$$22x = 143 - 33$$

$$22x = 110$$

$$\boxed{x = 5}$$

$$\therefore 10(x+3) + x = 10(5+3) + 5$$

$$= 80 + 5 = 85$$

$\therefore$ The two digit number is 85

12

Let the Raju's present age be x years

Then, Ritu's present age be $4x$ years

In four times, Ritu's age will be twice of Raju's age

ie $4x + 4 = 2(x + 4)$

$$4x + 4 = 2x + 8$$

$$4x - 2x = 8 - 4$$

$$2x = 4$$

$$\boxed{x = 2}$$

$\therefore$ The present ages of Raju, Ritu are 2, 8 years

11. Let the unit's digit be "x"

Then, the ten's digits number be "$11-x$"

The two digit number $= 10(11-x)+x$.

When we interchange the digits, the resulting new number is greater than original number by 63.

ie $10(x) + (11-x) = 10(11-x)+x+63$

$10x + 11 - x = 110 - 10x + x + 63$

$9x + 11 = 173 - 9x$

$9x + 9x = 173 - 11$

$18x = 162$

$\boxed{x = 9}$

$\therefore 10(11-x)+x = 10(11-9)+9$

$= 10(2)+9 = 20+9 = 29$.

$\therefore$ The two digit number is 29.

13. Let the son's age be "x" years.

Then the father age be "$7x$" years.

Two years ago, father was 13 times as old as his son.

$$7x - 2 = 13(x-2)$$

$$7x - 2 = 13x - 26$$

$$13x - 7x = 26 - 2$$

$$6x = 24$$

$$\boxed{x = 4}$$

Their forecent age of Son, Father are 4, 28.

14. Let the ages of Sona and Sonali are $5x$, $3x$.

Five years hence, the ratio of their ages were 10 : 7

i.e $$\frac{5x+5}{3x+5} = \frac{10}{7}$$

Cross Multiplication

$$7(5x+5) = 10(3x+5)$$

$$35x + 35 = 30x + 50$$

$$35x - 30x = 50 - 35$$

$$5x = 15$$

$$\boxed{x = 3}$$

Therefore their present ages are 15, 9.

15. An employee works on a contract of 30 days for that he will receive ₹ 200 for each day and he will be fined ₹ 20 for each day he is absent.

Let the number he remain absent be 'x' days

Then the no of days he worked are '30 − x' days

$\therefore \quad 200(30-x) - 20x = 3,800$

$6,000 - 200x - 20x = 3,800$

$220x = 6,000 - 3,800$

$220x = 2,200$

$\boxed{x = 10}$

∴ The no. of days he remained absent are 10 days

16. Let the no. of ₹ 5 Coins be x.

no of ₹ 2 Coins be $3x$

no of ₹ 1 Coins be $160 - 4x$.

Total ₹ 300 in Coins of denomination

$\therefore \quad 5x(x) + 2(3x) + 1(160 - 4x) = 300$

$5x + 6x + 160 - 4x = 300$

$$7x = 300 - 160$$

$$7x = 140$$

$$\boxed{x = 20}$$

Coins of each denomination are

₹5 Coins = 20

₹2 Coins = 60

₹1 Coins = 80

17 Let the no. of passengers with ₹5 Tickets be 'x'

The No of passengers with ₹7.5 Tickets be '$40-x$'

Total receipts from passengers is ₹230

i.e $5x + 7.5(40-x) = 230$

$$5x + 300 - 7.5x = 230$$

$$7.5x - 5x = 300 - 230$$

$$2.5x = 70$$

$$x = \frac{70}{2.5}$$

$$x = 28$$

∴ Number of passengers with ₹5 Tickets are 28

18. Let the no of Students in the group be 'x'

They paid equally for use of a full boat and

pay ₹ 10 each i.e = $10 \times x = 10x$ —— (1)

If there are 3 more students in group, each would have

paid ₹ 2 less i.e ₹ 8 i.e = $8(x+3)$ —— (2)

(1) = (2)

$$10x = 8(x+3)$$

$$10x = 8x + 24$$

$$2x = 24$$

$$\boxed{x = 12}$$

∴ No. of students in group are 12

19. Let the number of deer in the herd be 'x'

Half of a herd of deer are grazing in field ie = $\frac{1}{2}x$

Three fourths of remaining are playing i.e = $\frac{3}{4}\left(\frac{1}{2}x\right)$

$= \frac{3}{8}x$:

The rest 9 are drinking water

ie $x - \left\{\frac{x}{2} + \frac{3x}{8}\right\} = 9$

$$x - \frac{4x+3x}{8} = 9$$

$$\frac{8x - 7x}{8} = 9$$

$$\frac{x}{8} = 9$$

$$\boxed{x = 72}$$

Number of deer in the herd are 72

20. Let the no of flower in the beginning be "x"

At 1st temple she offers $= \frac{1}{2} \times x = \frac{x}{2}$

2nd temple she offer $= \frac{1}{2} \times \frac{x}{2} = \frac{x}{4}$.

3rd temple she offer $= \frac{1}{2} \times \frac{x}{4} = \frac{x}{8}$.

Now she is left with 6 flowers at end

i.e $x - \left\{\frac{x}{2} + \frac{x}{4} + \frac{x}{8}\right\} = 6$.

$$x - \frac{4x + 2x + x}{8} = 6.$$

$$\frac{8x - 7x}{8} = 6$$

$$\frac{x}{8} = 6$$

$$\boxed{x = 48}$$

$\therefore$ No. of flowers in the beginning are 48.

21. Let the two supplementary angles be x, $90-x$

These angles differs by $50°$.

i.e $90 - x - x = 50$

$$90 - 2x = 50$$

$$2x = 90 - 50$$

$$2x = 40$$

$$\boxed{x = 20°}$$

∴ The two supplementary angles are $20°$, $70°$.

22 Let the angles of triangles are $5x$, $6x$, $7x$.

Sum of angles of Triangle = 180

i.e $5x + 6x + 7x = 180$

$$18x = 180$$

$$\boxed{x = 10}$$

∴ The angles of triangle are $50°$, $60°$, $70°$.

23. Two equal sides of an isosceles triangle are $3x-1$, $2x+2$

i.e $3x - 1 = 2x + 2$

$$3x - 2x = 2 + 1$$

$\boxed{x = 3}$

The third side is $2x = 2 \times 3 = 6$ Units

The two sides are $3x - 1 = 3 \times 3 - 1 = 9 - 1 = 8$ Units

$2x + 2 = 2 \times 3 + 2 = 6 + 2 = 8$ Units

$\therefore$ Perimeter of Triangle $= 6 + 8 + 8 = 22$ Units

24.

Let the perimeter of given triangle be x Cm.

As each side is increased by 4Cm, So the perimeter is increased by $3 \times 4 = 12$ Cm

According to given information.

$$\frac{x+12}{x} = \frac{7}{5}$$

Cross Multiplication

$$7x = 5(x + 12)$$

$$7x = 5x + 60$$

$$7x - 5x = 60$$

$$2x = 60$$

$$\boxed{x = 30}$$

$\therefore$ Perimeter of given triangle $= 30$ Cm

25. Length of a rectangle is 5cm less than twice its breadth

i.e $l = 2b - 5 \Rightarrow 2b = l + 5$ — ①

Length is decreased by 3cm i.e $(l-3)$ cm

breadth is increased by 2cm i.e $(b+2)$ cm

Resulting perimeter of rectangle is 72 cm

$$2(l-3+b+2) = 72$$

$$2l + 2b - 2 = 72$$

From eq ① we get

$$2l + l + 5 - 2 = 72$$

$$3l + 3 = 72$$

$$3l = 72 - 3$$

$$3l = 69$$

$$l = 23 \text{ cm}$$

∴ Length of Rectangle = 23 cm

From eq ① $2b = l + 5 = 23 + 5$

$$2b = 28 \Rightarrow b = 14 \text{ cm}$$

∴ breadth of Rectangle = 14 cm

∴ Area of Rectangle = $l \times b = 23 \times 14 = 322 \text{ cm}^2$.

26. Length of rectangle $l = 10$ cm

Breadth of rectangle $b = 8$ cm

Each side of rectangle is increased by x cm, its perimeter is doubled.

Perimeter of rectangle $= 2(10+8) = 2 \times 18$

$= 36$ cm.

i.e $2[(10+x)+(8+x)] = 2 \times 36$ [$\because$ perimeter is doubled]

$18 + 2x = 36$ — (1).

$2x = 36 - 18 = 18$

$x = 18/2 = 9$

$\boxed{x = 9 \text{ cm}}$

Area of new rectangle i.e $(10+9) \times (8+9)$

$= 19 \times 17 = 323 \text{ cm}^2$.

27. Let the speed of streamer in still water be x km/h

Given the speed of stream = 5 km/h.

The speed of streamer downstream = $(x+5)$ km/h

Speed of streamer upward stream = $(x-5)$ km/h

Both upstream and down stream takes same time

Time Taken by Streamer for down stream is $\frac{90}{x+5}$ hrs

Time taken by Streamer for up stream is $\frac{60}{x-5}$ hrs

i.e $\frac{^{3}90}{x+5} = \frac{^{2}60}{x-5}$

Cross Multiplication

$3(x-5) = 2(x+5)$

$3x - 15 = 2x + 10$

$3x - 2x = 10 + 15$

$\boxed{x = 25}$

∴ Speed of streamer in still water = 25 km/h

28

Let the speed of streamer in still water be "x"

Given, the speed of stream = 1 km/h

Speed of streamer down stream = $(x+1)$ km/h

Speed of streamer upstream = $(x-1)$ km/h

Distance Covered by streamer, downstream = $5(x+1)$ km

Distance Covered by Streamer, upstream = $6(x-1)$ km

According to given information

$$5(x+1) = 6(x-1)$$

$$5x+5 = 6x-6$$

$$6x-5x = 5+6$$

$$\boxed{x = 11}$$

∴ Speed of Streamer in still waters is 11 km/h

Distance between two ports $= 5(x+1) = 5(11+1)$

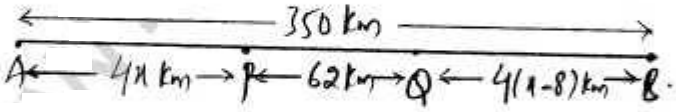
$= 60$ km.

29. Let the speed of faster car be x km/hr.

Then the speed of other car be $(x-8)$ km/hr

Let the faster car starts from place A and the slower car starts from place B.

Let P and Q be their position after 4 hours



$AP = 4x$ km, $BQ = 4(x-8)$ km, $PQ = 62$ km

According to the given problem

$$AP + PQ + BQ = 350$$

$$4x + 62 + 4(x-8) = 350$$

$$4x + 62 + 4x - 32 = 350$$

$$8x + 30 = 350$$

$$8x = 350 - 30 = 320$$

$$x = 320/8$$

$$\boxed{x = 40 \text{ km/hr}}$$

∴ Speed of faster car is 40 km/hr and the speed of slower car is (40−8) ie 32 km/hr.

EXERCISE : 12.3.

1. i) $x > -2$

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

ii) $x < -2$

Solution set $= \{-7, -5, -3\}$

iii) $x > 2$

Solution set $= \{3\}$

iv) $-5 < x \leq 5$

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

v) $-8 < x < 1$

Solution set $= \{-7, -5, -3, -1, 0\}$

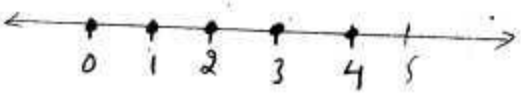
vi) $0 \leq x \leq 4$

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

2. It is shown by thick dots on number line

i) $x \leq 4$, $x \in N$

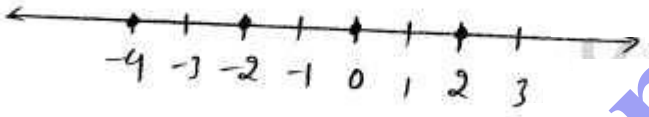
ii) $x < 5$, $x \in W$



iii) $-3 \leq x < 3$, $x \in I$

3. Replacement set $= \{-6, -4, -2, 0, 2, 4, 6\}$

$-4 \leq x < 4$



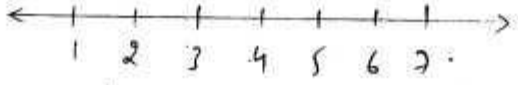
4.

i) $\{1, 2, 3 \ldots\ldots 10\}$

ii) $\{-1, 0, 1, 2, 5, 8\}$

iii) $\{-5, 10\}$

iv) $\{5, 6, 7, 8, 9, 10\}$



Solution set $= \phi$.

5. i) $2x - 3 > 7$

$2x > 7 + 3$

$2x > 10$

$x > 5$

Solution set = $\{6, 9, 12\}$

ii) $3x + 8 \leq 2$

$3x \leq 2 - 8$

$3x \leq -6$

$x \leq -2$

Solution set = $\{-6, -3\}$

iii) $-3 < 1 - 2x$

$3 > 2x - 1$

$2x - 1 < 3$

$2x < 3 + 1$

$2x < 4$

$x < 2$

Solution set = $\{-6, -3, 0\}$

6. i) $4x+1 < 17$, $x \in N$

$4x < 17-1$

$4x < 16$

$x < 4$, $x \in N$

As $x \in N$, the solution set is $\{1, 2, 3\}$

ii) $4x+1 \leq 17$, $x \in W$

$4x \leq 17-1$

$4x \leq 16$

$x \leq 4$

As $x \in W$, the solution set is $\{0, 1, 2, 3, 4\}$

iii) $4 > 3x-11$, $x \in N$

$3x-11 < 4$

$3x < 4+11$

$3x < 15$

$x < 5$

As $x \in N$, the solution set is $\{1, 2, 3, 4\}$

iv) $-17 \leq 9x-8$, $x \in z$

$9x-8 \geq -17$

$9x \geq -17+8$

$9x \geq -9$

$x \geq -1$

As $x \in z$, the solution set is $\{-1, 0, 1, 2, 3 \cdots\}$

7 i) $\frac{2y-1}{5} \leq 2$, $y \in N$

$2y - 1 \leq 10$

$2y \leq 10 + 1$

$2y \leq 11$

$y \leq \frac{11}{2}$.

As $y \in N$, the solution set is $\{1, 2, 3, 4, 5\}$

ii) $\frac{2y+1}{3} + 1 \leq 3$, $y \in W$

$\frac{2y+1}{3} \leq 3 - 1$

$\frac{2y+1}{3} \leq 2$

$2y + 1 \leq 6$

$2y \leq 6 - 1$

$2y \leq 5$

$y \leq \frac{5}{2}$

As $y \in W$, the solution set is $\{0, 1, 2\}$

iii) $\frac{2}{3}p + 5 < 9$, $p \in W$.

$\frac{2}{3}p < 9 - 5$

$\frac{2p}{3} < 4$

$2p < 12$

$p < 6$

As $p \in W$, the solution set is $\{0, 1, 2, 3, 4, 5\}$

iv. $-2(p+3) > 5 \quad p \in I$

Multiplying '$-$' on both sides

$2(p+3) < -5$

$2p + 6 < -5$

$2p < -5 - 6$

$2p < -11$

$p < -\frac{11}{2}$

As $p \in I$, the solution set is $\{\dots -9, -8, -7, -6\}$

8.

i) $2x - 3 < x + 2, \quad x \in N$

$2x < x + 2 + 3$

$2x - x < 5$

$x < 5$

As $x \in N$, the solution set is $\{1, 2, 3, 4\}$

ii) $3 - x \leq 5 - 3x, \quad x \in W$

$3 - x + 3x \leq 5$

$$2x + 3 \leq 5$$

$$2x \leq 5 - 3$$

$$2x \leq 2$$

$$x \leq 1$$

As $x \in N$, the solution set is $\{0, 1\}$

iv. $\frac{3}{2} - \frac{x}{2} > -1, \quad x \in N$

$$\frac{3-x}{2} > -1$$

$$3 - x > -2$$

Multiplying with "$-$" on both sides

$$x - 3 < 2$$

$$x < 2 + 3$$

$$x < 5$$

As $x \in N$, the solution set is $\{1, 2, 3, 4\}$

9. $\{-3, -2, -1, 0, 1, 2, 3\}$

$$\frac{3x - 1}{2} < 2$$

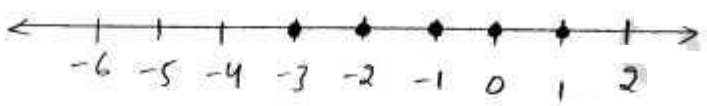
$$3x - 1 < 4$$

$$3x - 1 < 4 + 1$$

$$3x < 5$$

$x < 5/3$.

As x should be in replacement set, the solution set is $\{-3, -2, -1, 0, 1\}$.



10.

$$\frac{x}{3} + \frac{1}{4} < \frac{x}{6} + \frac{1}{2}, \quad x \in W$$

$$\frac{x}{3} - \frac{x}{6} + \frac{1}{4} < \frac{1}{2}$$

$$\frac{x}{3} - \frac{x}{6} < \frac{1}{2} - \frac{1}{4}$$

$$\frac{2x - x}{6} < \frac{2-1}{4}$$

$$\frac{x}{6} < \frac{1}{4}$$

$$x < \frac{6}{4}$$

$$x < \frac{3}{2}$$

As $x \in W$, the solution set is $\{0, 1\}$

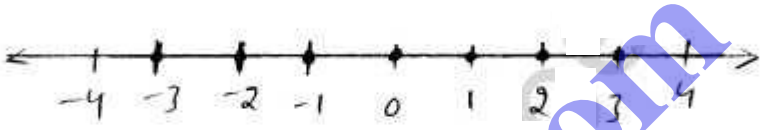
11 i) $-4 \leq 4x < 14, \quad x \in N$

$4x \geq -4 \quad ; \quad 4x < 14$

$x \geq -1 \quad ; \quad x < 14/4$

$x < 7/2$

As $x \in N$, the solution set is $\{-1, 0, 1, 2, 3\}$



ii) $-1 < \frac{x}{2} + 1 \leq 3, \quad x \in I$

$\frac{x}{2} + 1 > -1 \quad ; \quad \frac{x}{2} + 1 \leq 3$

$\frac{x}{2} > -1 - 1 \quad ; \quad \frac{x}{2} \leq 3 - 1$

$\frac{x}{2} > -2 \quad ; \quad \frac{x}{2} \leq 2$

$x > -4 \quad ; \quad x \leq 4$

i.e $-4 < x \leq 4$

As $x \in I$, the solution set is $\{-3, -2, -1, 0, 1, 2, 3, 4\}$