RD SHARMA Solutions for Class 9 Maths Chapter 7 - Linear Equations in Two Variables

Chapter 7 - Linear Equations in Two Variables Exercise 7.33

Question 1

If (4, 19) is a solution of the equation y = ax + 3, then a =
(a) 3
(b) 4
(c) 5
(d) 6

Solution 1

y = ax + 3
If (4, 19) is its solution, then it must satisfy the equation.
Thus, we have
19 = a × 4 + 3
i.e. 4a = 16
i.e. a = 4
Hence, correct option is (b).

Question 2

If (a, 4) lies on the graph of 3x + y = 10, then the value of a is
(a) 3
(b) 1
(c) 2
(d) 4

Solution 2

3x + y = 10
If (a, 4) lies on its graph, then it must satisfy the equation.
Thus, we have
3(a) + 4 = 10
i.e. 3a = 6
i.e. a = 2
Hence, correct option is (c).

Question 3

The graph of the linear equation 2x - y = 4 cuts x-axis at
(a) (2, 0)
(b) (-2, 0)
(c) (0, -4)
(d) (0, 4)

Solution 3

On x-axis, the y-co-ordinate is always 0.
So, 2x - y = 4 will cut the x-axis where y = 0
i.e. 2x = 4
i.e. x = 2
Thus, 2x - y = 4 will cut the x-axis at (2, 0).
Hence, correct option is (a).

Question 4

How many linear equations are satisfied by x = 2 and y = -3?
(a) Only one
(b) Two
(c) Three
(d) Infinitely many

Solution 4

From Point (2, -3) there are infinitely many lines passing in every-direction.
So (2, -3) is satisfied with infinite linear equations.
Hence, correct option is (d).

Question 5

The equation x - 2 = 0 on number line is represented by
(a) a line
(b) a point
(c) infinitely many lines
(d) two lines

Solution 5

Given equation is x – 2 = 0.
If this is treated as an equation in one variable x only, then it has the unique solution x = 2, which is a point on the number line.
However, when treated as an equation in two variables, it can be expressed as x - 2 = 0.
So as, an equation in two variables, x – 2 = 0 is represented by a single line parallel to y-axis at a distance of 2 units.
Hence, correct option is (a).

Question 6

x = 2, y = -1 is a solution of the linear equation
(a) x + 2y = 0
(b) x + 2y = 4
(c) 2x + y = 0
(d) 2x + y = 5

Solution 6

Substituting x = 2 and y = -1 in the following equations:
L.H.S. = x + 2y = 2 + 2(-1) = 2 - 2 = 0 = R.H.S.
L.H.S. = x + 2y = 2 + 2(-1) = 2 - 2 = 0 ≠ 4 ≠ R.H.S.
L.H.S. = 2x + y = 2(2) + (-1) = 4 - 1 = 3 ≠ 0 ≠ R.H.S.
L.H.S. = 2x + y = 2(2) + (-1) = 4 - 1 = 3 ≠ 5 ≠ R.H.S.
Hence, correct option is (a).

Question 7

If (2k - 1, k) is a solution of the equation 10x - 9y = 12, then k =
(a) 1
(b) 2
(c) 3
(d) 4

Solution 7

If (2k - 1, k) is solution of equation 10x - 9y = 12, then it must satisfy this equation.
Thus, we have
10(2k - 1) - 9k = 12
20k - 10 - 9k = 12
11k = 22
k = 2
Hence, correct option is (b).

Question 8

The distance between the graph of the equations x = -3 and x = 2 is
(a) 1
(b) 2
(c) 3
(d) 5

Solution 8

The distance between the graph of the equations x = -3 and x = 2
= 2 - (-3)
= 2 + 3
= 5
Hence, correct option is (d).

Question 9

The distance between the graphs of the equations y = -1 and y = 3 is
(a) 2
(b) 4
(c) 3
(d) 1

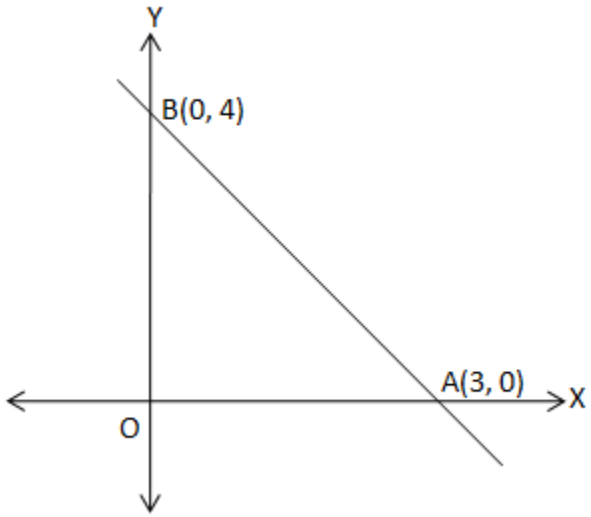
Solution 9

The distance between given two graphs
= 3 - (-1)
= 3 + 1
= 4
Hence, correct option is (b).

Question 10

If the graph of the equation 4x + 3y = 12 cuts the coordinate axes at A and B, then hypotenuse of right triangle AOB is of length
(a) 4 units
(b) 3 units
(c) 5 units
(d) none of these

Solution 10



$4x + 3y = 12$
At $x = 0$, $3y = 12 \Rightarrow y = 4$ units
At $y = 0$, $4x = 12 \Rightarrow x = 3$ units
The triangle formed is $\triangle AOB$, where
$OB = 4$ units
$OA = 3$ units
Hypotenuse $= AB = \sqrt{OB^2 + OA^2} = \sqrt{16 + 9} = 5$ units
Hence, correct option is (c).

Chapter 7 - Linear Equations in Two Variables Exercise Ex. 7.1

Question 1

Express the following linear equations in the form $ax + by + c = 0$ and indicate the value of a, b and c in each case:

(i) $-2x + 3y = 12$ **(ii)** $x - \frac{y}{2} - 5 = 0$ **(iii)** $2x + 3y = 9.3\bar{5}$

(iv) $3x = -7y$ **(v)** $2x + 3 = 0$ **(vi)** $y - 5 = 0$

(vii) $4 = 3x$ **(viii)** $y = \frac{x}{2}$

Solution 1

(i) We have,

$-2x + 3y = 12$

$\Rightarrow \quad -2x + 3y - 12 = 0$

On comparing this equation with $ax + by + c = 0$, we obtain

$a = -2,\ b = 3,$ and $c = -12$

(ii) We have,

$$x - \frac{y}{2} - 5 = 0$$

$$\Rightarrow \quad 1x - \frac{y}{2} - 5 = 0$$

On comparing this equation with $ax + by + c = 0$, we get

$$a = 1,\ b = \frac{-1}{2},\ \text{and } c = -5$$

(iii) We have,

$2x + 3y = 9.3\bar{5}$

$\Rightarrow \quad 2x + 3y - 9.3\bar{5} = 0$

On comparing this equation with $ax + by + c = 0$, we get

$a = 2,\ b = 3$ and $c = -9.3\bar{5}$

(iv) We have,

$3x = -7y$

$\Rightarrow \quad 3x + 7y + 0 = 0$

On comparing this equation with $ax + by + c = 0$, we get

$a = 3,\ b = 7$ and $c = 0$

(v) We have,

$2x + 3 = 0$

$\Rightarrow \quad 2x + 0y + 3 = 0$

On comparing this equation with $ax + by + c = 0$, we get

$a = 2,\ b = 0$ and $c = 3$

(vi) We have,

$y - 5 = 0$

$\Rightarrow \quad 0x + 1y - 5 = 0$

On comparing this equation with $ax + by + c = 0$, we get

$a = 0,\ b = 1$ and $c = -5$

(vii) We have,

$4 = 3x$

$\Rightarrow \quad -3x + 0y + 4 = 0$

On comparing this equation with $ax + by + c = 0$, we get

$a = -3,\ b = 0$ and $c = 4$

(viii) We have,

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

$\Rightarrow \quad 2y = x$

$\Rightarrow \quad 1x - 2y + 0 = 0$

On comparing this equation with $ax + by + c = 0$, we get

$a = 1,\ b = -2$ and $c = 0$.

Question 2

Write each of the following as an equation in two variables:

(i) $2x = -3$ (ii) $y = 3$ (iii) $5x = \frac{7}{2}$ (iv) $y = \frac{3}{2}x$

Solution 2

(i) We have,

$$2x = -3$$
$$\Rightarrow \quad 2x + 3 = 0$$
$$\Rightarrow \quad 2x + 0y + 3 = 0$$

(ii) We have,

$$y = 3$$
$$\Rightarrow \quad y - 3 = 0$$
$$\Rightarrow \quad 0x + y - 3 = 0$$

(iii) We have,

$$5x = \frac{7}{2}$$
$$\Rightarrow \quad 10x = 7$$
$$\Rightarrow \quad 10x - 7 = 0$$
$$\Rightarrow \quad 10x + 0y - 7 = 0$$

(iv) We have,

$$y = \frac{3}{2}x$$
$$\Rightarrow \quad 2y = 3x$$
$$\Rightarrow \quad 3x - 2y = 0$$
$$\Rightarrow \quad 3x - 2y + 0 = 0.$$

Question 3

The cost of ball pen is Rs 5 less than half of the cost of fountain pen. Write this statement as a linear equation in two variables.

Solution 3

Let the cost of ball pen be Rs x and that of a fountain pen to be Rs y. Then, according to the given statement, we have

$$x = \frac{y}{2} - 5$$
$$\Rightarrow \quad 2x = y - 10$$
$$\Rightarrow \quad 2x - y + 10 = 0.$$

Chapter 7 - Linear Equations in Two Variables Exercise Ex. 7.2

Question 1

Write two solutions for the following equation:

$3x + 4y = 7$

Solution 1

We have,

$3x + 4y = 7$

Substituting $x = 0$ in this equation, we get

$3 \times 0 + 4y = 7$

$\Rightarrow \quad y = \frac{7}{4}$

So, $\left(0, \frac{7}{4}\right)$ is a solution of the given equation.

Substituting $x = 1$, in the given equation, we get

$3 \times 1 + 4y = 7$

$\Rightarrow \quad 4y = 7 - 3$

$\Rightarrow \quad y = \frac{4}{4} = 1$

So, $(1,1)$ is a solution of the given equation.

$\therefore$ We obtain $\left(0, \frac{7}{4}\right)$ and $(1,1)$ as solutions of the given equation.

Question 2

Write two solutions for the following equation:

$x = 6y$

Solution 2

We have,

$x = 6y$

Substituting $y = 0$ in this equation, we get

$x = 6 \times 0 = 0$

So, $(0,0)$ is a solution of the given equation.

Substituting $y = 1$, in the given equation, we get

$x = 6 \times 1 = 6$

So, $(6,1)$ is a solution of the given equation.

$\therefore$ We obtain $(0,0)$ and $(6,1)$ as solutions of the given equation.

Question 3

Write two solutions for the following equation:

$x + xy = 4$

Solution 3

We have,

$x + \pi y = 4$

Substituting $y = 0$ in this equation, we get

$x + \pi \times 0 = 4$

$\Rightarrow \quad x = 4$

So, $(4, 0)$ is a solution of the given equation.

Substituting $y = 1$, in the given equation, we get

$x + \pi \times 1 = 4$

$\Rightarrow \quad x = 4 - \pi$

So, $(4 - \pi, 1)$ is a solution of the given equation.

$\therefore$ We obtain $(4, 0)$ and $(4 - \pi, 1)$ as solutions of the given equation.

Question 4

Write two solutions for the following equation:

$\frac{2}{3}x - y = 4$

Solution 4

We have,

$$\frac{2}{3}x - y = 4$$

Substituting $y = 0$ in this equation, we get

$$\frac{2}{3}x - 0 = 4$$

$$\Rightarrow \quad x = 4 \times \frac{3}{2}$$

$$\Rightarrow \quad x = 6$$

So, $(6,0)$ is a solution of the given equation.

Substituting $y = 1$, in the given equation, we get

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

$$\Rightarrow \quad \frac{2}{3}x = 5$$

$$\Rightarrow \quad x = \frac{15}{2}$$

So, $\left(\frac{15}{2},1\right)$ is a solution of the given equation.

$\therefore$ We obtain $(6,0)$ and $\left(\frac{15}{2},1\right)$ as solutions of the given equation.

Question 5

Check which of the following are solutions of the equation $2x - y = 6$ and which are not:

(i) $(3,0)$ (ii) $(0,6)$ (iii) $(2,-2)$ (iv) $(\sqrt{3},0)$ (v) $\left(\frac{1}{2},-5\right)$

Solution 5

In the equation $2x - y = 6$, we get

$\text{LHS} = 2x - y$ and $\text{RHS} = 6$

(i) Substituging $x = 3$ and $y = 0$ in $2x - y = 6$, we get

$\text{LHS} = 2 \times 3 - 0 = 6 - 0 = 6 = \text{RHS}$

So, $x = 3$, $y = 0$ or $(3,0)$ is a solution of $2x - y = 6$.

(ii) Substituging $x = 0$ and $y = 6$ in $2x - y = 6$, we get

$\text{LHS} = 2 \times 0 - 6 = -6 \neq \text{RHS}$

So, $(0,6)$ is not a solution of the equation $2x - y = 6$.

(iii) Substituting $x = 2$ and $y = -2$ in $2x - y = 6$, we get

$\text{LHS} = 2 \times 2 - (-2) = 4 + 2 = 6 = \text{RHS}$

So, $(2,-2)$ is a solution of $2x - y = 6$.

(iv) Substituting $x = \sqrt{3}$ and $y = 0$ in $2x - y = 6$, we get

$\text{LHS} = 2 \times \sqrt{3} - 0 = 2\sqrt{3} \neq \text{RHS}$

So, $(\sqrt{3},0)$ is not a solution of the equation $2x - y = 6$.

(v) Substituting $x = \frac{1}{2}$ and $y = -5$ in $2x - y = 6$, we get

$\text{LHS} = 2 \times \frac{1}{2} - (-5) = 1 + 5 = 6 = \text{RHS}$

So, $\left(\frac{1}{2},-5\right)$ is a solution of the $2x - y = 6$.

Question 6

If $x = -1, y = 2$ is a solution of the equation $3x + 4y = k$, find the value of k.

Solution 6

We have,

$3x + 4y = k$

It is given that $x = -1$ and $y = 2$ is a solution of the equation $3x + 4y = k$.

$\therefore \quad 3 \times (-1) + 4 \times 2 = k$

$\Rightarrow \quad -3 + 8 = k$

$\Rightarrow \quad 5 = k$

$\Rightarrow \quad k = 5$

Question 7

Find the value of λ, if $x = -\lambda$ and $y = \frac{5}{2}$ is a solution of the equation $x + 4y - 7 = 0$.

Solution 7

We have,

$$x + 4y - 7 = 0$$

It is given that $x = -\lambda$ and $y = \frac{5}{2}$ is a solution of the equation $x + 4y - 7 = 0$.

$$\therefore \quad -\lambda + 4 \times \frac{5}{2} - 7 = 0$$
$$\Rightarrow \quad -\lambda + 10 - 7 = 0$$
$$\Rightarrow \quad -\lambda = -3$$
$$\Rightarrow \quad \lambda = 3$$

Question 8

If $x = 2\alpha + 1$ and $y = \alpha - 1$ is a solution of the equation $2x - 3y + 5 = 0$, find the value of α.

Solution 8

We have,

$$2x - 3y + 5 = 0$$

It is given that $x = 2\alpha + 1$ and $y = \alpha - 1$ is a solution of the equation $2x - 3y + 5 = 0$.

$$\therefore \quad 2(2\alpha + 1) - 3(\alpha - 1) + 5 = 0$$
$$\Rightarrow \quad 4\alpha + 2 - 3\alpha + 3 + 5 = 0$$
$$\Rightarrow \quad \alpha + 10 = 0$$
$$\Rightarrow \quad \alpha = -10$$

Question 9

If x = 1 and y = 6 is solution of the equation 8x - ay + a^2= 0, find the value of a.

Solution 9

We have,

$$8x - ay + a^2 = 0$$

It is given that $x = 1$ and $y = 6$ is a solution of the equation $8x - ay + a^2 = 0$.

$$\therefore \quad 8 \times 1 - a \times 6 + a^2 = 0$$
$$\Rightarrow \quad 8 - 6a + a^2 = 0$$
$$\Rightarrow \quad a^2 - 6a + 8 = 0$$
$$\Rightarrow \quad a^2 - 4a - 2a + 8 = 0$$
$$\Rightarrow \quad a(a - 4)(a - 2) = 0$$
$$\Rightarrow \quad a - 4 = 0 \quad \text{or,} \quad a - 2 = 0$$
$$\Rightarrow \quad a = 4 \quad \text{or,} \quad a = 2$$

Hence, $a = 4$ or, $a = 2$.

Question 10

Write two solutions of the form x = 0, y = a and x = b, y = 0 for the follwoing equation: 5x - 2y = 10

Solution 10

We have,

$$5x - 2y = 10$$

Substituting $x = 0$ in the equation $5x - 2y = 10$, we get

$$5 \times 0 - 2y = 10$$

$$\Rightarrow \quad y = \frac{10}{-2} = -5$$

Thus, $x = 0$ and $y = -5$ is a solution of $5x - 2y = 10$.

Substituting $y = 0$, we get

$$5x - 2 \times 0 = 10$$

$$\Rightarrow \quad 5x = 10$$

$$\Rightarrow \quad x = 2$$

Thus, $x = 2$ and $y = 0$ is a solution of $5x - 2y = 10$.

Thus, $x = 0, y = -5$ and $x = 2, y = 0$ are two solutions of $5x - 2y = 10$.

Question 11

Write two solutions of the form x = 0, y = a and x = b, y = 0 for the following equation: -4x + 3y = 12

Solution 11

We have,

$$-4x + 3y = 12$$

Substituting $x = 0$ in the equation $-4x + 3y = 12$, we get

$$-4 \times 0 + 3y = 12$$

$$\Rightarrow \quad 3y = 12$$

$$\Rightarrow \quad y = \frac{12}{3} = 4$$

Thus, $x = 0$ and $y = 4$ is a solution of $-4x + 3y = 12$.

Substituting $y = 0$ in the equation $-4x + 3y = 12$, we get

$$-4x + 3 \times 0 = 12$$

$$\Rightarrow \quad -4x = 12$$

$$\Rightarrow \quad x = \frac{12}{-4} = -3$$

Thus, $x = -3$ and $y = 0$ is a solution of $-4x + 3y = 12$.

Thus, $x = 0, y = 4$ and $x = -3, y = 0$ are two solutions of $-4x + 3y = 12$.

Question 12

Write two solutions of the form $x = 0, y = a$ and $x = b, y = 0$ for the following equation:
$2x + 3y = 24$

Solution 12
We have,

$$2x + 3y = 24$$

Substituting $x = 0$ in the equation $2x + 3y = 24$, we get

$$2 \times 0 + 3y = 24$$

$$\Rightarrow \quad 3y = 24$$

$$\Rightarrow \quad y = \frac{24}{3} = 8$$

Thus, $x = 0$ and $y = 8$ is a solution of $2x + 3y = 24$.

Substituting $y = 0$ in $2x + 3y = 24$, we get

$$2x + 3 \times 0 = 24$$

$$\Rightarrow \quad 2x = 24$$

$$\Rightarrow \quad x = \frac{24}{2} = 12$$

Thus, $x = 12$ and $y = 0$ is a solution of $2x + 3y = 24$.

Thus, $x = 0, y = 8$ and $x = 12, y = 0$ are two solutions of $2x + 3y = 24$.

Chapter 7 - Linear Equations in Two Variables Exercise Ex. 7.3

Question 1
Draw the graph of each of the following linear equations in two variables:
$x + y = 4$

Solution 1

We have,

$$x + y = 4$$

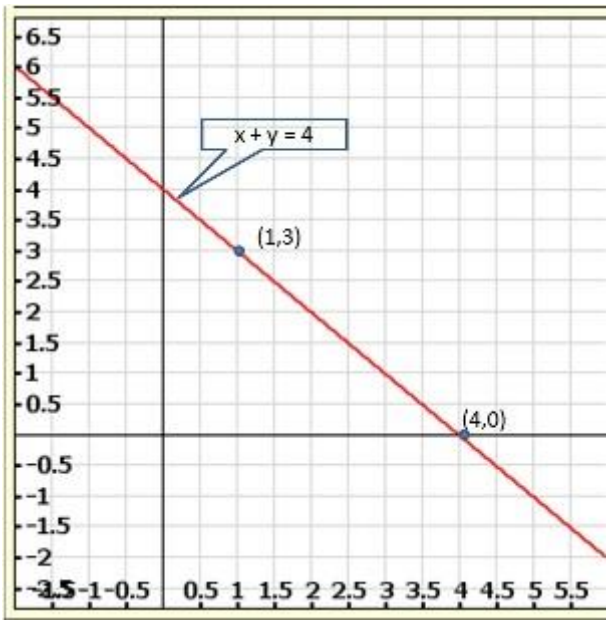
$$\Rightarrow \quad x = 4 - y \qquad \text{—(i)}$$

Putting $y = 0$, we get $x = 4 - 0 = 4$

Putting $y = 3$, we get $x = 4 - 3 = 1$

Thus, we have the following table giving two points on the line represented by the equation $x + y = 4$:

Graph of the equation $x + y = 4$:



Question 2

Draw the graph of each of the following linear equations in two variables:

$x - y = 2$

Solution 2

We have,

$$x - y = 2$$

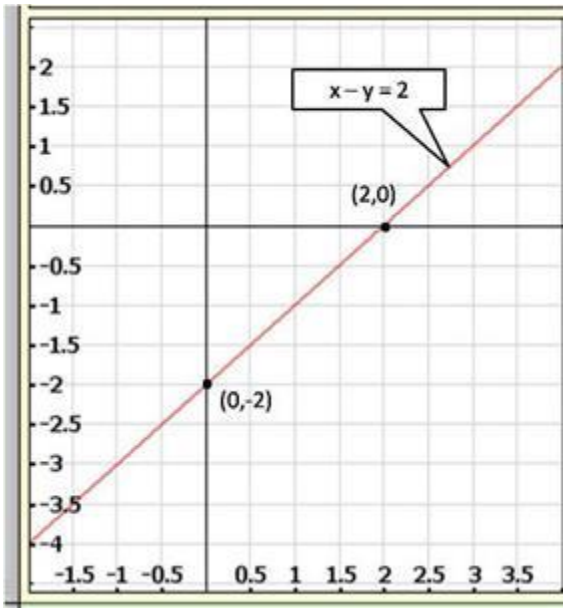
$$\Rightarrow \quad x = 2 + y \qquad \text{—(i)}$$

Putting $y = 0$, we get $x = 2 + 0 = 2$

Putting $y = -2$, we get $x = 2 - 2 = 0$

Thus, we have the following table giving two points on the line represented by the equation $x - y = 2$:

Graph of the equation $x - y = 2$:



Question 3

Draw the graph of each of the following linear equations in two variables:

$-x + y = 6$

Solution 3

We have,

$-x + y = 6$

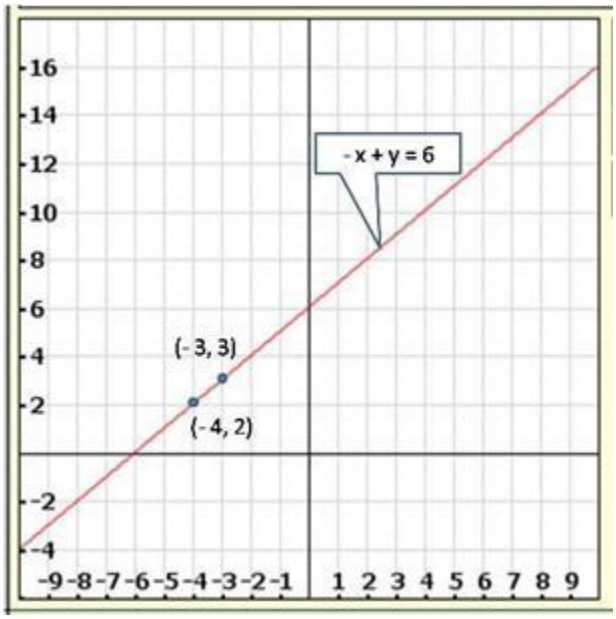
$\Rightarrow \quad y = 6 + x \qquad \text{—(i)}$

Putting $x = -4$, we get $y = 6 - 4 = 2$

Putting $x = -3$, we get $y = 6 - 3 = 3$

Thus, we have the following table giving two points on the line represented by the equation $-x + y = 6$

Graph of the equation $-x + y = 6$:



Question 4

Draw the graph of each of the following linear equations in two variables:

$y = 2x$

Solution 4

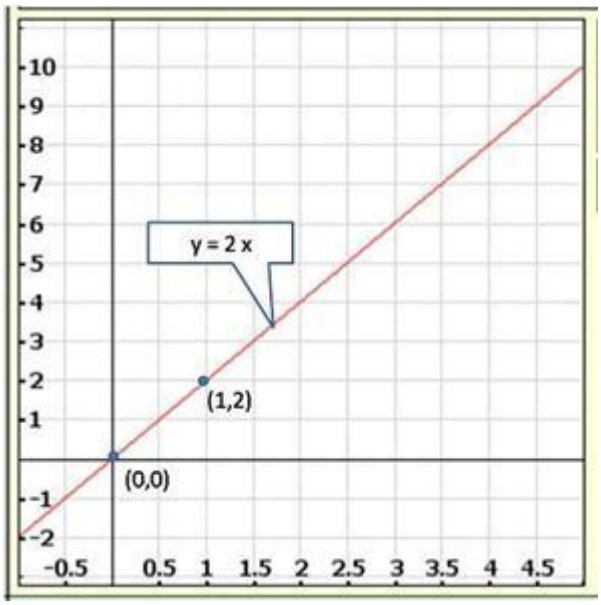
We have,

$$y = 2x \qquad \text{—(i)}$$

Putting $x = 0$, we get $y = 2 \times 0 = 0$
Putting $x = 1$, we get $y = 2 \times 1 = 2$

Thus, we have the following table giving two points on the line represented by the equation $y = 2x$:

Graph of the equation $y = 2x$:



Question 5

Draw the graph of each of the following linear equations in two variables:

$3x + 5y = 15$

Solution 5

We have,

$$3x + 5y = 15$$

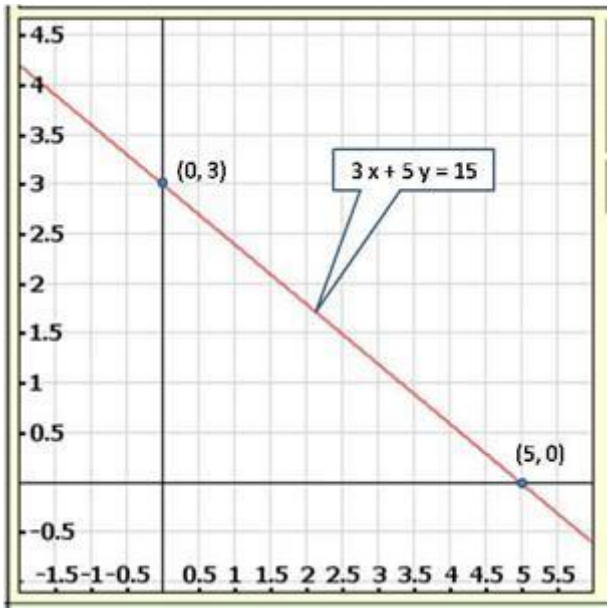
$$\Rightarrow \quad 3x = 15 - 5y$$

$$\Rightarrow \quad x = \frac{15 - 5y}{3} \qquad \text{—(i)}$$

Putting $y = 0$, we get $x = \frac{15 - 5 \times 0}{3} = 5$

Putting $y = 3$, we get $x = \frac{15 - 5 \times 3}{3} = 0$

Thus, we have the following table giving two points on the line represented by the equation $3x + 5y = 1$



Question 6

Draw the graph of each of the following linear equations in two variables:

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

Solution 6

We have,

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

$$\Rightarrow \quad \frac{3x-2y}{6}=2$$

$$\Rightarrow \quad 3x-2y=12$$

$$\Rightarrow \quad 3x=12+2y$$

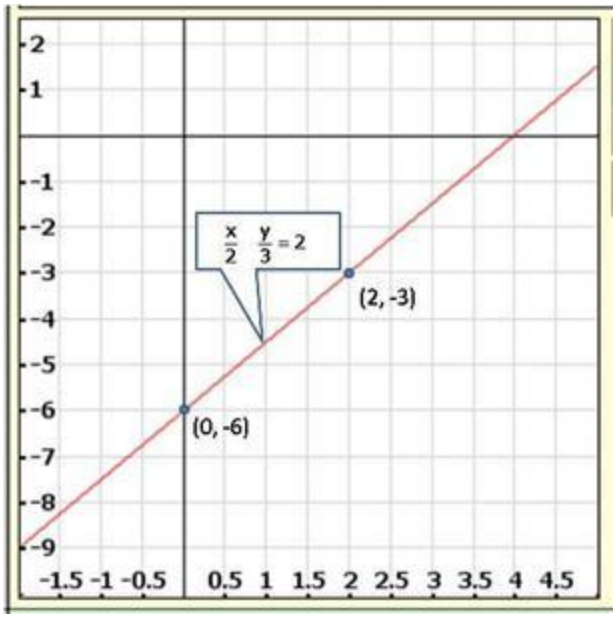
$$\Rightarrow \quad x=\frac{12+2y}{3}$$

Putting $y=-6$, we get $x=\frac{12+2(-6)}{3}=0$

Putting $y=-3$, we get $x=\frac{12+2(-3)}{3}=2$

Thus, we have the following table giving two points on the line represented by the equation $\frac{x}{2}-\frac{y}{3}=2$

Graph of the equation $\frac{x}{2}-\frac{y}{3}=2$:



Question 7

Draw the graph of each of the following linear equations in two variables:

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

Solution 7

We have,

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

$$\Rightarrow \quad x-2 = 3(y-3)$$

$$\Rightarrow \quad x-2 = 3y-9$$

$$\Rightarrow \quad x = 3y-9+2$$

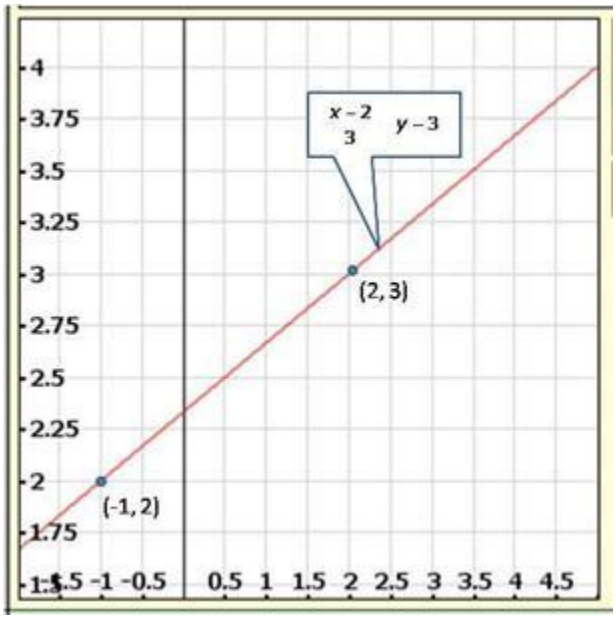
$$\Rightarrow \quad x = 3y-7 \qquad \text{—(i)}$$

Putting $y = 2$, we get $x = 3(2)-7 = -1$

Putting $y = 3$, we get $x = 3(3)-7 = 2$

Thus, we have the following table giving two points on the line represented by the equation $\frac{x-2}{3} = y$

Graph of the equation $\frac{x-2}{3} = y-3$:



Question 8

Draw the graph of each of the following linear equations in two variables:

$2y = -x+1$

Solution 8

We have,

$$2y = -x + 1$$

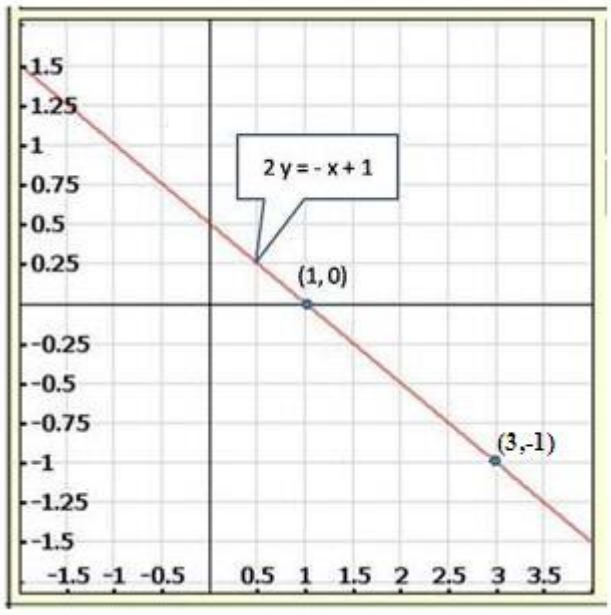
$$\Rightarrow \quad x = 1 - 2y \qquad \text{—(i)}$$

Putting $y = 0$, we get $x = 1 - 2 \times 0 = 1$

Putting $y = -1$, we get $x = 1 - 2(-1) = 3$

Thus, we have the following table giving two points on the line represented by the equation $2y = -x + 1$

Graph of the equation $2y = -x + 1$:



Question 9

Give the equations of two lines passing through $(3,12)$. How many more such lines are there, and why?

Solution 9

The equation of two lines passing through $(3,12)$ are

$$4x - y = 0$$

$$3x - y + 3 = 0 \qquad \text{—(i)}$$

There are infinitely many lines passing through $(3,12)$.

Question 10

A three-wheeler scooter charges Rs 15 for first kilometer and Rs 8 each for every subsequent kilometer. Fora distance of x km, an amount of Rs y is paid. Write the linear equation representing the above information.

Solution 10

Total fare of Rs y for covering distance of x kilometres is given by

$$y = 15 + 8(x - 1)$$

$$\Rightarrow \quad y = 15 + 8x - 8$$

$$\Rightarrow \quad y = 8x + 7$$

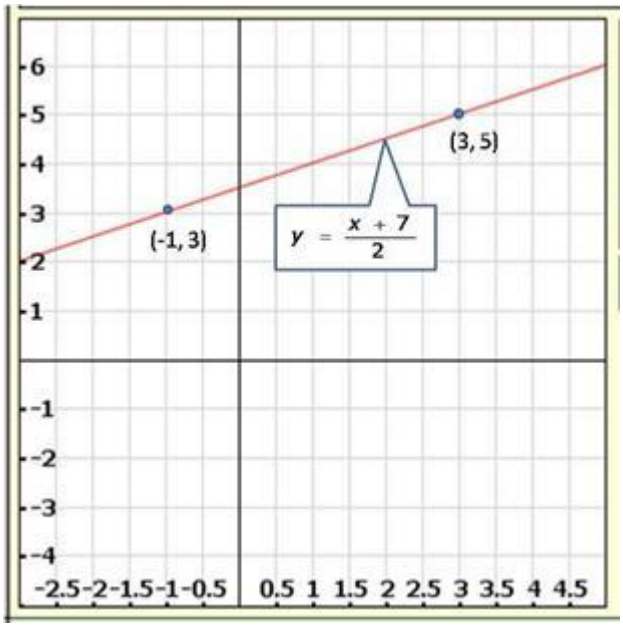
This is the required linear equation for the given information.

Question 11

Plot the points (3,5) and (-1,3) on a graph paper and verify that the straight line passing through these points also passes through the point (1,4).

Solution 11

The given points on the graph:



It is dear from the graph, the straight line passing through these points also passes through the point (1,4).

Question 12

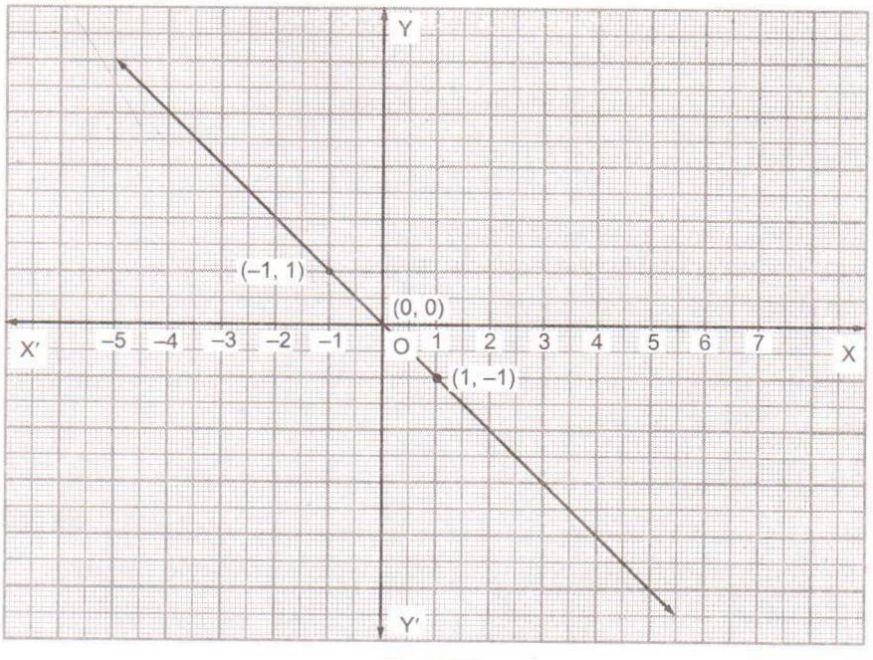
From the choices given below, choose the equation whose graph is given in fig.,

(i) y = x

(ii) x + y = 0

(iii) y = 2x

(iv) 2 + 3y = 7x



Solution 12

Clearly $(-1,1)$ and $(1,-1)$ satisfy the equation $x + y = 0$

$\therefore$ The equation whose graph is given is $x + y = 0$.

Question 13

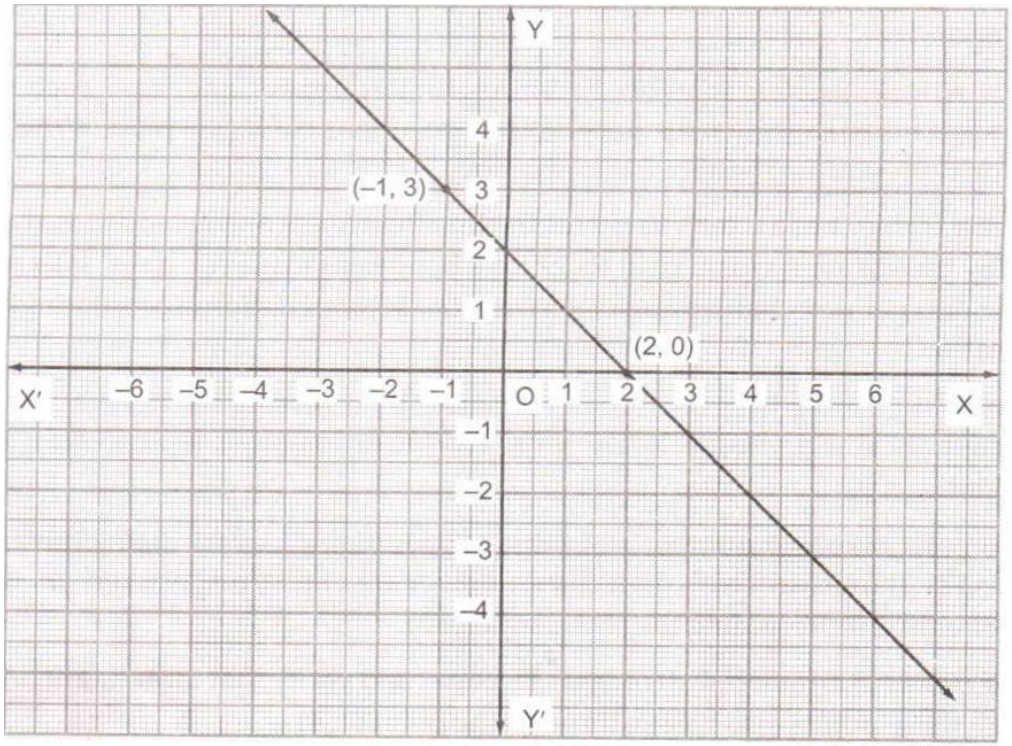
From the choices given below, choose the equation whose graph is given in fig.,

(i) y = x + 2

(ii) y = x - 2

(iii) y = -x + 2

(iv) x + 2y = 6



Solution 13

Clearly, $(2,0)$ and $(-1,3)$ satisfy the equation $y = -x + 2$.

$\therefore$ The equation whose graph is given is $y = -x + 2$.

Question 14

If the point $(2,-2)$ lies on the graph of the linear equation $5x + ky = 4$, find the value of k.

Solution 14

It is given that $(2,-2)$ is a solution of the equation $5x + ky = 4$

$$\therefore \quad 5 \times 2 + k \times (-2) = 4$$
$$\Rightarrow \quad 10 - 2k = 4$$
$$\Rightarrow \quad -2k = 4 - 10$$
$$\Rightarrow \quad -2k = -6$$
$$\Rightarrow \quad k = \frac{6}{2}$$
$$\Rightarrow \quad k = 3$$

Question 15

Draw the graph of the equation 2x + 3y = 12. Find the graph, find the coordinates of the point.

(i) whose y-coordinate is 3.

(ii) whose x-coordinate is -3

Solution 15

Graph of the equation $2x + 3y = 12$:

We have,

$$2x + 3y = 12$$

$$\Rightarrow \quad 2x = 12 - 3y$$

$$\Rightarrow \quad x = \frac{12 - 3y}{2}$$

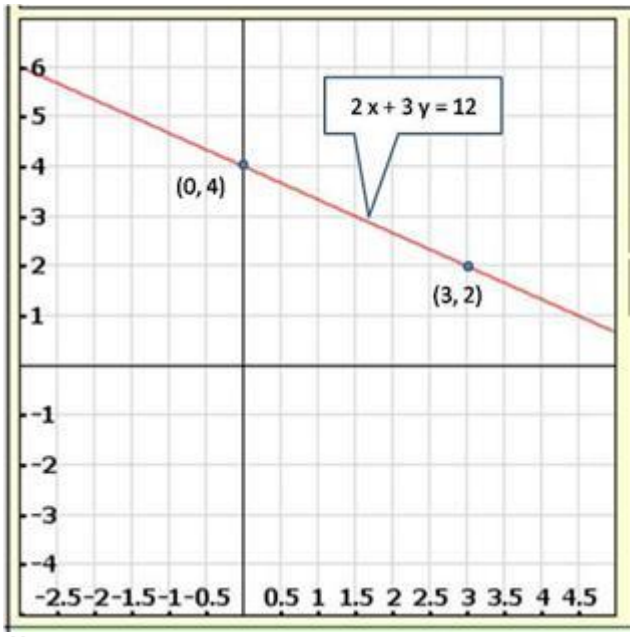
Putting $y = 2$, we get $x = \frac{12 - 3 \times 2}{2} = 3$

Putting $y = 4$, we get $x = \frac{12 - 3 \times 4}{2} = 0$

Thus, (3,0) and (0,4) are two points on the line $2x + 3y = 12$.

The graph of the line represented by the equation $2x + 3y = 12$:

x	0	3
y	4	2



(i) To find the coordinates of the point when $y = 3$, we draw a line parallel to x-axis and passing through (0,3). This line meets the graph of $2x + 3y = 12$ at a point P from which we draw a line parallel to y-axis which crosses x-axis at $x = \frac{3}{2}$. So, the coordinates of the required point are $\left(\frac{3}{2}, 3\right)$.

(ii) To find the coordinates of the point when $x = -3$, we draw a line parallel to y-axis and passing through $(-3, 0)$. This line meets the graph of $2x + 3y = 12$ at a point P from which we draw a line parallel to x-axis which crosses y-axis at $y = 6$. So, the coordinates of the required point are $(-3, 6)$.

Question 16

Draw the graph of the equation given below. Also, find the coordinates of the points where the graph cuts the coordinate axes:

$6x - 3y = 12$

Solution 16

We have,

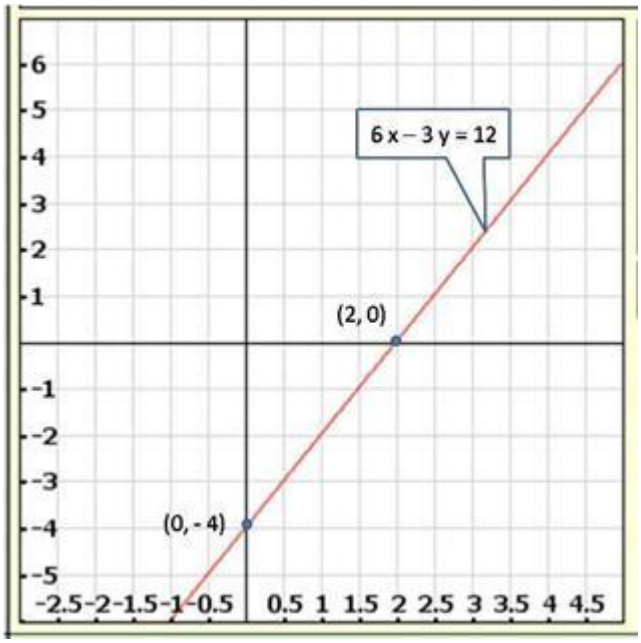
$$6x - 3y = 12$$
$$\Rightarrow \quad 3(2x - y) = 12$$
$$\Rightarrow \quad 2x - y = 4$$
$$\Rightarrow \quad 2x - 4 = y$$
$$\Rightarrow \quad y = 2x - 4 \qquad \text{—(i)}$$

Putting $x = 0$ in (i), we get $y = -4$

Putting $x = 2$ in (i), we get $y = 0$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $6x - 3y = 12$.

The graph of line $6x - 3y = 12$:



Clearly, the line intersect with the coordinate axes at $(2,0)$ and $(0,-4)$.

Question 17

Draw the graph of the equation given below. Also, find the coordinates of the points where the graph cuts the coordinate axes:

$-x + 4y = 8$

Solution 17

We have,

$-x + 4y = 8$

$\Rightarrow \quad 4y - 8 = x$

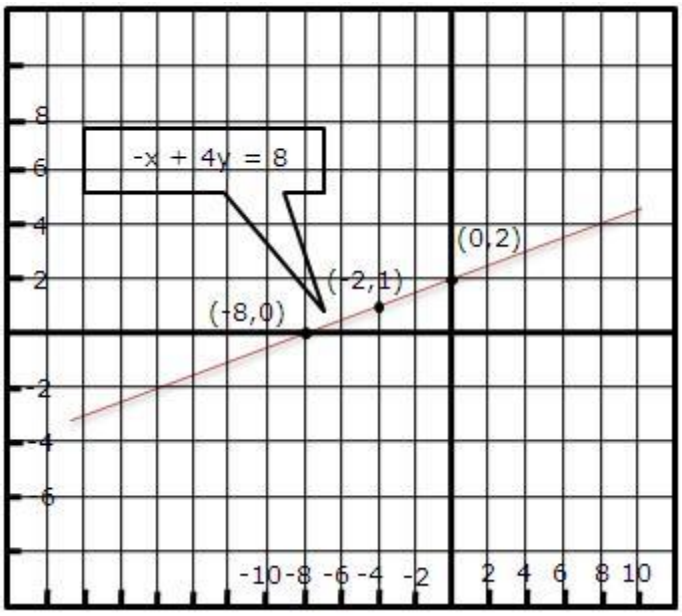
$\Rightarrow \quad x = 4y - 8 \qquad \text{—(i)}$

Putting $y = 1$ in (i), we get $x = 4 \times 1 - 8 = -4$

Putting $y = 2$ in (i), we get $x = 4 \times 2 - 8 = 0$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $-x + 4y = 8$.

The graph of line $-x + 4y = 8$:



Clearly, the line intersect with the coordinate axes at $(-8,0)$ and $(0,2)$.

Question 18

Draw the graph of the equation given below. Also, find the coordinates of the points where the graph cuts the coordinate axes:

$2x + y = 6$

Solution 18

We have,

$2x + y = 6$

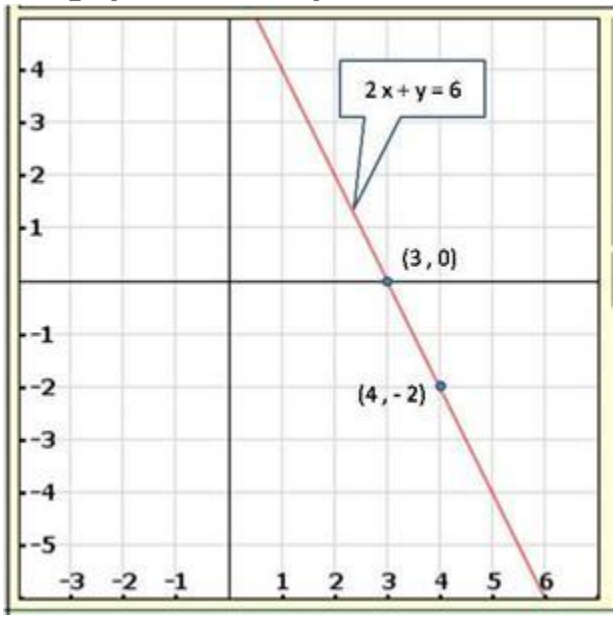
$\Rightarrow \quad y = 6 - 2x \qquad \text{—(i)}$

Putting $x = 3$ in (i), we get $y = 6 - 2 \times 3 = 0$

Putting $x = 4$ in (i), we get $y = 6 - 2 \times 4 = -2$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $2x + y = 6$.

The graph of line $2x + y = 6$:



Clearly, the line intersect with the coordinate axes at $(3,0)$ and $(0,6)$.

Question 19

Draw the graph of the equation given below. Also, find the coordinates of the points where the graph cuts the coordinate axes:

$3x + 2y + 6 = 0$

Solution 19

We have,

$$3x + 2y + 6 = 0$$

$$\Rightarrow \quad 2y = -6 - 3x$$

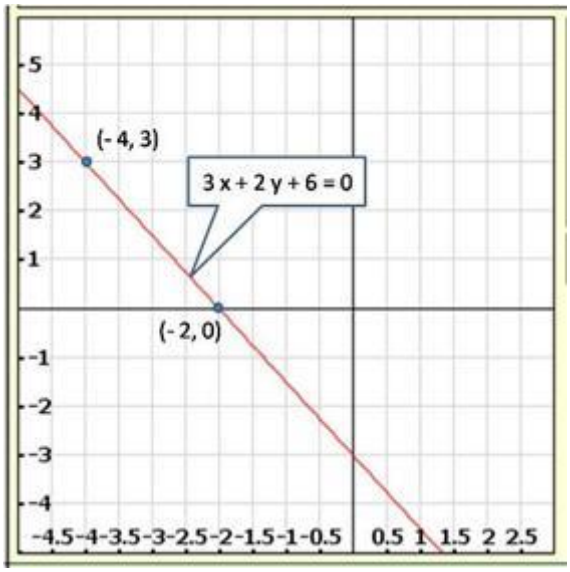
$$\Rightarrow \quad y = \frac{-6 - 3x}{2} \qquad \text{—(i)}$$

Putting $x = -2$ in (i), we get $y = \frac{6 - 3(-2)}{2} = 0$

Putting $x = -4$ in (i), we get $y = \frac{-6 - 3(-4)}{2} = 3$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $3x - 2y + 6 = 0$.

The graph of line $3x + 2y + 6 = 0$:



Clearly, the line intersect with the coordinate axes at $(-2, 0)$ and $(0, -3)$.

Question 20

A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Aarushi paid Rs 27 for a bookkept for seven days. If fixed charges are Rs x and per day charges are Rs y. Write the linear equation representing the above information.

Solution 20

Total charges paid by Aarushi is given by

$$27 = x + 4y$$

$$\Rightarrow \quad x + 4y = 27$$

This is the required linear equation for the given information.

Question 21

A number is 27 more than the number obtained by reversing its digits. If its unit's and ten's digit are x and y respectively, write the linear equation representing the above statement.

Solution 21

Total original number is $10y + x$.

The new number is obtained after reversing the order of digits is $10x + y$.

Acciding to question,

$$10y + x = 10x + y + 27$$
$$\Rightarrow \quad 9y - 9x = 27$$
$$\Rightarrow \quad y - x = 3$$
$$\Rightarrow \quad x - y + 3 = 0$$

This is the required linear equation for the given information.

Question 22

The sum of a two digit number and the number obtained by reversing the order of its digits is 121. If units and ten's digit of the number are x and y respectively, then write the linear equation representing the above statement.

Solution 22

Total original number is $10y + x$.

The new number is obtained after reversing the order of digits is $10x + y$.

Acciding to question,

$$(10y + x) + (10x + y) = 121$$
$$\Rightarrow \quad 10y + x + 10x + y = 121$$
$$\Rightarrow \quad 11x + 11y = 121$$
$$\Rightarrow \quad 11(x + y) = 121$$
$$\Rightarrow \quad x + y = 11$$

This is the required linear equation for the given information.

Question 23

Draw the graph of the equation $2x + y = 6$. Shade the region bounded by the graph and the coordinate axes. Also, find the area of the shaded region.

Solution 23

We have,

$2x + y = 6$

$\Rightarrow \quad y = 6 - 2x \qquad \text{—(i)}$

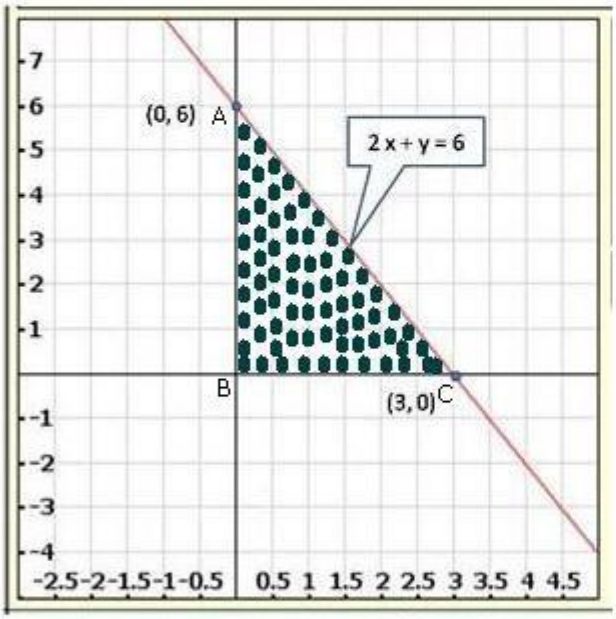
Putting $x = 3$ in (i), we get $y = 6 - 2 \times 3 = 0$

Putting $x = 0$ in (i), we get $y = 6 - 2 \times 0 = 6$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $2x + y = 6$.

x	3	0
y	0	6

The graph of line $2x + y = 6$:



The area enclosed by the graph of line and the coordinate axes is shaded in the graph

Now,

Required area = Area of the shaded region

$\Rightarrow$ Required area = Area of ΔABC

$\Rightarrow \text{Required area} = \frac{1}{2}(\text{Base} \times \text{Height})$

$\Rightarrow \text{Required area} = \frac{1}{2}(3 \times 6)$

$= 9$ sq. units.

Question 24

Draw the graph of the equation $\frac{x}{3} + \frac{y}{4} = 1$. Also, find the area of the triangle formed by the line and the coordinates axes.

Solution 24

We have,

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

$$\Rightarrow \quad 4x+3y=12$$

$$\Rightarrow \quad 4x=12-3y$$

$$\Rightarrow \quad x=\frac{12-3y}{4}$$

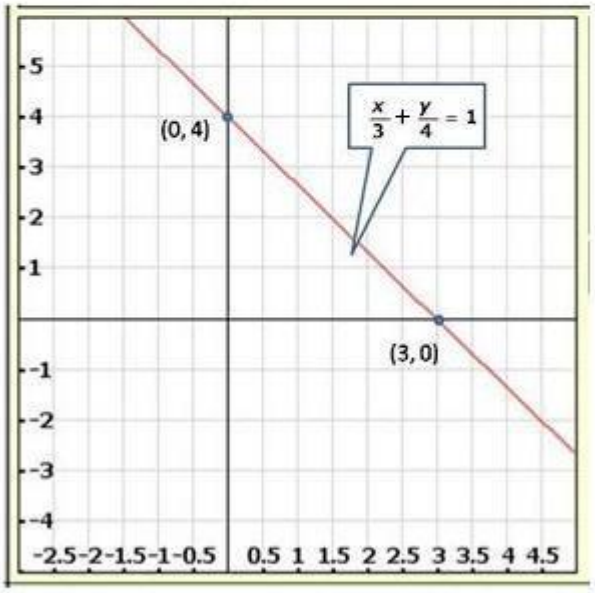
Putting $y=0$ in (i), we get $x=\frac{12-3\times 0}{4}=3$

Putting $y=4$ in (i), we get $x=\frac{12-3\times 4}{4}=0$

Thus, we obtain the following table giving coordinates of two points on the line represented by the equation $\frac{x}{3}+\frac{y}{4}=1$.

x	0	3
y	4	0

The graph of line $\frac{x}{3}+\frac{y}{4}=1$:



Now,

$$\text{Required area of trianlge}=\frac{1}{2}(\text{Base}\times\text{Height})$$

$$=\frac{1}{2}\times AB\times AC$$

$$=\frac{1}{2}\times 3\times 4$$

$$=6 \text{ sq. units}$$

Question 25

Draw the graph of y = |x|.

Solution 25

We have,

y = |X| ...(i)

Putting x = 0, we get y = 0

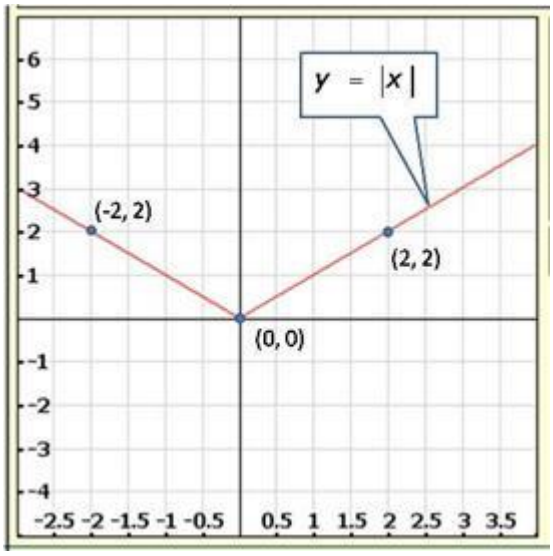
Putting x = 2, we get y = 2

Putting x = -2, we get y = 2

Thus, we have the following table for the points on graph of |x|.

x	0	2	-2
y	0	2	2

The graph of the equation y = |x|:



Question 26

Draw the graph of y = |x| + 2.

Solution 26

We have,

y = |x| + 2 ...(i)

Putting x = 0, we get y = 2

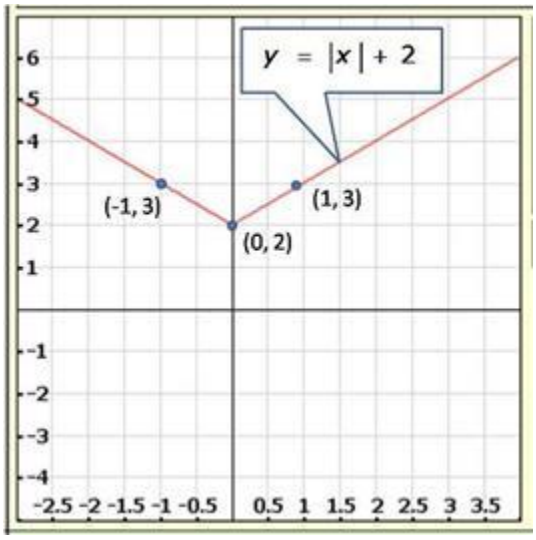
Putting x = 1, we get y = 3

Putting x = -1, we get y = 3

Thus, we have the following table for the points on graph of |x| + 2:

x	0	1	-1
y	2	3	3

The graph of the equation y = |x| + 2:



Question 27

Draw the graphs of the following linear equations on the same graph paper:

$$2x + 3y = 12, \quad x - y = 1$$

Find the coordinates of the vertices of the triangle formed by the two straight lines and the y-axis. Also, find the area of the triangle.

Solution 27

Graph of the equation $2x+3y=12$:

We have,

$$2x+3y=12$$

$$\Rightarrow \quad 2x=12-3y$$

$$\Rightarrow \quad x=\frac{12-3y}{2} \qquad \text{—(i)}$$

Putting $y=4$, we get $x=\frac{12-3\times 4}{2}=0$

Putting $y=2$, we get $x=\frac{12-3\times 2}{2}=3$

Thus, we have the following table for the points on the line $2x+3y=12$:

x	0	3
y	4	2

Ploting points $A(0,4), B(3,2)$ on the graph paper and drawing a line passing through them, we obtain graph of the equation $2x+3y=12$.

Graph of the equation $x-y=1$:

We have,

$$x-y=1$$

$$\Rightarrow \quad x=1+y$$

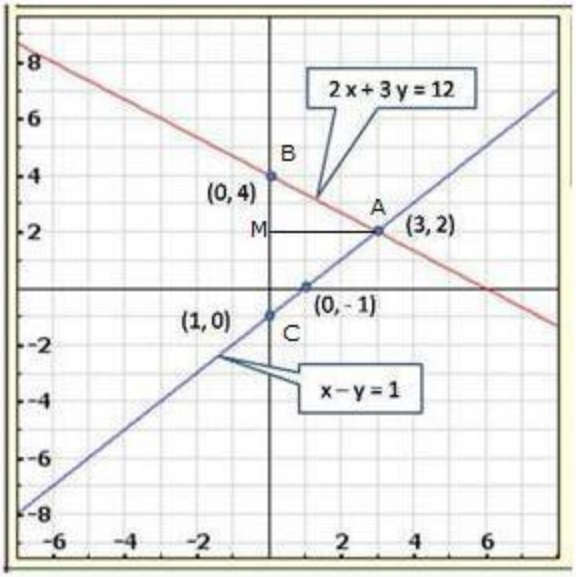
Putting $y=0$, we get $x=1+0=1$

Putting $y=-1$, we get $x=1-1=0$

Thus, we have the following table for the points on the line $x-y=1$:

x	1	0
y	0	-1

Ploting points $C(1,0)$ and $D(0,-1)$ on the same graph paper and drawing a line passing through them, we obtain the graph of the line represented by the equation $x-y=1$.



Clearly, two lines intersect at $A(3,2)$.

The graph of line $2x+3y=12$ intersect with y-axis at $B(0,4)$ and the graph of the line $x-y=1$ intersect with y-axis at $C(0,-1)$.

So, the vertices of the triangle formed by the two straight lines and y-axis are $A(3,2)$, $B(0,4)$ and $C(0,-1)$.

Now,

$$\text{Area of } \Delta ABC = \frac{1}{2}(\text{Base} \times \text{Height})$$
$$= \frac{1}{2}(BC \times AM)$$
$$= \frac{1}{2}(5 \times 3)$$
$$= \frac{15}{2} \text{ sq. units.}$$

Question 28

Draw the graphs of the linear equations $4x-3y+4=0$ and $4x+3y-20=0$. Find the area bounded by these lines and x-axis.

Solution 28

We have,

$$4x - 3y + 4 = 0$$

$$\Rightarrow \quad 4x = 3y - 4$$

$$\Rightarrow \quad x = \frac{3y - 4}{4}$$

Putting $y = 0$, we get $x = \frac{3 \times 0 - 4}{4} = -1$

Putting $y = 4$, we get $x = \frac{3 \times 4 - 4}{4} = 2$

Thus, we have the following table for the points on the line $4x - 3y + 4 = 0$:

x	-1	2
y	0	4

We have,

$$4x + 3y - 20 = 0$$

$$\Rightarrow \quad 4x = 20 - 3y$$

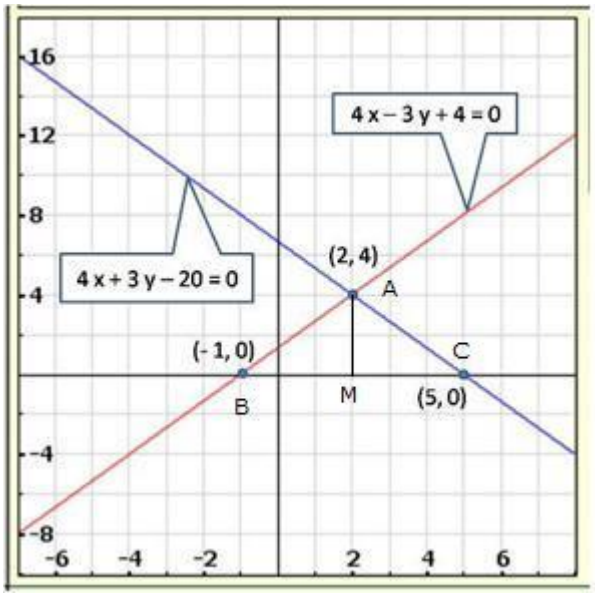
$$\Rightarrow \quad x = \frac{20 - 3y}{4}$$

Putting $y = 0$, we get $x = \frac{20 - 3 \times 0}{4} = 5$

Putting $y = 4$, we get $x = \frac{20 - 3 \times 4}{4} = 2$

Thus, we have the following table for the points on the line $4x - 3y - 20 = 0$:

x	5	2
y	0	4



Clearly, two lines intersect at $A(2,4)$.

The graphs of the lines $4x-3y+4=0$ and $4x+3y-20=0$ intersect with y-axis at $B(-1,0)$ and $C(5,0)$ respectively.

$$\therefore \quad \text{Area of } \Delta ABC = \frac{1}{2}(\text{Base} \times \text{Height})$$
$$= \frac{1}{2}(BC \times AM)$$
$$= \frac{1}{2}(6 \times 4)$$
$$= 3 \times 4$$
$$= 12 \text{ sq. units}$$

$\therefore$ Area of $\Delta ABC = 12$ sq. units.

Question 29

The path of a train A is given by the equation $3x+4y-12=0$ and the path of another train B is given by the equation $6x+8y-48=0$. Represent this situation graphically.

Solution 29

We have,

$$3x + 4y - 12 = 0$$

$$\Rightarrow \quad 3x = 12 - 4y$$

$$\Rightarrow \quad 3x = \frac{12 - 4y}{3}$$

Putting $y = 0$, we get $x = \frac{12 - 4 \times 0}{3} = 4$

Putting $y = 3$, we get $x = \frac{12 - 4 \times 3}{3} = 0$

Thus, we have the following table for the points on the line $3x + 4y - 12 = 0$:

x	4	0
y	0	3

We have,

$$6x + 8y - 48 = 0$$

$$\Rightarrow \quad 6x + 8y = 48$$

$$\Rightarrow \quad 6x = 48 - 8y$$

$$\Rightarrow \quad x = \frac{48 - 8y}{6}$$

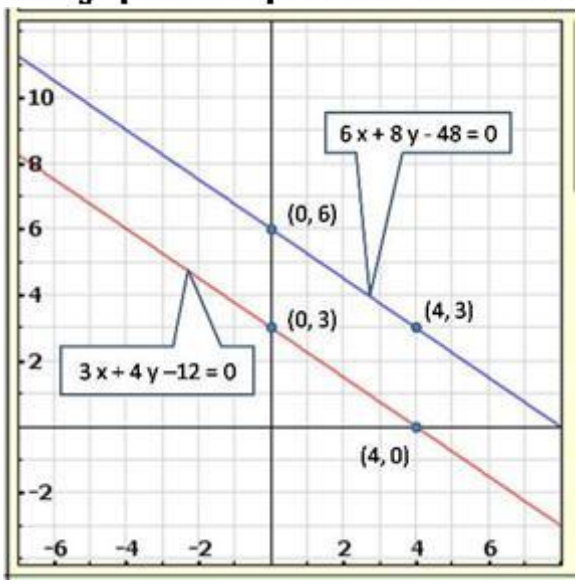
Putting $y = 6$, we get $x = \frac{48 - 8 \times 6}{6} = 0$

Putting $y = 4$, we get $x = \frac{48 - 8 \times 3}{6} = 4$

Thus, we have the following table for the points on the line $6x + 8y - 48 = 0$:

x	0	4
y	6	3

The graphs of the path of a train *A* and *B* are:



Question 30

Ravish tells his daughter Aarushi, "Seven years ago, I was seven times as old as you were then. Also, three years form now, I shall be three times as old as you will be". If present ages of Aarushi and Ravish are x and y years respectively, represent this situation algebraically as well as graphically.

Solution 30

It is given that seven year ago Ravish was seven times as old as his daughter.

$\therefore \quad 7(x-7) = y-7$

$\Rightarrow \quad 7x-49 = y-7$

$\Rightarrow \quad 7x-42 = y \qquad \text{—(i)}$

It is also given that after three years from now Ravish shall be three times as old as her daughter.

$\therefore \quad 3(x+3) = y+3$

$\Rightarrow \quad 3x+9 = y+3$

$\Rightarrow \quad 3x+6 = y \qquad \text{—(ii)}$

Now,

$y = 7x-42 \qquad [\text{Using (i)}]$

Putting $x = 6$, we get $y = 7\times6-42 = 0$

Putting $x = 5$, we get $y = 7\times5-42 = -7$

Thus, we have the following table for the points on the line $7x-42 = y$:

x	6	5
y	0	-7

We have,

$y = 3x+6 \qquad [\text{Using (ii)}]$

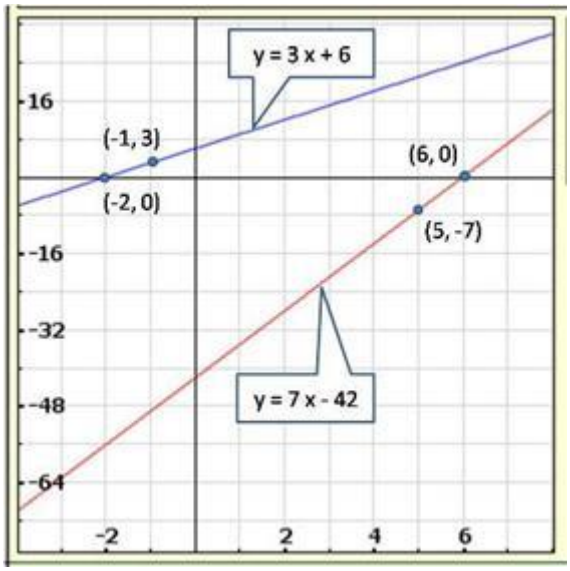
Putting $x = -2$, we get $y = 3\times(-2)+6 = 0$

Putting $x = -1$, we get $y = 3\times(-1)+6 = 3$

Thus, we have the following table for the points on the line $y = 3x+6$:

x	-1	-2
y	3	0

The graphs of the both linear equations are:



Question 31

Aarushi was driving a car with uniform speed of 60 km/h. Draw distance-time graph. From the graph, find the distance travelled by Aarushi in

(i) $2\frac{1}{2}$ **Hours** **(ii)** $\frac{1}{2}$ **Hour**

Solution 31

Let x be the time and y be the distance travelled by Aarushi.

It is given that speed of car is 60 km/h

We know that,

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\Rightarrow \quad 60 = \frac{y}{x}$$

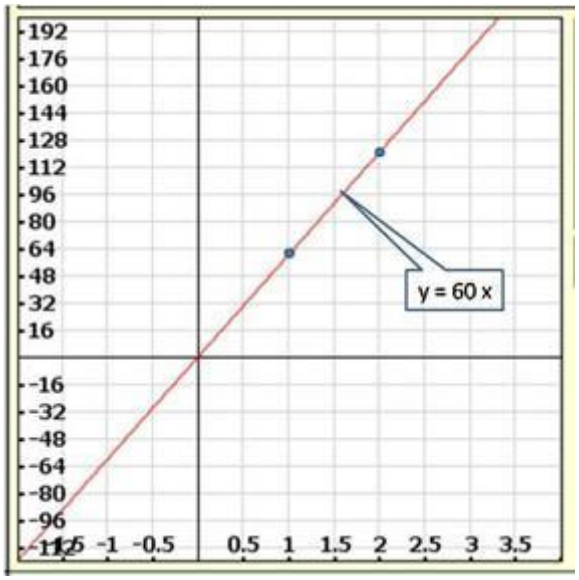
$$\Rightarrow \quad y = 60x$$

Putting $x = 1$, we get $y = 60$
Putting $x = 2$, we get $y = 120$

Thus, we have the following table for the points on the line $y = 60x$:

x	1	2
y	60	120

The graph of the equation $y = 60x$:



(i) To find the coordinates of the point when $x = 2\frac{1}{2} = 2.5$, we draw a line parallel to y-axis and passing through $(2.5, 0)$. This line meets the graph of $y = 60x$ at a point P from which we draw a line parallel to x-axis which crosses y-axis at $y = 150$. So, the distance travelled by Aarushi in $2\frac{1}{2}$ hours is 150 km.

(ii) To find the coordinates of the point when $x = \frac{1}{2} = 0.5$, we draw a line parallel to y-axis and passing through $(0.5, 0)$. This line meets the graph of $y = 60x$ at a point P from which we draw a line parallel to x-axis which crosses y-axis at $y = 30$. So, the distance travelled by Aarushi in $\frac{1}{2}$ hour is 30 km.

Chapter 7 - Linear Equations in Two Variables Exercise Ex. 7.4

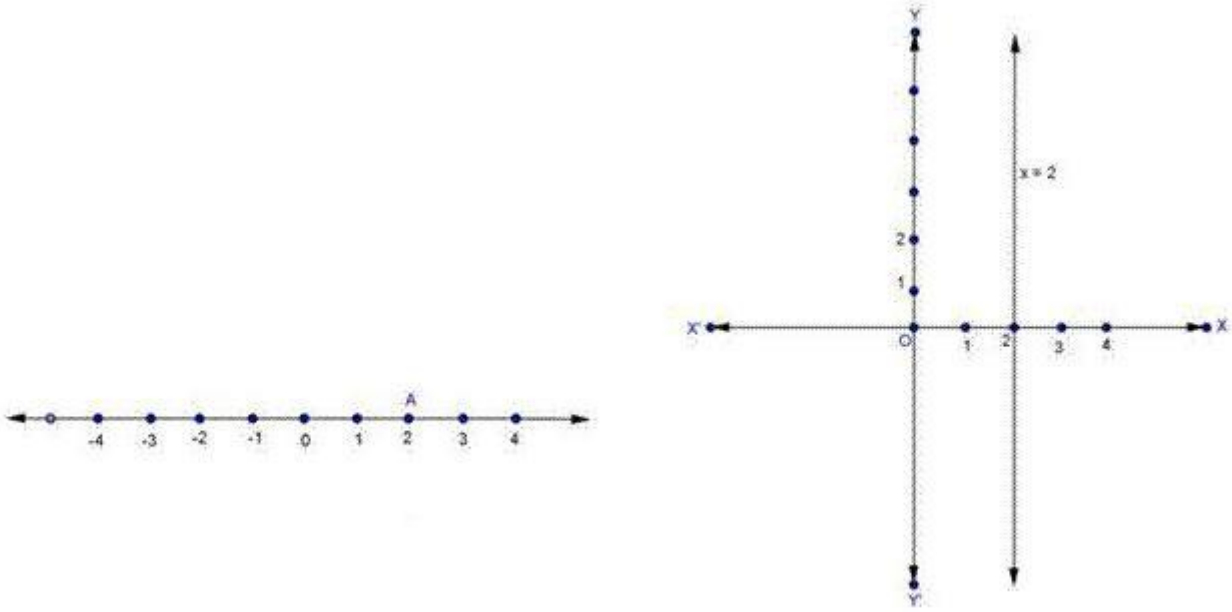
Question 1

Give the geometric representations of the following equations

(a) on the number line (b) on the Cartesian plane:

$x = 2$

Solution 1



x = 2

Point A represents x = 2 number line.

On Cartesian plane, equation represents all points on y axis for which x = 2

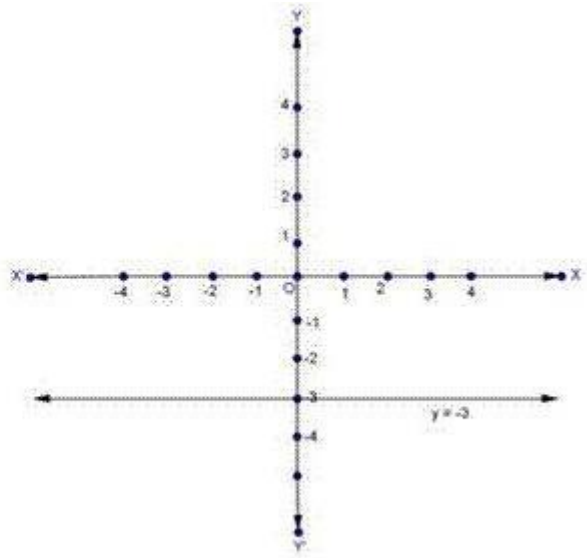
Question 2

Give the geometric representations of the following equations

(a) on the number line (b) on the Cartesian plane:

$y + 3 = 0$

Solution 2



y + 3 = 0

y = -3

Point A represents -3 on number line.

On Cartesian plane, equation represents all points on x axis for which y = -3

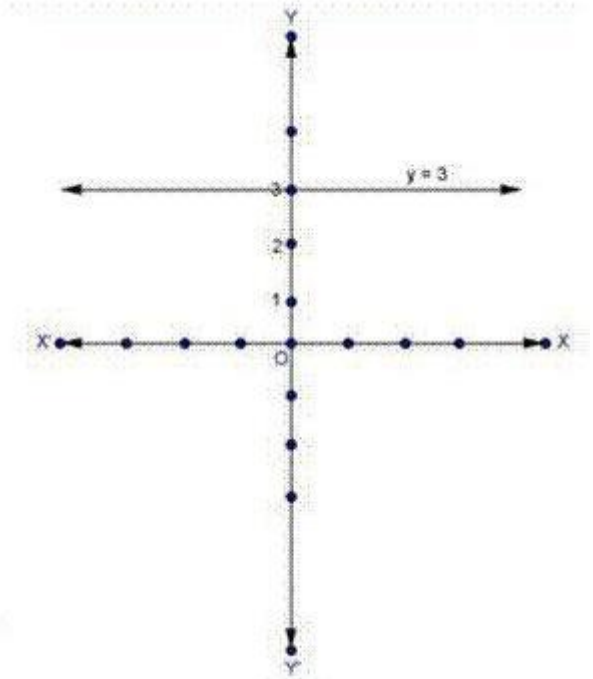
Question 3

Give the geometric representations of the following equations

(a) on the number line (b) on the Cartesian plane:

$$y = 3$$

Solution 3



y = 3

Point A represents 3 on number line.

On Cartesian plane, equation represents all points on x axis for which y = 3

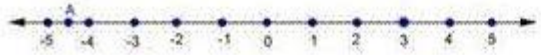
Question 4

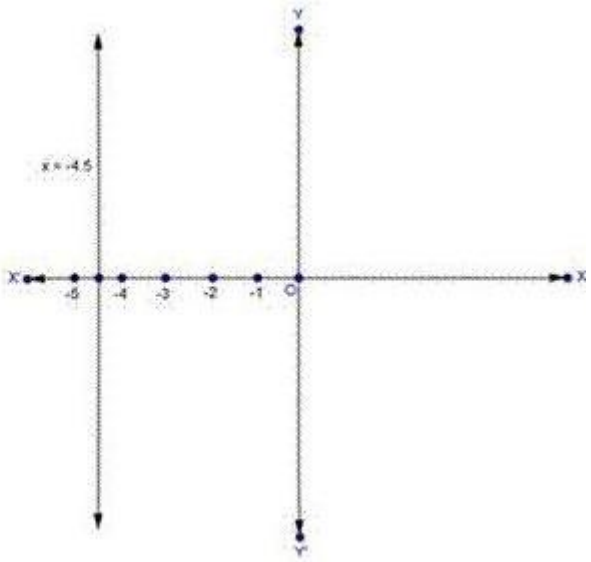
Give the geometric representations of the following equations

(a) on the number line (b) on the Cartesian plane:

$$2x + 9 = 0$$

Solution 4





$2x + 9 = 0$

$2x = -9$

$X = x = \frac{-9}{2} = -4.5$

Point A represents -4.5 on the number line.

On Cartesian plane, equation represents all points on y axis for which x = -4.5

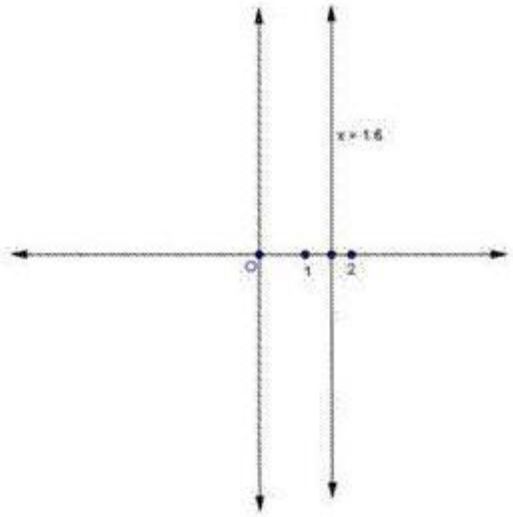
Question 5

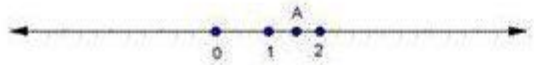
Give the geometric representations of the following equations

(a) on the number line (b) on the Cartesian plane:

$$3x - 5 = 0$$

Solution 5





$3x - 5 = 0$

$3x = 5$

$X = \frac{5}{3} = 1\frac{2}{3} = 1.6$ (uprox)

Point A represents $1\frac{1}{2}$ or $\frac{5}{3}$ on number line.

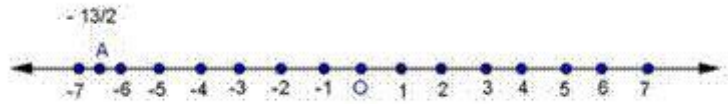
On Cartesian plane, equation represents all points on y axis for which $x = 1.6$

Question 6

Give the geometrical representation of 2x + 13 = 0 as an equation in

One variable

Solution 6



One variable representation of $2x + 13 = 0$

$2x = -13$

$x = \frac{-13}{2} = -6\frac{1}{2}$

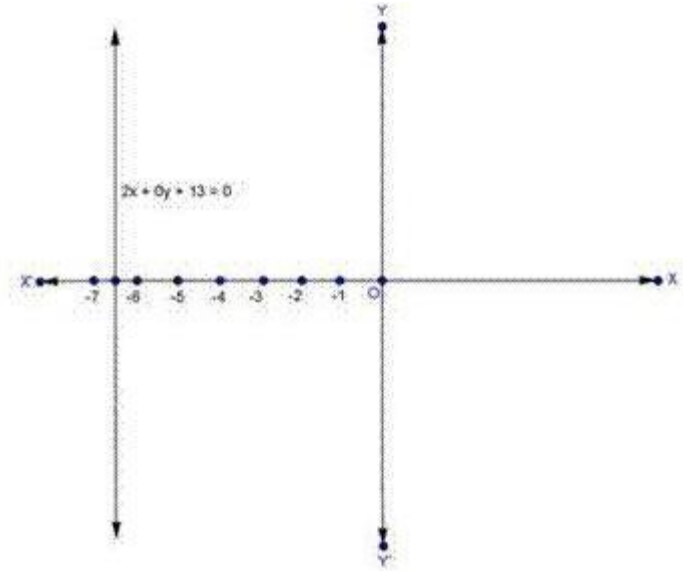
Point A represents $-\frac{13}{2}$.

Question 7

Give the geometrical representation of 2x + 13 = 0 as an equation in

Two variables

Solution 7



Two variable representation of 2x + 13 = 0

2x + 0y + 13 = 0

2x + 13 = 0

2x = -13

$$x = -\frac{13}{2} = -6\frac{1}{2}$$

On Cartesian plane, equation represents all points on y axis for which x = -6.5

Question 8

Solve the equation 3x + 2 = x - 8, and represent the solution on (i) the number line.

Solution 8

3x +2 = x − 8

⇒ 3x − x = -8 − 2

⇒ 2x = -10

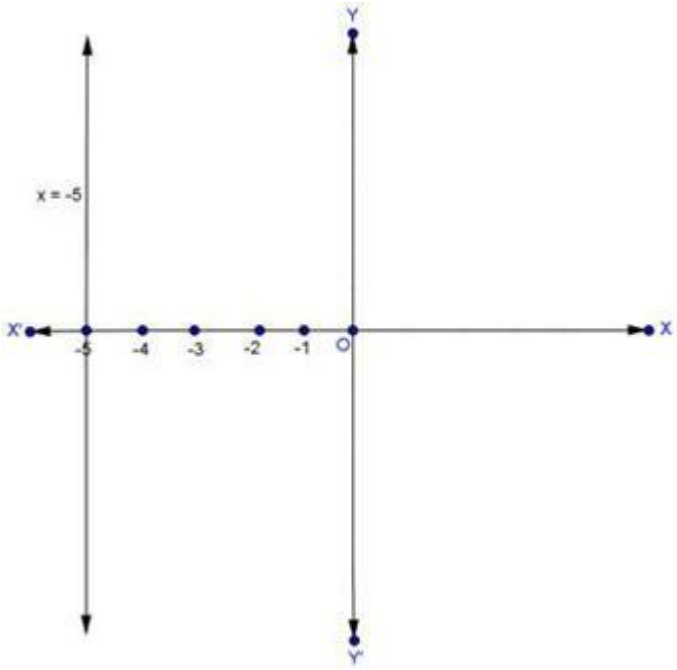
⇒ x = -5

Points A represents − 5 on number line.

Question 9

Solve the equation 3x + 2 = x - 8, and represent the solution on (ii) the Cartesian plane.

Solution 9



On Cartesian plane, equation represents all points on y axis for which x = -5

Question 10

Write the equation of the line that is parallel to x-axis and passing through the point

(i) (0,3)

(ii) (0,-4)

(iii) (2,-5)

(iv) (3,4)

Solution 10

(i) The equation of the line that is parallel to x-axis and passing through the point (0,3) is y = 3

(ii) The equation of the line that is parallel to x-axis and passing through the point (0,-4) is y = -4

(iii) The equation of the line that is parallel to x-axis and passing through the point (2,-5) is y = -5

(iv) The equation of the line that is parallel to x-axis and passing through the point (3, 4) is y = 4

Question 11

Write the equation of the line that is parallel to y-axis and passing through the point

(i) $(4,0)$ (ii) $(-2,0)$ (iii) $(3,5)$ (iv) $(-4,-3)$

Solution 11

(i) The equation of the line that is parallel to the y-axis and passing through $(4,0)$ will be $x = 4$.

(ii) The equation of the line that is parallel to the y-axis and passing through $(-2,0)$ will be $x = -2$.

(iii) The equation of the line that is parallel to the y-axis and passing through $(3,5)$ will be $x = 3$.

(iv) The equation of the line that is parallel to the y-axis and passing through $(-4,-3)$ will be $x = -4$.