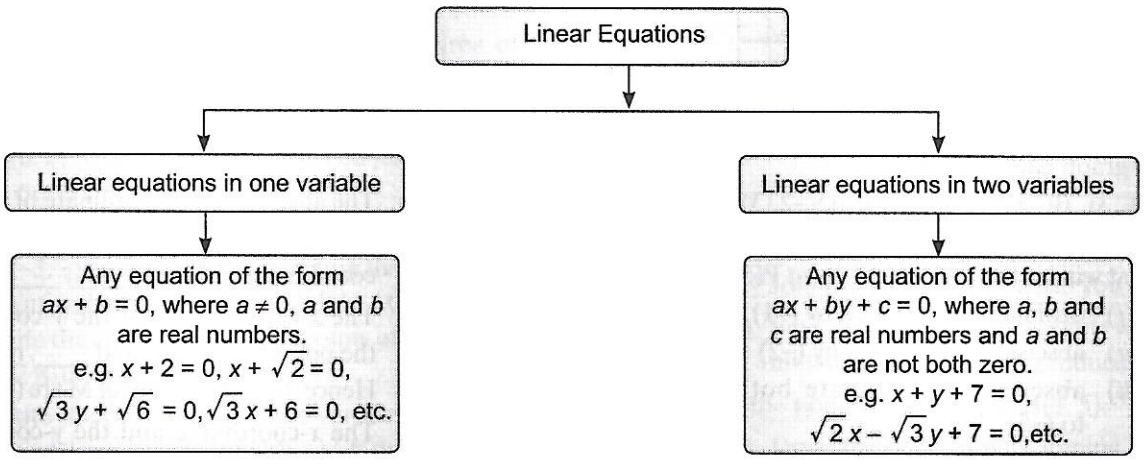
4 LINEAR EQUATIONS IN TWO VARIABLES

Linear Equations



SOLVED QUESTIONS BASED ON EXERCISE 4.1

Very Short Answer Type Questions [1 Mark]

1. Express $5x = -8y$ in the form of $ax + by + c = 0$ **[CBSE 2014]**

Sol. $5x = -8y$

or $5x + 8y + 0 = 0$

2. Tell whether the equation $x(x + 4) - x^2 + 3y + 5 = 0$ is a linear equation in 2 variables or not. **[CBSE 2014]**

Sol. $x(x + 4) - x^2 + 3y + 5 = 0$

or $x^2 + 4x - x^2 + 3y + 5 = 0$

or $4x + 3y + 5 = 0$

This equation is in the form $ax + by + c = 0$, where $a = 4, b = 3, c = 5$. Hence, this is a linear equation in two variables.

3. Tell whether the equation $x(x + 2) - x^2 + y(y - 3) - y^2 = 0$ is an equation of linear equation in 2 variables or not.

Sol. $x(x + 2) - x^2 + y(y - 3) - y^2 = 0$

or $x^2 + 2x - x^2 + y^2 - 3y - y^2 = 0$

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

This equation is in the form $ax + by + c = 0$, where $a = 2, b = -3, c = 0$. Hence, this is a linear equation in two variables.

4. 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) $3x + 4y = 5$ **(ii)** $3x = \frac{8}{3}y + 10$ **(iii)** $5y = 10x - 7$

(iv) $2x + 8 = 11y$ (v) $x = 5y$ (vi) $\frac{3}{5}x = 2y$

(vii) $8x = 7$ (viii) $4y = \frac{8}{3}$ (ix) $5 = 6y$

(x) $12 = \frac{5}{2}x$

Sol. (i) $3x + 4y = 5 \Rightarrow 3x + 4y - 5 = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = 3, b = 4, c = -5$

(ii) $3x = \frac{8}{3}y + 10 \Rightarrow 3x - \frac{8}{3}y - 10 = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = 3, b = \frac{-8}{3}, c = -10$

(iii) $5y = 10x - 7 \Rightarrow -10x + 5y + 7 = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = -10, b = 5, c = 7$

(iv) $2x + 8 = 11y \Rightarrow 2x - 11y + 8 = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = 2, b = -11, c = 8$

(v) $x = 5y \Rightarrow x - 5y = 0 \Rightarrow 1x - 5y + 0 = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = 1, b = -5, c = 0$

(vi) $\frac{3}{5}x = 2y \Rightarrow \frac{3}{5}x - 2y = 0 \Rightarrow \frac{3}{5}x - 2y + 0 = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = \frac{3}{5}, b = -2, c = 0$

(vii) $8x = 7 \Rightarrow 8x - 7 = 0 \Rightarrow 8x + 0.y - 7 = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = 8, b = 0, c = -7$

(viii) $4y = \frac{8}{3} \Rightarrow 4y - \frac{8}{3} = 0 \Rightarrow 0.x + 4y - \frac{8}{3} = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = 0, b = 4, c = -\frac{8}{3}$

(ix) $5 = 6y \Rightarrow -6y + 5 = 0 \Rightarrow 0x - 6y + 5 = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = 0, b = -6, c = 5$

(x) $12 = \frac{5}{2}x \Rightarrow -\frac{5}{2}x + 12 = 0$
$\Rightarrow -\frac{5}{2}x + 0.y - 12 = 0$
This equation is in the form $ax + by + c = 0$
Now, on comparing, we have
$a = -\frac{5}{2}, b = 0, c = -12$

5. A rabbit covers y metres distance by walking 10 metres in slow motion and the remaining by x jumps, each jump contains 2 metres. Express this information in linear equation.

Sol. Distance covered by rabbit in x jumps is $2 \times x$, i.e. $2x$ metres.
According to question,

$$y = 10 + 2x$$

Short Answer Type Questions I [2 Marks]

6. The cost of a pen is three times the cost of a pencil. Write a linear equation in two variables to represent this statement.
(Take the cost of a pen to be ₹ x and that of a pencil to be ₹ y)

Sol. Let the cost of a pen be ₹ x and that of a pencil be ₹ y.
According to question,

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

Hence, this is required equation.

7. Age of x is more than the age of y by 10 years. Express this statement in linear equation.

Sol. According to question,

$$x = y + 10$$

7. Write the linear equation if each point on its graph has an abscissa 2 times its ordinate.
8. Write a linear equation on which the point of the form $(-b, b)$ always lies.
9. If x years represents the present age of the father and y years represents the present age of the son, then find the equation of the statement "present age of the father is 5 more than 6 times age of the son".

Solution of a Linear Equation

- A value of x which satisfies the equation $ax + b = 0$, is called its solution.
- Every linear equation in one variable has a unique solution.
- Any pair of values of x and y which satisfies the equation $ax + by + c = 0$ is called its solution.
- A linear equation in two variables has infinitely many solutions.
- An easy way of obtaining a solution is to take $x = 0$ and obtain corresponding value of y, or take $y = 0$ to obtain the corresponding value of x.
- Every point on the line satisfies the equation of the line and every solution of the equation is a point on the line.

SOLVED QUESTIONS BASED ON EXERCISE 4.2

Very Short Answer Type Questions [1 Mark]

1. Write one solution of $\pi x + y = 5$. **[CBSE 2015]**

Sol. $\pi x + y = 5$

$\Rightarrow$ $y = 5 - \pi x$ ...(*i*)

On putting $x = 0$ in (*i*), we have

$y = 5 - \pi \times 0$

$\Rightarrow$ $y = 5 - 0 \Rightarrow y = 5$

Hence, $x = 0, y = 5$ is a solution of $\pi x + y = 5$.

2. Find a, if linear equation $3x - ay = 6$ has one solution as (4, 3). **[CBSE 2015]**

Sol. On putting $x = 4$ and $y = 3$ in the equation $3x - ay = 6$, we have

$3 \times 4 - a \times 3 = 6$

$\Rightarrow$ $12 - 3a = 6 \Rightarrow 12 - 6 = 3a \Rightarrow 3a = 6$

$\Rightarrow$ $a = \frac{6}{3} \Rightarrow a = 2$

Hence, $a = 2$.

3. Find the value of b, if $x = 5, y = 0$ is a solution of the equation $3x + 5y = b$.

Sol. On putting $x = 5$ and $y = 0$ in the equation $3x + 5y = b$, we have

$3 \times 5 + 5 \times 0 = b$

$\Rightarrow$ $15 + 0 = b \Rightarrow b = 15$

Hence, $b = 15$.

4. For what value of k, $x = 2$ and $y = -1$ is a solution of $x + 3y - k = 0$.

Sol. On putting $x = 2$ and $y = -1$ in the equation $x + 3y - k = 0$, we have

$2 + 3 \times (-1) - k = 0$

$\Rightarrow$ $2 - 3 - k = 0 \Rightarrow -1 - k = 0$

$\Rightarrow$ $k = -1$

5. If a line represented by the equation $3x + \alpha y = 8$ passes through (1, 1), then find the value of α.

Sol. $3x + \alpha y = 8$ ...(*i*)

On putting $x = 1$ and $y = 1$ in (*i*), we have

$$3 \times 1 + \alpha \times 1 = 8 \Rightarrow 3 + \alpha = 8$$

$$\Rightarrow \alpha = 8 - 3 \Rightarrow \alpha = 5$$

6. Find the value of β, so that $x = 1$ and $y = 1$ is a solution of the equation $5\beta x + 30\beta y = 70$.

Sol. On putting $x = 1$ and $y = 1$ in equation $5\beta x + 30\beta y = 70$, we have

$$5\beta \times 1 + 30\beta \times 1 = 70 \Rightarrow 5\beta + 30\beta = 70$$

$$\Rightarrow 35\beta = 70 \Rightarrow \beta = \frac{70}{35} \Rightarrow \beta = 2$$

7. How many solution(s) of the linear equation $2x - 5y = 7$ has? **[NCERT Exemplar]**

Sol. A linear equation in two variables has infinitely many solutions. Therefore, the linear equation $2x - 5y = 7$ has infinitely many solutions.

8. If (2, 0) is a solution of the linear equation $2x + 3y = k$, then find the value of k. **[NCERT Exemplar]**

Sol. On putting $x = 2$ and $y = 0$ in the equation $2x + 3y = k$, we have

$$2 \times 2 + 3 \times 0 = k$$

$$4 + 0 = k \Rightarrow k = 4$$

Short Answer Type Questions I [2 Marks]

9. Find two solutions for the equation $4x + 3y = 24$. How many solutions of this equation are possible?

Sol. $4x + 3y = 24$

On putting $x = 0$, we have $4 \times 0 + 3y = 24 \Rightarrow 0 + 3y = 24 \Rightarrow 3y = 24$

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

On putting $y = 0$, we have

$$4x + 3 \times 0 = 24 \Rightarrow 4x + 0 = 24 \Rightarrow 4x = 24$$

$$\Rightarrow x = \frac{24}{4} \Rightarrow x = 6$$

Therefore, two solutions are (0, 8) and (6, 0).

Given equation is a linear equation in two variables. Therefore, it has infinitely many solutions.

10. Write $3x + 2y = 18$ in the form of $y = mx + c$. Find the value of m and c. Is (4, 3) lies on this linear equation?

Sol. Given: $3x + 2y = 18$

$$\Rightarrow y = \frac{18 - 3x}{2} = -\frac{3}{2}x + 9$$ ...(*i*)

On comparing, we get $m = -\frac{3}{2}$ and $c = 9$

Substitute $x = 4$ in (*i*), we get $y = -\frac{3}{2} \times 4 = 9 = -6 + 9 = 3$

Hence, point (4, 3) lies on $3x + 2y = 18$.

Short Answer Type Questions II [3 Marks]

11. Determine the point on the graph of the linear equation $2x + 5y = 19$, whose ordinate is $1\frac{1}{2}$ times its abscissa. **[NCERT Exemplar]**

Sol. Let x be the abscissa and y be the ordinate of the given line $2x + 5y = 19$.

According to the question, $y = 1\frac{1}{2}x$

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

On putting $y = \frac{3}{2}x$ in $2x + 5y = 19$, we have

$$2x + 5 \times \frac{3}{2}x = 19 \Rightarrow 4x + 15x = 38$$

$\Rightarrow$ $$19x = 38 \Rightarrow x = \frac{38}{19} \Rightarrow x = 2$$

$\therefore$ $$y = \frac{3}{2}x \Rightarrow y = \frac{3}{2} \times 2 \Rightarrow y = 3$$

Hence, the required point is (2, 3).

12. For what value of c, the linear equation $2x + cy = 8$, has equal values of x and y for its solution.

[NCERT Exemplar]

Sol. Given equation is $2x + cy = 8$ ...(i)

It is given the value of x is equal to the value of y, i.e. $x = y$

On putting $x = y$ in (i), we have

$$2x + cx = 8 \Rightarrow cx = 8 - 2x$$

$\Rightarrow$ $$c = \frac{8 - 2x}{x}, \quad x \neq 0$$

This is the required value of c.

13. The angles of a triangle are $2x$, $3x$ and $5x$. Find x and the angles of the triangle.

Sol. $\because$ Sum of angles of a triangle is 180°.

$\therefore$ $$2x + 3x + 5x = 180°$$

$$10x = 180°$$

$$x = 18°$$

The angles of the triangle are $2x = 2 \times 18 = 36°$; $3x = 3 \times 18 = 54°$ and $5x = 5 \times 18 = 90°$

Hence, angles are 36°, 54° and 90°.

Long Answer Type Questions [4 Marks]

14. For what value of p; $x = 2, y = 3$ is a solution of $(p + 1)x - (2p + 3)y - 1 = 0$?

(i) Write the equation.

(ii) How many solutions of this equation are possible?

(iii) Is this line passes through the point (–2, 3)? Give justification.

Sol. Given: $(p + 1)x - (2p + 3)y - 1 = 0$ ...(*i*)

Put $x = 2$ and $y = 3$ in (*i*), we get

$$(p + 1)2 - (2p + 3)3 - 1 = 0$$

$$\Rightarrow \quad 2p + 2 - 6p - 9 - 1 = 0$$

$$\Rightarrow \quad -4p + 2 - 10 = 0$$

$$\Rightarrow \quad -4p = 8$$

$$\Rightarrow \quad p = -2$$

(*i*) Substitute the value of p in (*i*), we get

$$(-2 + 1)x - [2(-1) + 3]y - 1 = 0$$

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

$$\Rightarrow \quad x + y + 1 = 0 \qquad ...(ii)$$

(*ii*) Since the given equation is a linear equation in two variables. Therefore, it has infinitely many solutions.

(*iii*) Substitute $x = -2$ and $y = 3$ in L.H.S. of (*ii*), we have

L.H.S. $= -2 + 3 + 1 = 2 \neq$ R.H.S.

Hence, the line $x + y + 1 = 0$ will not pass through the point $(-2, 3)$.

15. (*i*) If the point (4, 3) lies on the linear equation $3x - ay = 6$, find whether (–2, –6) also lies on the same line?

(*ii*) Find the coordinate of the point lies on above line

(*a*) abscissa is zero **(*b*) ordinate is zero**

Sol. (*i*) If point (4, 3) lies on $3x - ay = 6$, then

$$3 \times 4 - a \times 3 = 6$$

$$\Rightarrow \quad 12 - 3a = 6$$

$$\Rightarrow \quad -3a = 6 - 12 = -6$$

$$\Rightarrow \quad 3a = 6$$

$$\Rightarrow \quad a = 2$$

So, linear equation became $3x - 2y = 6$ ...(*i*)

Substitute $x = -2$ and $y = -6$ in L.H.S. of (*i*), we get

L.H.S. $= 3 \times (-2) - 2 \times (-6) = -6 + 12 = 6 =$ R.H.S.

Hence, $(-2, -6)$ lies on the line $3x - 2y = 6$

(*ii*) (*a*) When abscissa is zero, it means $x = 0$.

From (*i*), we get

$$3 \times 0 - 2 \times y = 6$$

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

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

$\therefore$ Required point is $(0, -3)$

(*b*) When ordinate is zero. i.e. $y = 0$

From (*i*), we get $3x - 2 \times 0 = 6 \Rightarrow x = 2$

$\therefore$ Required point is $(2, 0)$

PRACTICE QUESTIONS BASED ON EXERCISE 4.2

1. Write one solution of $2x + \pi y = 4$.
2. Find b, if linear equation $3bx - y = 9$ has one solution as $(3, 3)$.
3. How many solution(s) of the linear equation $2x + 3y = 18$ has?
4. Find the two solutions for the equation $3x - 4y = 12$. How many solutions of this equation are possible?
5. Find the value of a and b, if the lines $2ax + 7by = 14$ and $3ax - 7by = 6$ pass through $(2, 1)$.
6. Find the value of k, if the line $3kx = 5 + 2y$, will pass through: (*i*) $(1, 1)$ (*ii*) $(1, 2)$ (*iii*) $(2, 1)$
7. Determine the point on the line of linear equation $2x + 5y = 20$ whose x-coordinate is $\frac{5}{2}$ times its ordinate.
8. The co-ordinate of points given in the following table represent same of the solutions of the equation $y - 5x = 2$

x_i	1	–	–	–2	2	–
y_i	–	17	–3	–	–	3

Find the missing values. Also find the co-ordinate of the points where the line cut x-axis and y-axis. **[CBSE 2015]**

9. Which of the following point(s) A(5, 0), B(0, 17), C(4, 4) and D(5, 1) lie on the linear equation $5(x - 2) + 3(y + 1) = 44$.
10. Side of an equilateral triangle is x. If the perimeter is 30 cm, find the value of x.
11. If $(m, 2m + 1)$ is the solution of the equation $5x + 3y = 65$, find the value of m.
12. Let y varies directly as x. If $y = 12$ when $x = 4$, then write a linear equation. What is the value of y when $x = 5$? **[NCERT Exemplar]**
13. The shares of three persons are in the ratio 3 : 2 : 5. Total amount is given by ₹ 90,000. Determine the share of each of them.
14. Adjacent sides of a parallelogram are in the ratio 2 : 3. If the perimeter of the parallelogram is 60 cm, then find the sides of the parallelogram.

Graph of a Linear Equation in Two Variables

- A linear equation in two variables is represented geometrically by a line whose points make the large number of collection of solutions of the equation. This representation is known as the graph of the linear equation.
- To draw the graph of a linear equation in two variables, it is enough to plot two points corresponding to two solutions and join them by a line. Although, it is advisable to plot more than two such points to check the more correctness of the graph.
- $x = 0$, is the equation of the y-axis
- $y = 0$, is the equation of the x-axis
- The graph of the equation of the form $y = kx$ *is* a line which always passes through the origin.

SOLVED QUESTIONS BASED ON EXERCISE 4.3

Very Short Answer Type Questions [1 Mark]

1. **Is the point (0, 3) lie on the graph of the linear equation $3x + 4y = 12$?** **[NCERT Exemplar]**

Sol. $3x + 4y = 12$

On putting $x = 0$ and $y = 3$ in the given linear equation, we have

$$3 \times 0 + 4 \times 3 = 12 \Rightarrow 0 + 12 = 12 \Rightarrow 12 = 12, \text{ true}$$

So, the point (0, 3) lies on the graph of the linear equation $3x + 4y = 12$.

2. At what point the graph of the linear equation $x + y = 5$ cuts the x-axis?

Sol. At x-axis, $y = 0$

On putting $y = 0$ in $x + y = 5$, we have

$$x + 0 = 5 \Rightarrow x = 5$$

Therefore, the graph of the linear equation $x + y = 5$ cuts the x-axis at $(5, 0)$.

3. At what point the graph of the linear equation $2x - y = 7$ cuts the y-axis.

Sol. At y-axis, $x = 0$

On putting $x = 0$ in $2x - y = 7$, we have

$$2 \times 0 - y = 7$$

$$\Rightarrow \quad 0 - y = 7$$

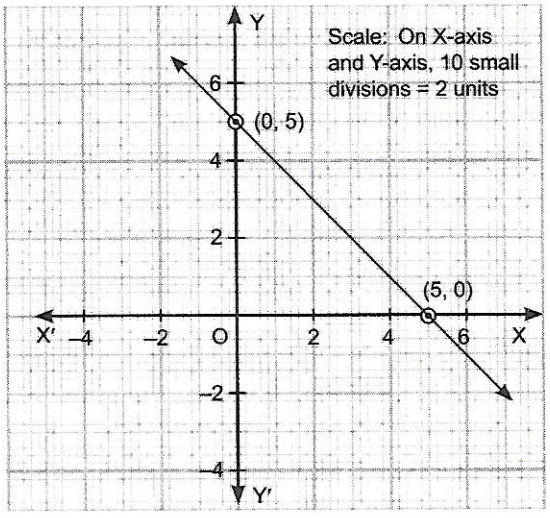
$$\Rightarrow \quad y = -7$$

Therefore, the graph of the linear equation $2x - y = 7$ cuts the y-axis at $(0, -7)$.

4. Draw the graph using the values of x, y as given in the table:

x	0	5
y	5	0

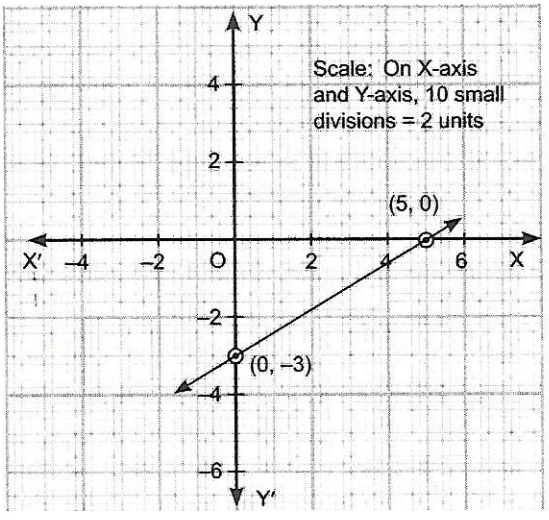
Sol.



5. Draw the graph using the values of x, y as given in the table

x	0	5
y	–3	0

Sol.



Short Answer Type Questions I [2 Marks]

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

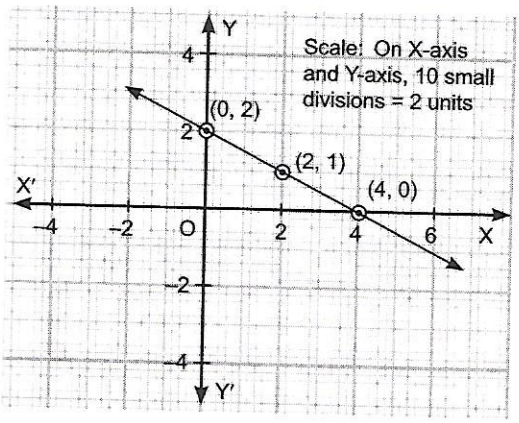
(i) $x + 2y = 4$ *(ii)* $3x + 2y = 6$ *(iii)* $5x - y = 10$ *(iv)* $y = x$

(v) $y = -x$ *(vi)* $y = 5x$ *(vii)* $15 + 3x + y = 0$

Sol. *(i)* $x + 2y = 4$

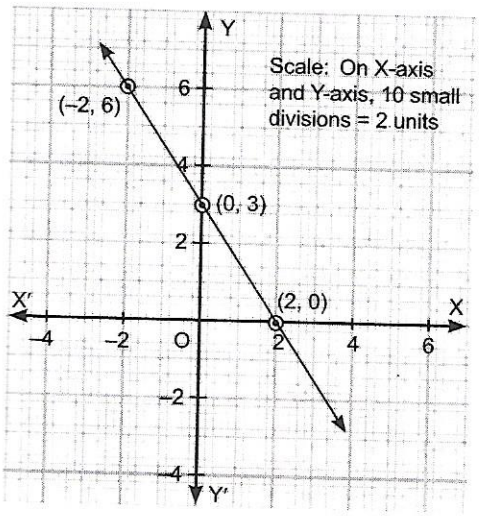
x	0	4	2
y	2	0	1

Here, points are (0, 2), (4, 0) and (2, 1)



(ii) $3x + 2y = 6$

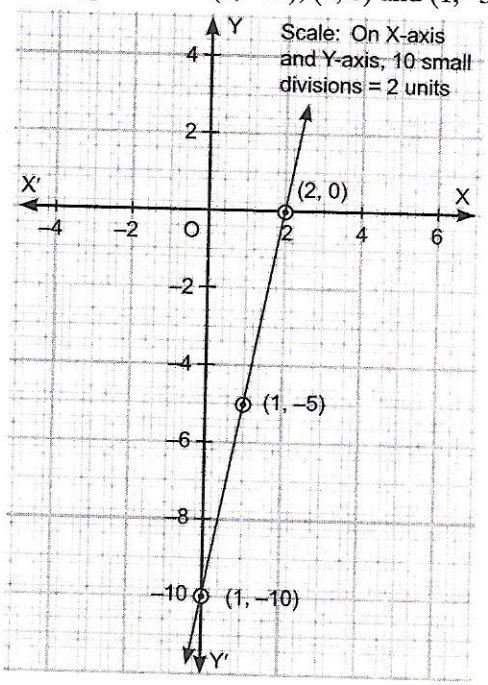
x	0	2	–2
y	3	0	6



(iii) $5x - y = 10$

x	0	2	1
y	–10	0	–5

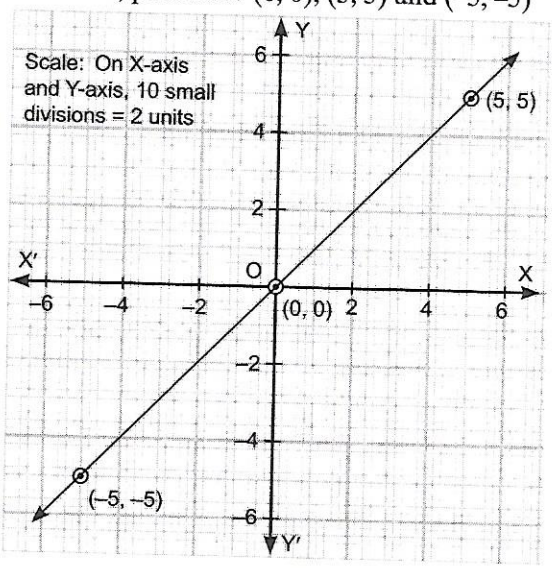
Here, points are (0, –10), (2, 0) and (1, –5).



(iv) $y = x$

x	0	5	–5
y	0	5	–5

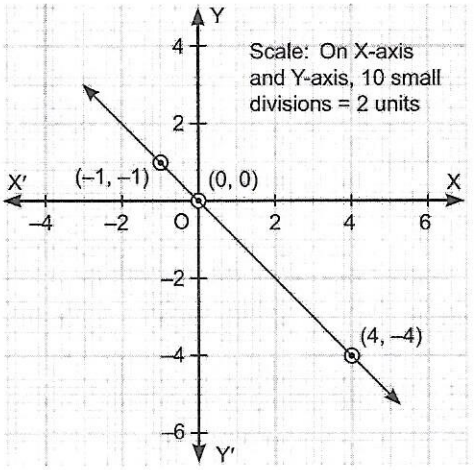
Here, points are (0, 0), (5, 5) and (–5, –5)



(v) $y = -x$

x	0	–1	4
y	0	1	–4

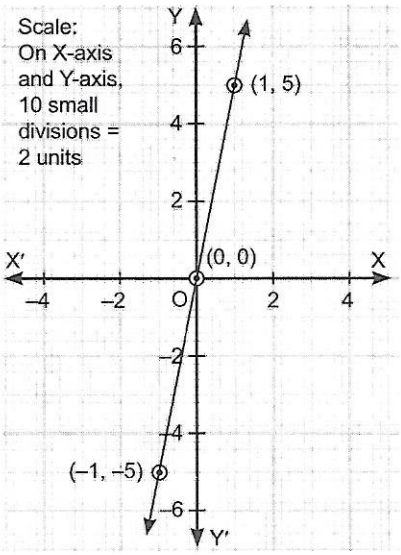
Here, points are (0, 0), (–1, 1) and (4, –4)



(vi) $y = 5x$

x	0	1	–1
y	0	5	–5

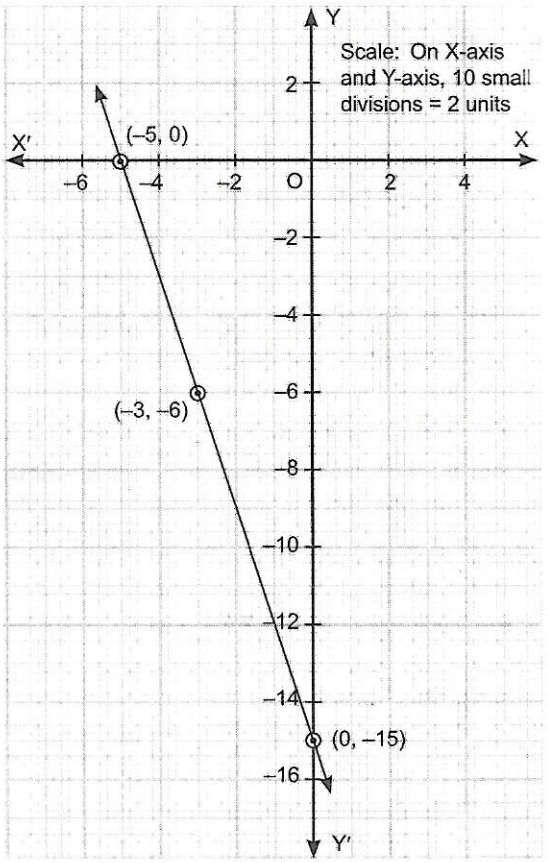
Here, points are (0, 0), (1, 5) and (–1, –5)



(vii) $15 + 3x + y = 0 \Rightarrow 3x + y = -15$

x	0	–5	–3
y	–15	0	–6

Here, points are (0, –15), (–5, 0) and (–3, –6)



7. Find the solution of the linear equation $x + 2y = 8$ which represents a point on the: [NCERT Exemplar]

(i) x-axis **(ii) y-axis**

Sol. (i) For x-axis, $y = 0$

On putting $y = 0$ in $x + 2y = 8$, we have

$x + 2 \times 0 = 8 \Rightarrow x = 8$

(ii) For y-axis, $x = 0$

On putting $x = 0$ in $x + 2y = 8$, we have

$0 + 2y = 8 \Rightarrow y = 4$

Hence, point (8, 0) is a point on x-axis and point **(0, 4) is a point** on y-axis.

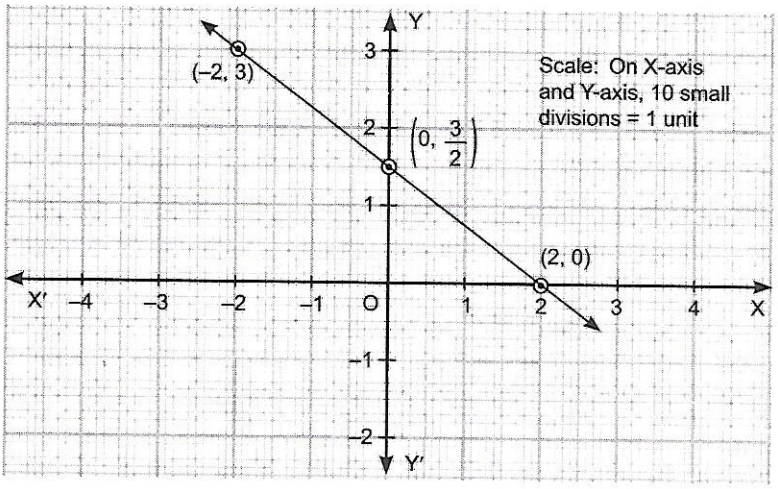
8. Draw the graph of the linear equation $3x + 4y = 6$. At what points, the graph cuts the x-axis and the y-axis.

[NCERT Exemplar]

Sol. $3x + 4y = 6$

x	0	2	–2
y	3/2	0	3

We notice, the graph cuts the x-axis at (2, 0) and the y-axis at $\left(0, \frac{3}{2}\right)$.



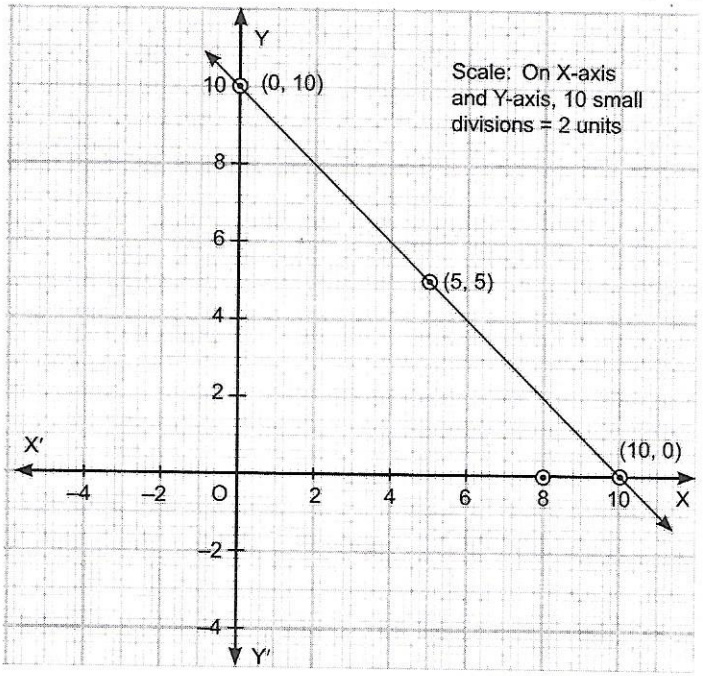
9. Draw the graph of the linear equation whose solutions are represented by the points having the sum of the coordinates as 10 units.

[NCERT Exemplar]

Sol. Given, the solutions are represented by the points having the sum of the coordinates as 10 units. Therefore, linear equation is

$x + y = 10$

x	0	10	5
y	10	0	5



10. Find the value of a, if the line $5y = ax + 10$, will pass through (i) (2, 3), (ii) (1, 1).

Sol. $5y = ax + 10$

(i) On putting $x = 2$ and $y = 3$ in the given equation, we have

$5 \times 3 = a \times 2 + 10 \Rightarrow 15 = 2a + 10$

$\Rightarrow 15 - 10 = 2a$

$\Rightarrow 2a = 5 \Rightarrow a = \frac{5}{2}$

(*ii*) On putting $x = 1$ and $y = 1$ in the given equation, we have

$$5 \times 1 = a \times 1 + 10$$

$$\Rightarrow \quad 5 = a + 10 \Rightarrow a = 5 - 10 \Rightarrow a = -5$$

11. Find the value of a and b, if the line $6bx + ay = 24$ passes through (2, 0) and (0, 2).

Sol. $$6bx + ay = 24 \quad ...(i)$$

On putting $x = 2$ and $y = 0$ in (*i*), we have

$$6b \times 2 + a \times 0 = 24 \Rightarrow 12b + 0 = 24 \Rightarrow 12b = 24$$

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

On putting $x = 0$ and $y = 2$ in (*i*), we have

$$6b \times 0 + a \times 2 = 24 \Rightarrow 0 + 2a = 24 \Rightarrow 2a = 24$$

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

Hence, value of a and b are 12 and 2 respectively.

12. Find the value of a and b, if the lines $2ax + 3by = 18$ and $5ax + 3by = 15$ pass through (1, 1).

Sol. On putting $x = 1$ and $y = 1$ in equations $2ax + 3by = 18$ and $5ax + 3by = 15$, we have

$$2a + 3b = 18 \quad ...(i)$$

$$5a + 3b = 15 \quad ...(ii)$$

$$- \quad - \quad -$$

$$-3a = 3 \quad \text{(on subtracting)}$$

$$\Rightarrow \quad a = \frac{3}{-3} \Rightarrow a = -1$$

On putting $a = -1$ in (*i*), we have

$$2 \times (-1) + 3b = 18 \Rightarrow -2 + 3b = 18 \Rightarrow 3b = 18 + 2$$

$$\Rightarrow \quad 3b = 20 \Rightarrow b = \frac{20}{3}$$

Therefore, value of a and b are -1 and $\frac{20}{3}$ respectively.

Short Answer Type Questions II [3 Marks]

13. Find the value of a, if the line $3y = ax + 7$, will pass through:

(*i*) (3, 4), (*ii*) (1, 2), (*iii*) (2, –3) **[CBSE 2014]**

Sol. $$3y = ax + 7$$

(*i*) Putting $x = 3$ and $y = 4$ in the given equation of line, we have

$$3 \times 4 = a \times 3 + 7 \Rightarrow 12 = 3a + 7 \Rightarrow 3a = 12 - 7$$

$$\Rightarrow \quad 3a = 5 \Rightarrow a = \frac{5}{3}$$

(*ii*) Putting $x = 1$ and $y = 2$ in the given equation of line, we have

$$3 \times 2 = a \times 1 + 7 \Rightarrow 6 = a + 7 \Rightarrow a = 6 - 7 \Rightarrow a = -1$$

(*iii*) Putting $x = 2$ and $y = -3$ in the given equation, we have

$$3 \times (-3) = a \times 2 + 7 \Rightarrow -9 = 2a + 7 \Rightarrow 2a = -9 - 7$$

$$\Rightarrow \quad 2a = -16 \Rightarrow a = \frac{-16}{2} \Rightarrow a = -8$$

14. Show that the points A (1, 2), B (–1, –16) and C (0, –7) lie on the graph of the linear equation $y = 9x - 7$.

[NCERT Exemplar]

Sol. $$y = 9x - 7$$

or $$9x - y = 7 \quad ...(i)$$

On putting $x = 1, y = 2$ in (*i*), we have

$$9 \times 1 - 2 = 7 \Rightarrow 9 - 2 = 7$$

$$\Rightarrow \quad 7 = 7, \text{ true.}$$

Therefore, (1, 2) is a solution of linear equation $y = 9x - 7$.

On putting $x = -1, y = -16$ in (i), we have

$$9 \times (-1) - (-16) = 7 \Rightarrow -9 + 16 = 7$$

$$\Rightarrow \quad 7 = 7, \quad \text{true.}$$

Therefore, $(-1, -16)$ is a solution of linear equation $y = 9x - 7$.

On putting $x = 0, y = -7$ in (i), we have

$$9 \times 0 - (-7) = 7 \Rightarrow 0 + 7 = 7$$

$$\Rightarrow \quad 7 = 7, \quad \text{true.}$$

Therefore, $(0, -7)$ is a solution of linear equation $y = 9x - 7$.

15. Find the equations of any two lines passing through the point (–1, 2). How many such lines can be there?

[CBSE 2015]

Sol. Here, (–1, 2) is a solution of infinite number of linear equations.

(–1, 2) is a solution of linear equation $y = -2x$

(–1, 2) is a solution of linear equation $3x + 2y = 1$.

(–1, 2) is a solution of linear equation $-5x + 3y = 11$

Hence, there can be infinite linear equation of which the point (–1, 2) is a solution.

16. Write y in terms of x for the equation $x - y + 4 = 0$. Also draw graph of linear equation.

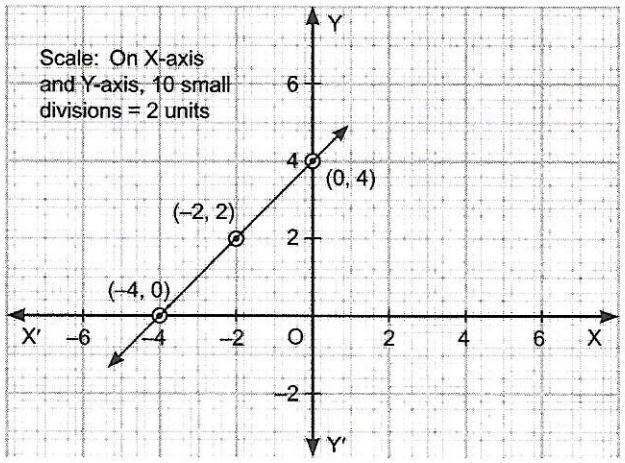
[CBSE 2014]

Sol.

$$x - y + 4 = 0$$

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

x	0	–4	–2
y	4	0	2



17. Draw the graph of linear equation $3x - 7y = 21$. Check whether (8, 1) is a solution of the given equation or not.

Sol.

$$3x - 7y = 21 \qquad ...(i)$$

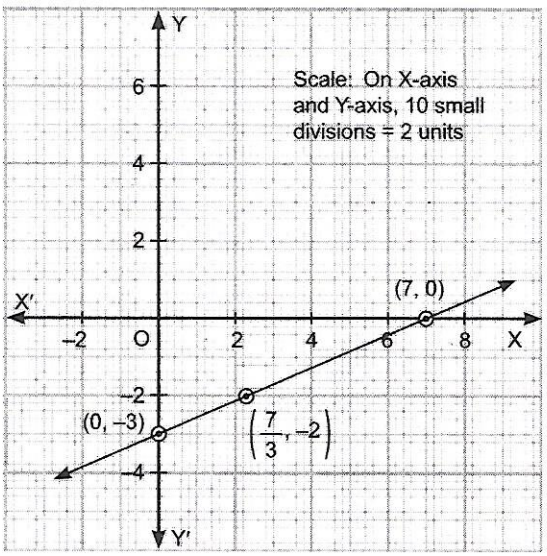
x	0	7	7/3
y	–3	0	–2

On putting $x = 8$ and $y = 1$ in (i), we have

$$3 \times 8 - 7 \times 1 = 21 \Rightarrow 24 - 7 = 21$$

$$17 = 21, \quad \text{false } (\because 17 \neq 21)$$

Hence, (8, 1) is not a solution of the equation $3x - 7y = 21$.

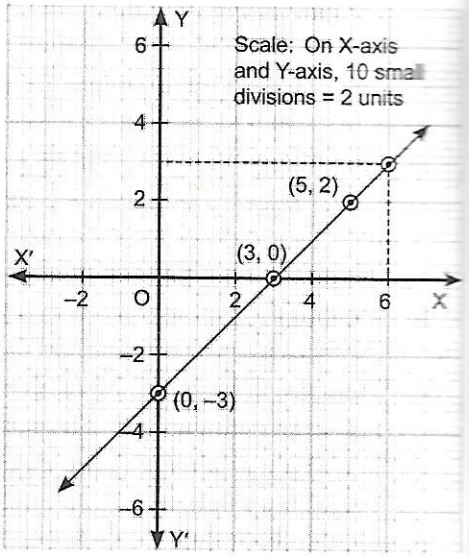


18. Draw the graph of the equation $x - y = 3$. If $y = 3$, then find the value of x from the graph.

Sol. $x - y = 3$

x	0	3	5
y	–3	0	2

From the graph, we can see that the value of x is 6 for $y = 3$.



19. Draw the graph of the linear equation $x + 2y = 8$ and find the point on the graph where abscissa is twice the value of ordinate.

Sol. $x + 2y = 8$ ...(*i*)

x	0	8	6
y	4	0	1

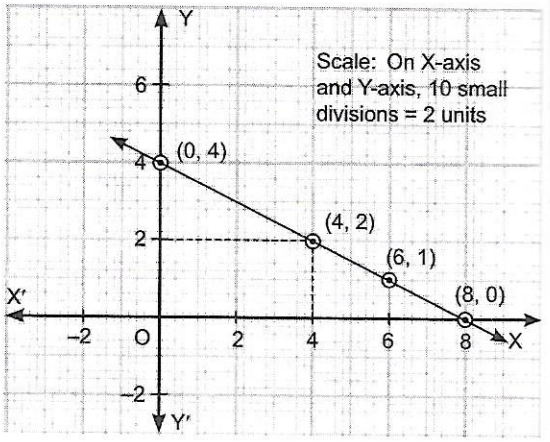
Given, $x = 2y$

Putting $x = 2y$ in (*i*), we have

$2y + 2y = 8 \Rightarrow 4y = 8 \Rightarrow y = 2$

$\therefore \quad x = 2 \times 2 \Rightarrow x = 4$

Hence, point (4, 2) is the required point on the graph.



Long Answer Type Questions [4 Marks]

20. Which of the following points $A\left(0, \frac{17}{3}\right)$, B(2, 6), C(1, 5) and D(5, 1) lie on the linear equation $2(x + 1) + 3(y - 2) = 13$.

Sol. $2(x + 1) + 3(y - 2) = 13 \Rightarrow 2x + 2 + 3y - 6 = 13 \Rightarrow 2x + 3y = 13 + 4$

$\Rightarrow \quad 2x + 3y = 17$ ...(*i*)

On putting $x = 0$ and $y = \frac{17}{3}$ in (*i*), we have

$$2 \times 0 + 3 \times \frac{17}{3} = 17$$

$\Rightarrow \quad 0 + 17 = 17 \Rightarrow 17 = 17$, true

Therefore, $\left(0, \frac{17}{3}\right)$ lies on the given linear equation $2(x + 1) + 3(y - 2) = 13$.

On putting $x = 2$ and $y = 6$ in (*i*), we have

$2 \times 2 + 3 \times 6 = 17 \Rightarrow 4 + 18 = 17 \Rightarrow 22 = 17$, false

Therefore, (2, 6) does not lie on the given linear equation $2(x + 1) + 3(y - 2) = 13$.

On putting $x = 1$ and $y = 5$ in (*i*), we have

$2 \times 1 + 3 \times 5 = 17$

$\Rightarrow \quad 2 + 15 = 17 \Rightarrow 17 = 17$, true

Therefore (1, 5) lies on the given linear equation $2(x + 1) + 3(y - 2) = 13$.

On putting $x = 5$ and $y = 1$ in (i), we have

$$2 \times 5 + 3 \times 1 = 17 \Rightarrow 10 + 3 = 17$$

$$\Rightarrow \quad 13 = 17, \text{ false}$$

Therefore, (5, 1) does not lie on the given linear equation $2(x + 1) + 3(y - 2) = 13$.

21. The points A(a, b) and B$(b, 0)$ lie on the linear equation $y = 8x + 3$.

(i) Find the value of a and b. **(ii) Is (2, 0) a solution of $y = 8x + 3$?**

(iii) Find two solutions of $y = 8x + 3$.

Sol. Given: $y = 8x + 3$ ...(i)

(i) On putting $x = a$ and $y = b$ in (i), we have

$$b = 8a + 3 \quad ...(ii)$$

On putting $x = b$ and $y = 0$ in (i), we have

$$0 = 8b + 3 \Rightarrow b = \frac{-3}{8}$$

By putting $b = \frac{-3}{8}$ in (ii), we have

$$\frac{-3}{8} = 8a + 3$$

$$\Rightarrow \quad \frac{-3}{8} - 3 = 8a \Rightarrow \frac{-27}{8} = 8a \Rightarrow a = \frac{-27}{64}$$

(ii) On putting $x = 2$ and $y = 0$ in (i), we have

$$0 = 8 \times 2 + 3$$

$$\Rightarrow \quad 0 = 16 + 3 \Rightarrow 0 = 19, \text{ false}$$

Hence, (2, 0) is not a solution of the linear equation $y = 8x + 3$.

(iii) $y = 8x + 3$ (i)

Let $x = 0$, then $y = 8 \times 0 + 3 \Rightarrow y = 3$

Hence, (0, 3) is a solution of the linear equation $y = 8x + 3$.

Let $y = 0$, then $0 = 8x + 3 \Rightarrow -3 = 8x \Rightarrow x = \frac{-3}{8}$

Hence, $\left(\frac{-3}{8}, 0\right)$ is a solution of the linear equation $y = 8x + 3$.

22. In a class, number of girls is x and that of boys is y. Also, the number of girls is 10 more than the number of boys. Write the given data in the form of a linear equation in two variables. Also, represent it graphically. Find graphically the number of girls, if the number of boys is 20. **[CBSE 2014]**

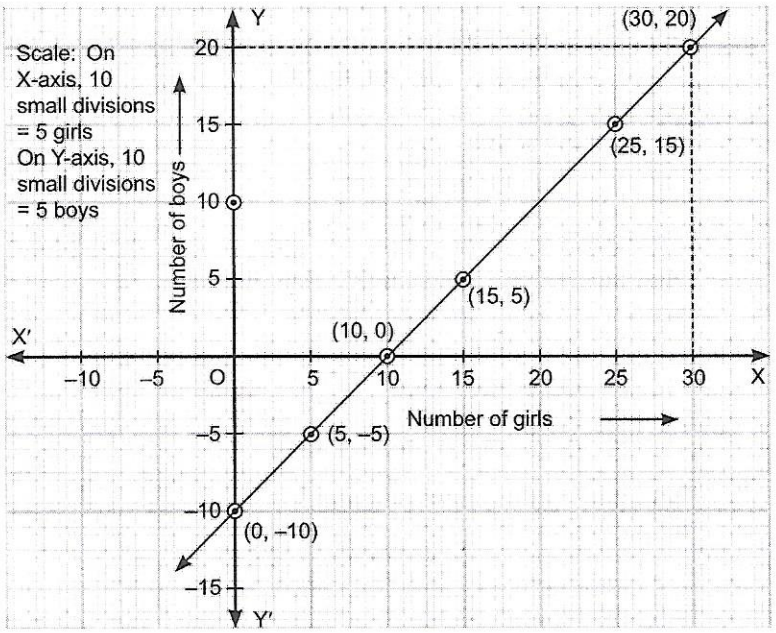
Sol. Given number of girls and boys are x and y respectively.

According to the question,

$x - y = 10$

x	0	10	5	15	25
y	–10	0	–5	5	15

Hence, from the graph, if the number of boys is 20, then the number of girls is 30.



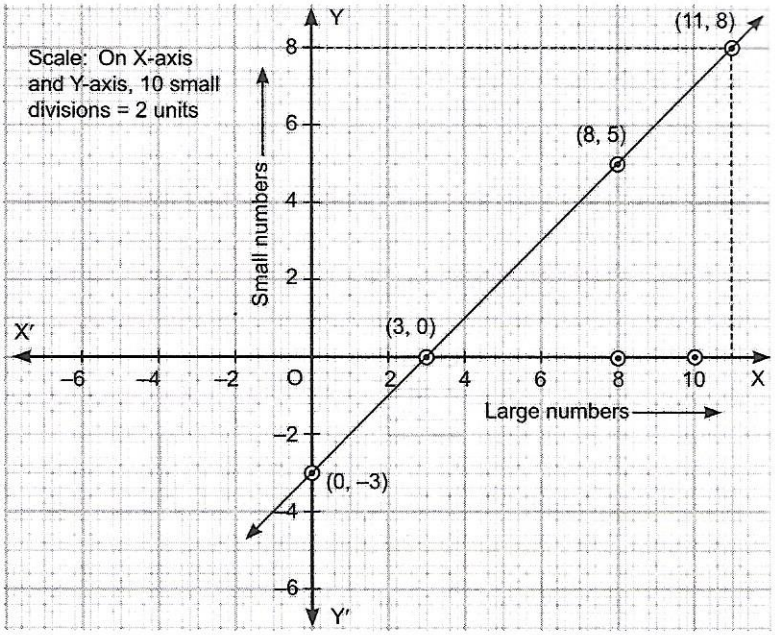
23. The difference between two number is 3. Write the given data in form of a linear equation in two variables. Also, represent it graphically. If smaller number is 8, then find graphically the value of the larger number. [CBSE 2015]

Sol. Let x be the larger number and y be the smaller number.

According to the question, $x - y = 3$

x	0	3	8
y	−3	0	5

From graph, we notice, if smaller number is 8, then value of the larger number is 11.



24. The following observed values of x and y are thought to satisfy a linear equation. Write the linear equation:

x	6	−6
y	−2	10

Draw the graph using the values of x, y as given in the above table.

At what points the graph of the linear equation (*i*) cuts the x-axis (*ii*) cuts the y-axis

Sol. The linear equation in two variables is of the form

$$ax + by = c \quad ...(i)$$

Since, point (6, – 2) satisfy the linear equation

So $6a - 2b = c \quad ...(ii)$

Since, point (– 6, 10) satisfy the linear equation

So $-6a + 10b = c \quad ...(iii)$

On adding (*ii*) and (*iii*) we get

$$8b = 2c \Rightarrow b = \frac{c}{4}$$

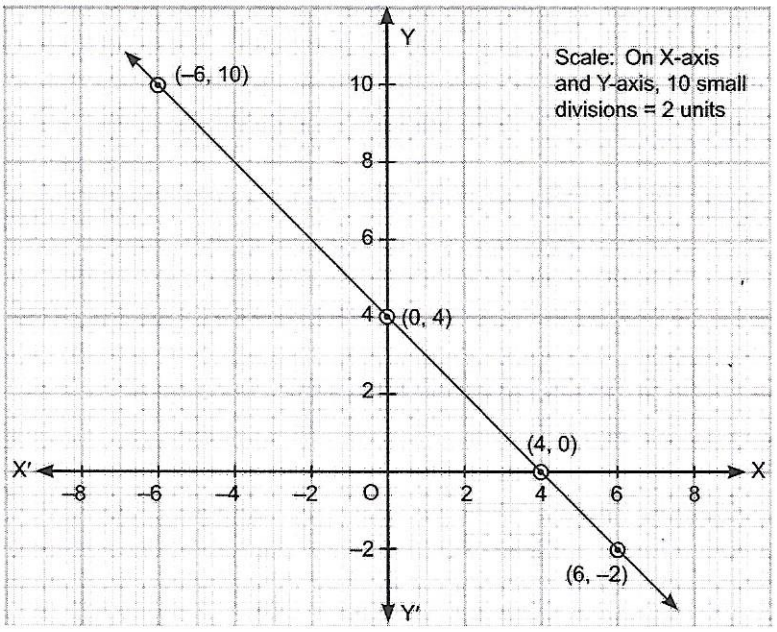
Now on multiply (*ii*) by 5 and adding (*iii*), we get

$$30a - 10b = 5c \quad ...(iv)$$
$$-6a + 10b = c \quad ...(iii)$$

$$24a = 6c \Rightarrow a = \frac{1}{4}c$$

Now putting the values of a and b in eq. (*i*) we get

$$\frac{c}{4}x + \frac{c}{4}y = c \Rightarrow x + y = 4$$

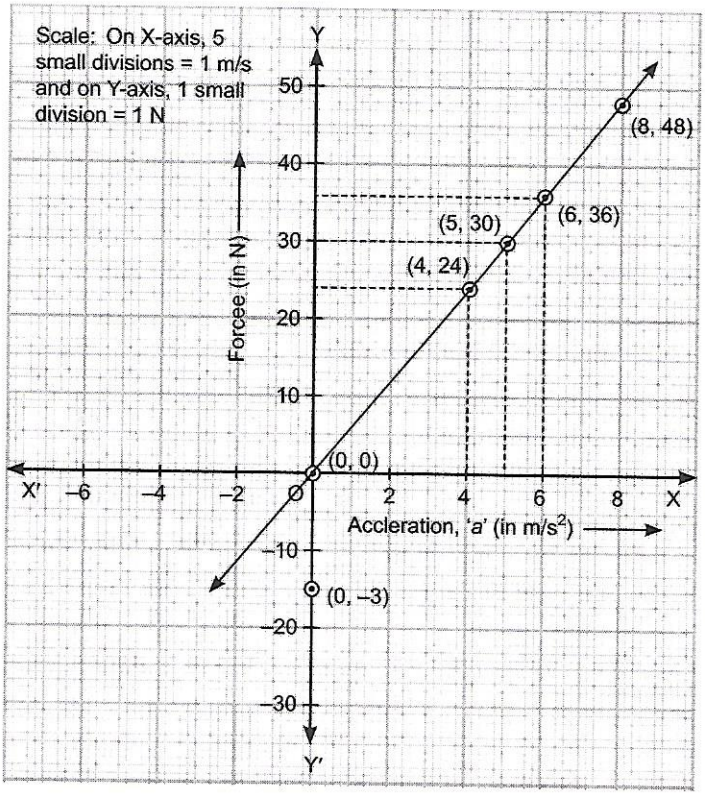


From the graph, we notice, (*i*) graph cuts the x-axis at point (4, 0) and (*ii*) graph cuts the y-axis at (0, 4).

25. The force exerted to pull a cart is directly proportional to the acceleration produced in the body. Express the statement as a linear equation of two variables and draw the graph of the same by taking the constant mass equal to 6 kg. Read from the graph, the force required when the acceleration produced is (*i*) 5 m/sec^2, (*ii*) 6 m/sec^2.

[NCERT Exemplar]

Sol. Let F be the force and a be the acceleration.



According to the question, $F \propto a$

$\Rightarrow$ $F = ma$,

where m = arbitrary constant

Given, $m = 6$

$\therefore$ $F = 6a$

Consider 'F' as y and 'a' as x. $\Rightarrow y = bx$

a or x	0	4	8
F or y	0	24	48

Therefore, from the graph,

(*i*) When acceleration is 5 m/s^2, F = 30 N

(*ii*) When acceleration is 6 m/s^2, F = 36 N

PRACTICE QUESTIONS BASED ON EXERCISE 4.3

1. At what point the graph of the linear equation $2x - 3y = -15$ cuts the x-axis?
2. At what point the graph of the linear equation $2x + 5y = 10$ cuts the y-axis?
3. Draw the graph using the values of x, y as given in the table and write its linear equation.

x	0	-3
y	-3	0

4. Draw the graph using the values of x, y as given in the table and write its linear equation.

x	0	-28	-14
y	10	0	5

5. Draw the graph of the equation $5x + 3y = -105$ in two variables.
6. Represent graphically the equation $3x - 17y = 51$ in the Cartesian plane.
7. Find the solution of the linear equation $13x + y = -39$ which represents a point on
   (*i*) x-axis
   (*ii*) y-axis
8. Draw the graph of the linear equation whose solutions are represented by the points having the difference of the coordinates as 25 units.
9. Find the equation of any two lines passing through the point $(-21, 42)$. How many such lines can be there?
10. Draw the graph of the linear equation $7x - 5y = 70$. Check whether $\left(11, \frac{7}{5}\right)$ is a solution of the given equation or not.
11. Draw the graph of the linear equation $-4x + 5y = -40$ and find the point on the graph where abscissa is 0 and write the value of ordinate.
12. In a graph, the number of men is 5 more than the twice of the number of women. Write the above information in the form a linear equation in two variables and also, represent it graphically. From the graph, find the number of men when the number of women is 5.
13. The following observed values of x and y are thought to satisfy a linear equation are given in the table.

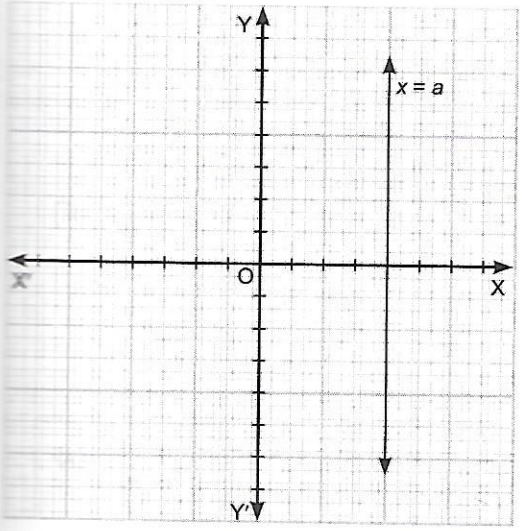
x	4	-3
y	3	-4

   (*i*) Write the linear equation.
   (*ii*) Draw the graph using the values of x and y as given in the table.
   (*iii*) At what points the graph of the linear equation
      (*a*) cuts the x-axis
      (*b*) cuts the y-axis
14. The parking charges of a car in a parking lot is ₹ 20 for the first 3 hours and ₹ 10 for subsequent hours. Taking total parking time to be x hours and total charges as ₹ y, write a linear equation in two variables to express the above statements. Draw a graph for the linear equation and read the charges for five hours.
15. When a ball is thrown from a building having acceleration due to gravity 9.8 m/s^2. Then, the velocity of the ball is expressed as $v = 9.8\,t$.
    Express above information in the Cartesian plane and find the velocity after 10 seconds.
16. Is the point (2, 1) lie on the graph of the linear equation $5x + 15y = 19$?
17. Is the point (3, 0) lie on the graph of the linear equation $5x - y = 15$?
18. Find the value of a and b, if the line $5bx - 3ay = 30$ passes through $(-1, 0)$ and $(0, -3)$.
19. Determine the point on the graph of the linear equation $2x - 7y = 49$, whose ordinate is equal to abscissa.
20. The car is moving with a speed of 60 km/h, travels y km distance in x hours. Represent this statement as a linear equation of two variables and draw the graph.
    Read from the graph, distance travelled when time is (*i*) 5 hours, (*ii*) 10 hours.

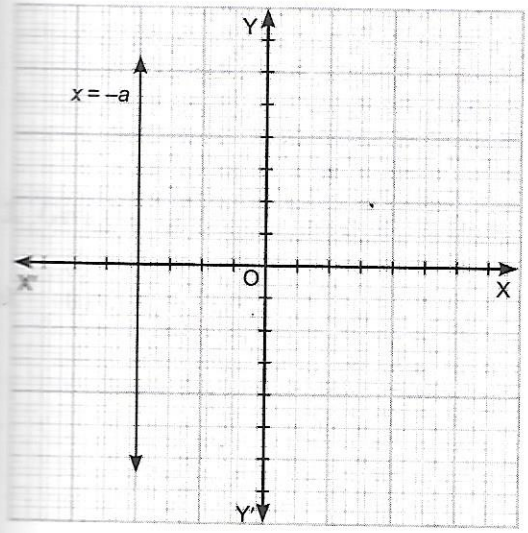
Equations of Lines Parallel to the x-axis and y-axis

- The graph of $x = \pm a$ is a straight line parallel to the y-axis. This is because for whatever be the value of y, x remains equal to a.

For $x = a$

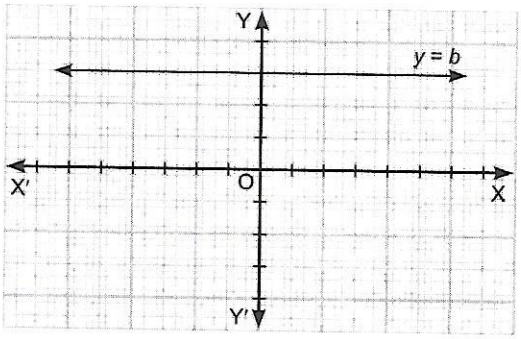


For $x = -a$

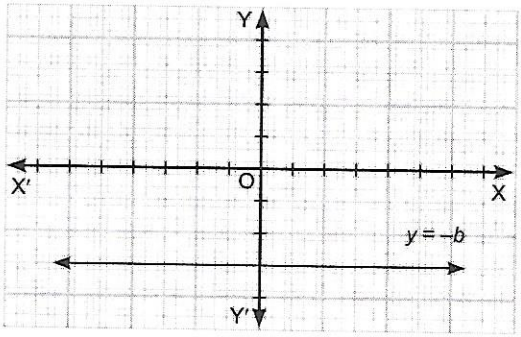


- The graph of $y = \pm b$ is a straight line parallel to the x-axis. This is because for whatever be the value of x, y remains equal to b.

For $y = b$



For $y = -b$



SOLVED QUESTIONS BASED ON EXERCISE 4.4

Short Answer Type Questions I [2 Marks]

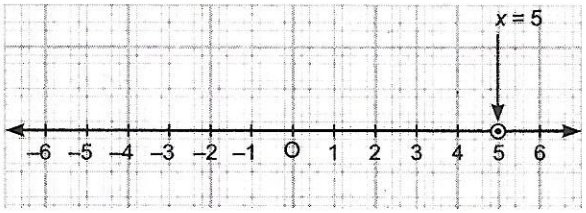
1. Represent the following equations on the number line:

(*i*) $x = 5$ (*ii*) $y = 2$ (*iii*) $x = -3$ (*iv*) $y = 7$

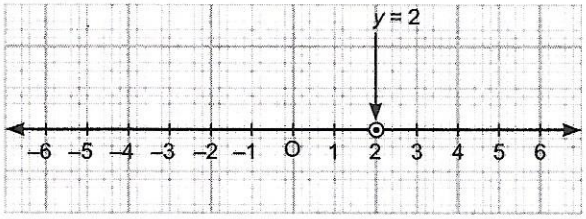
(*v*) $y = -4$ (*vi*) $x - 5 = 2$ (*vii*) $y = 2y - 4$ (*viii*) $1 + x = 2(x + 5)$

(*ix*) $2y - 1 = 11$ (*x*) $2\left(y - \frac{1}{2}\right) = 1$

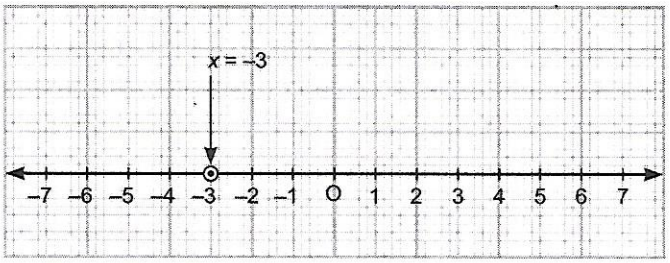
Sol. (*i*) $x = 5$



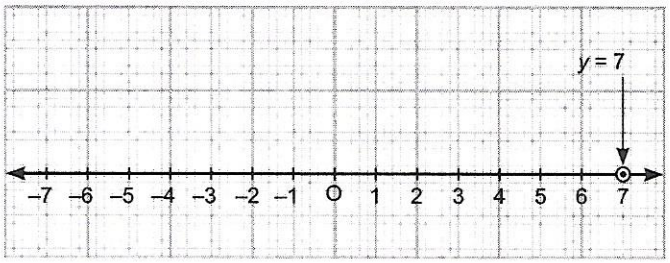
(*ii*) $y = 2$



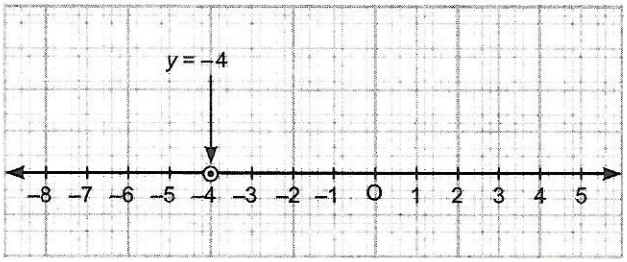
(*iii*) $x = -3$



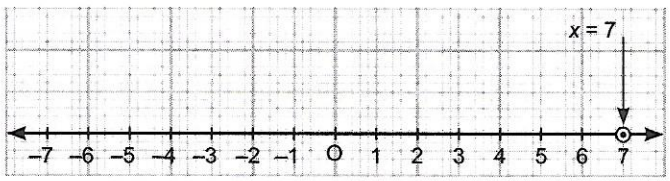
(*iv*) $y = 7$



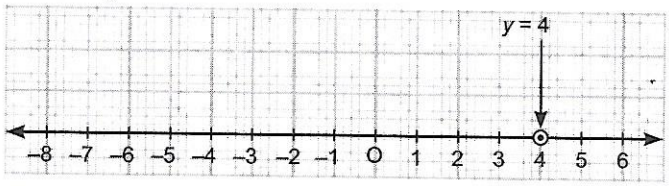
(*v*) $y = -4$



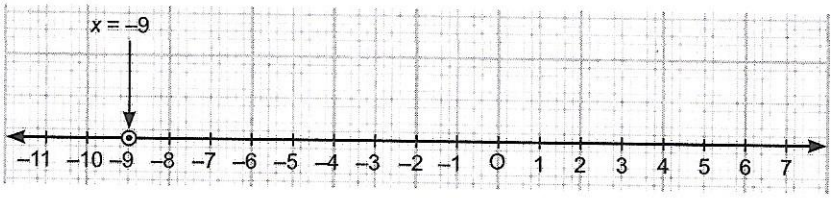
(*vi*) $x - 5 = 2 \Rightarrow x = 7$



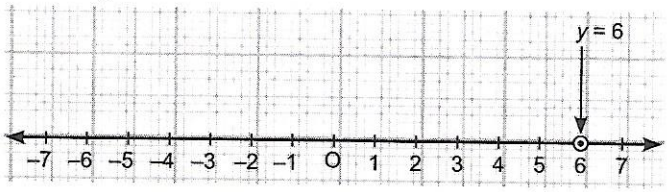
(*vii*) $y = 2y - 4 \Rightarrow 2y - y = 4 \Rightarrow y = 4$



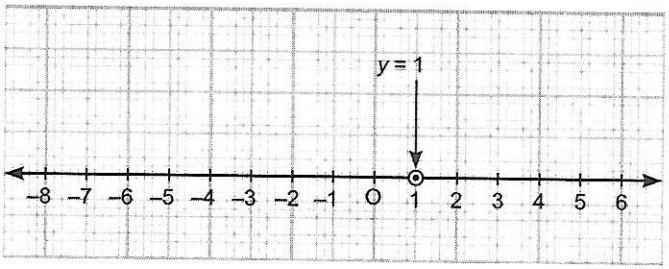
(*viii*) $1 + x = 2(x + 5) \Rightarrow 1 + x = 2x + 10 \Rightarrow x = -9$



(*ix*) $2y - 1 = 11 \Rightarrow 2y = 12 \Rightarrow y = 6$



(*x*) $2\left(y - \frac{1}{2}\right) = 1 \Rightarrow 2y - 1 = 1 \Rightarrow y = \frac{2}{2} \Rightarrow y = 1$



2. Give the geometric representations of the following equation in one variable.

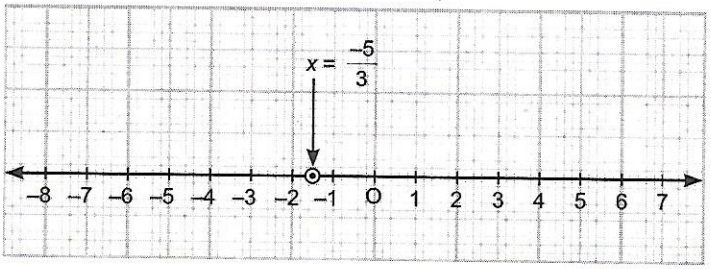
(*i*) $\mathbf{3(2x + 5) = 5}$ (*ii*) $\mathbf{\frac{2}{3}(3x - 5) = 2(2x + 1) - 11}$

Sol. (*i*) $3(2x + 5) = 5$

$\Rightarrow 6x + 15 = 5 \Rightarrow 6x = -10 \Rightarrow 3x = -5$

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

Geometrical representation of $x = \frac{-5}{3}$ in one variable is given by the number line.



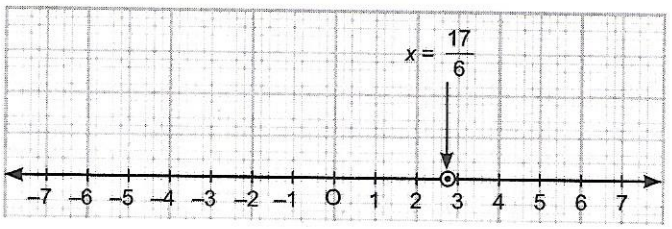
(*ii*) $\frac{2}{3}(3x - 5) = 2(2x + 1) - 11$

$\Rightarrow 2(3x - 5) = 3[2(2x + 1) - 11]$

$\Rightarrow 6x - 10 = 6(2x + 1) - 33$

$\Rightarrow 6x - 10 = 12x + 6 - 33$

$\Rightarrow -10 - 6 + 33 = 6x \Rightarrow 17 = 6x \Rightarrow x = \frac{17}{6}$



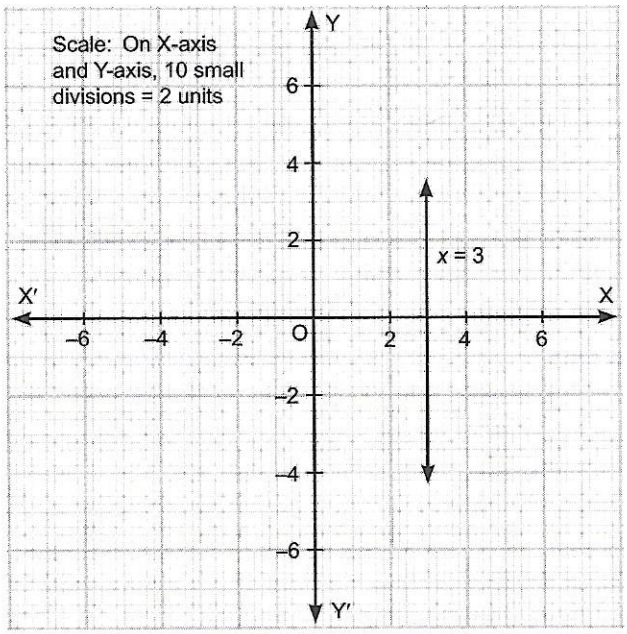
3. Represent the following equations on the Cartesian plane.

(*i*) $x = 3$ (*ii*) $x = -5$ (*iii*) $y = 7$ (*iv*) $y = -2$

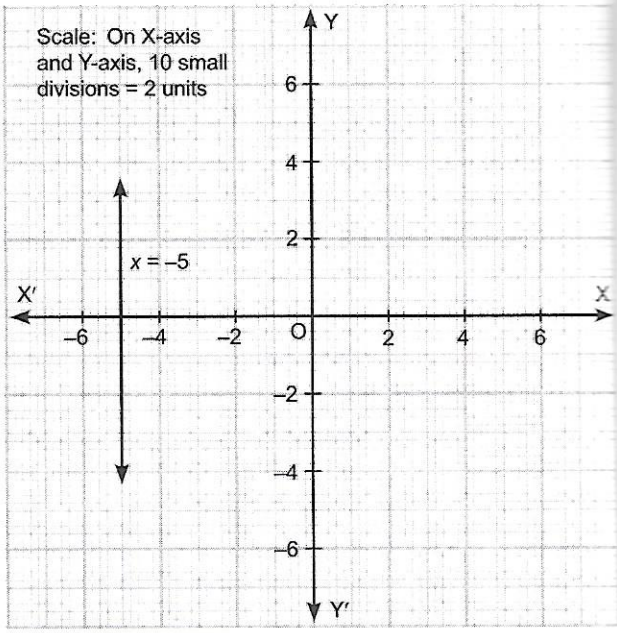
(*v*) $x + 5 = 10$ (*vi*) $x + 15 = 7$ (*vii*) $y + 7 = -2$ (*viii*) $\frac{1}{2}(y-3) = \frac{1}{3}(1-y)$

(*ix*) $2[(2x+1)-3] = \frac{(5-x)}{3}$ (*x*) $(2+2x) - \frac{1}{2} = 3(2x+7) - 5$

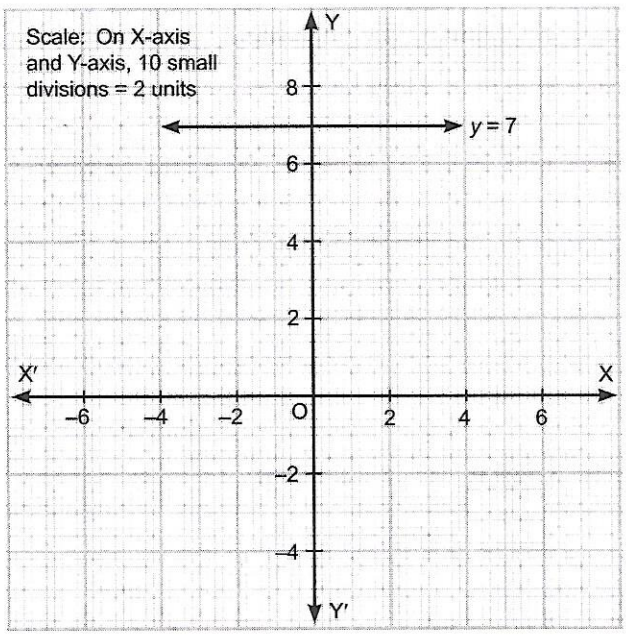
Sol. (*i*) $x = 3$



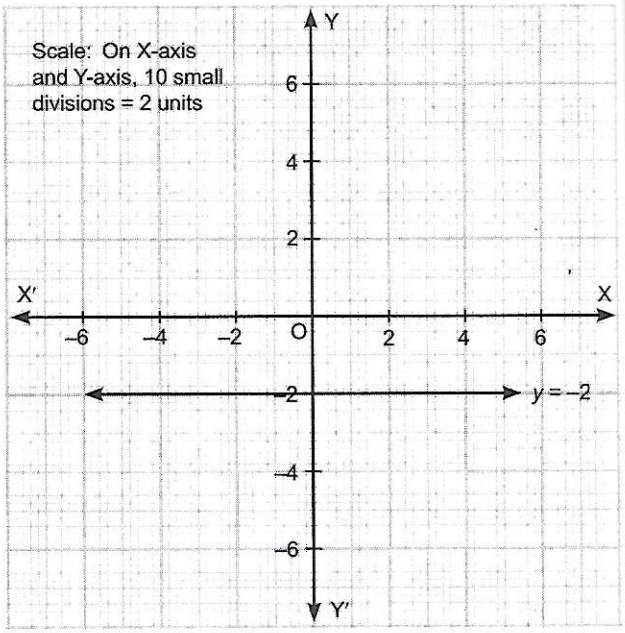
(*ii*) $x = -5$



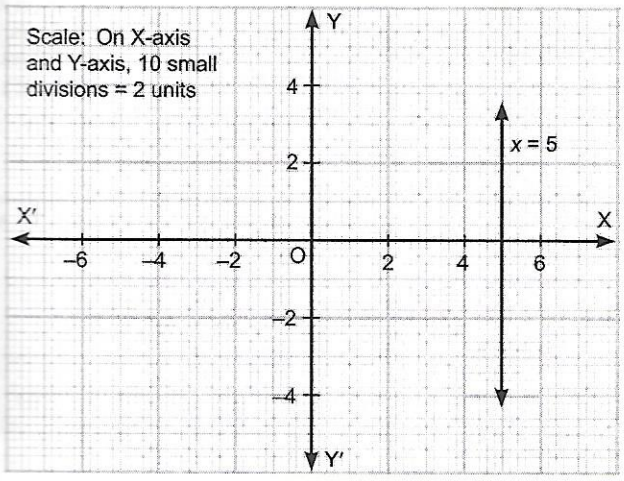
(*iii*) $y = 7$



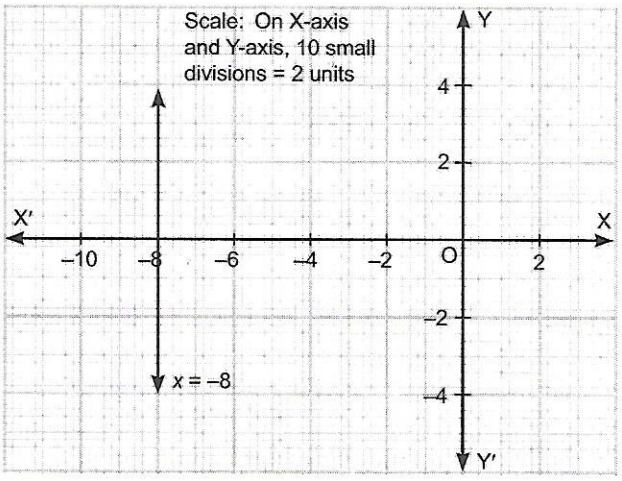
(*iv*) $y = -2$



(v) $x + 5 = 10 \Rightarrow x = 5$

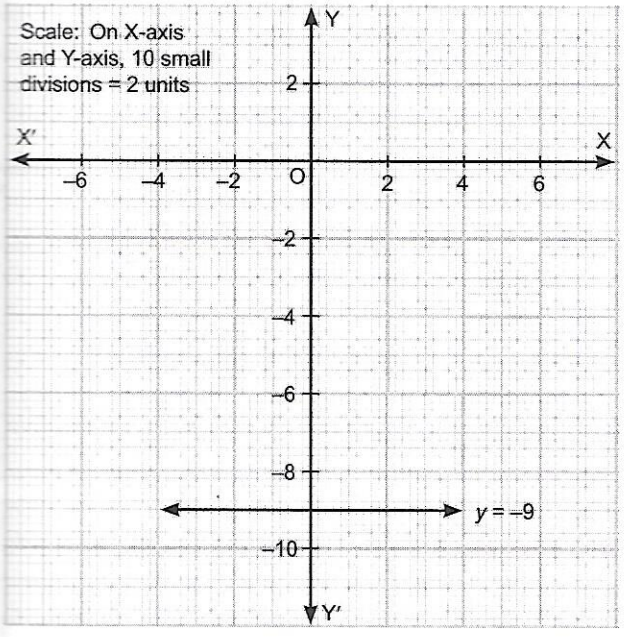


(vi) $x + 15 = 7 \Rightarrow x = -8$



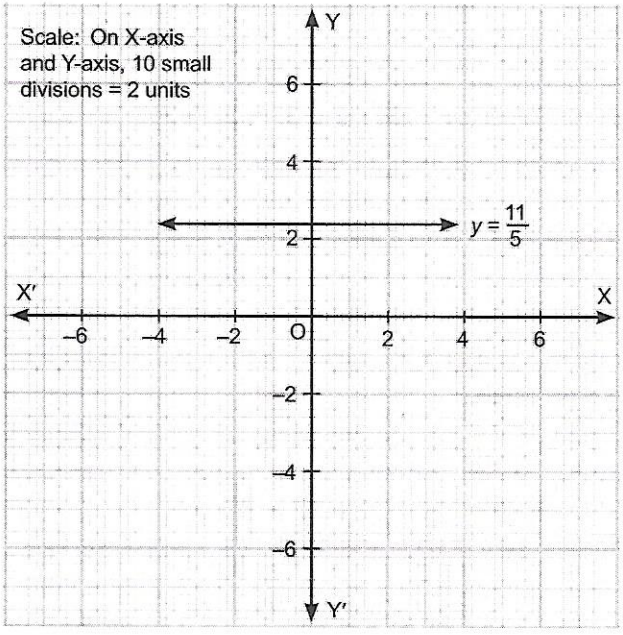
(vii) $y + 7 = -2$

$\Rightarrow y = -9$



(viii) $\frac{1}{2}(y-3) = \frac{1}{3}(1-y) \Rightarrow 3(y-3) = 2(1-y)$

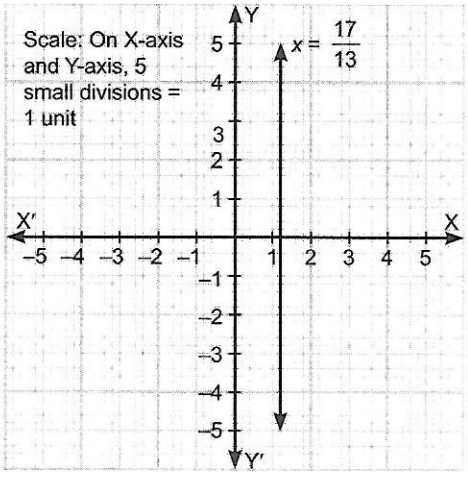
$\Rightarrow 3y - 9 = 2 - 2y \Rightarrow 5y = 11 \Rightarrow y = \frac{11}{5}$



(ix) $2[(2x + 1) - 3] = \frac{1}{3}(5 - x)$

$\Rightarrow 6[2x + 1 - 3] = 5 - x \Rightarrow 6[2x - 2] = 5 - x$

$\Rightarrow 12x - 12 = 5 - x \Rightarrow 13x = 17 \Rightarrow x = \frac{17}{13}$

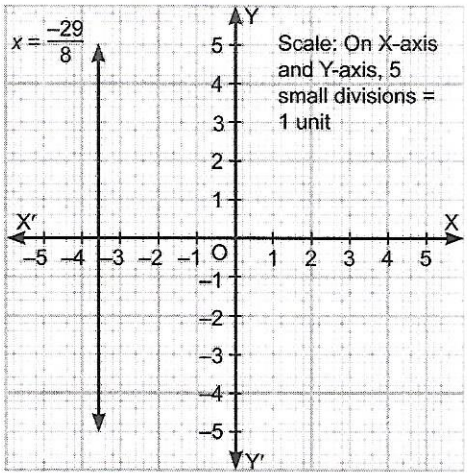


(x) $(2 + 2x) - \frac{1}{2} = 3(2x + 7) - 5$

$\Rightarrow \quad 4 + 4x - 1 = 6(2x + 7) - 10 \quad \Rightarrow \quad 3 + 4x = 12x + 42 - 10$

$\Rightarrow \quad 3 = 8x + 32 \quad \Rightarrow \quad 8x = -29$

$\Rightarrow \quad x = \frac{-29}{8}$



4. Give the geometric representation of the following equation in two variables.

(i) $2(3x - 1) + 7 = \frac{1}{3}[2(x + 7) - 1] + 6$

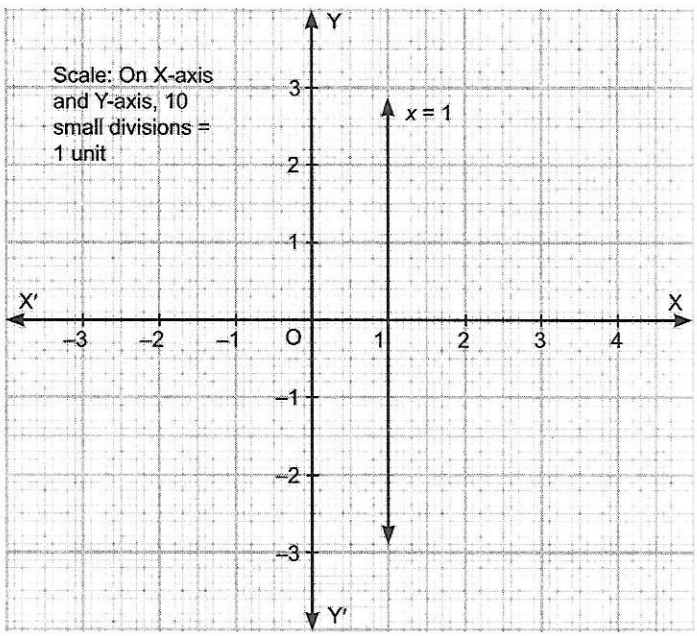
(ii) $\frac{1}{2}[y - (2y + 2)] = 5[y + 1]$

Sol. (i) $2(3x - 1) + 7 = \frac{1}{3}[(2x + 14) - 1] + 6$

$\Rightarrow \quad 6(3x - 1) + 21 = 2x + 13 + 18$

$\Rightarrow \quad 18x - 6 + 21 = 2x + 31$

$\Rightarrow \quad 16x = 31 - 15 \quad \Rightarrow \quad x = \frac{16}{16} = 1$



(ii) $\frac{1}{2}[y - (2y + 2)] = 5(y + 1)$

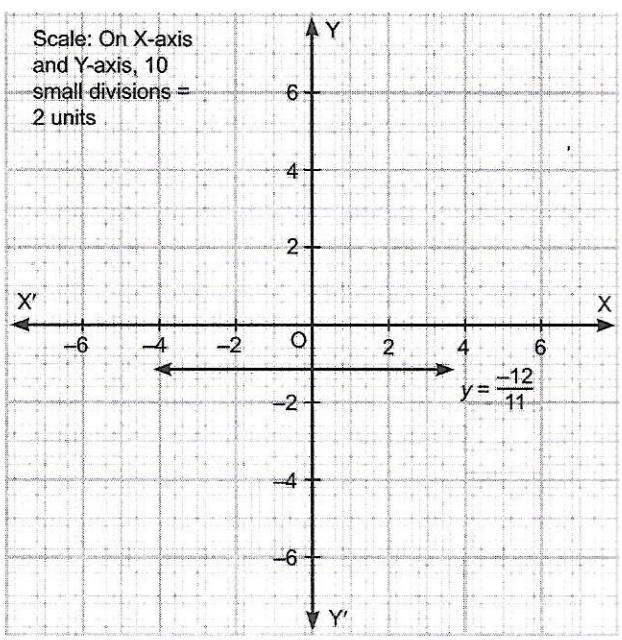
$\Rightarrow y - (2y + 2) = 10(y + 1)$

$\Rightarrow y - 2y - 2 = 10y + 10$

$\Rightarrow -y - 2 = 10y + 10$

$\Rightarrow 11y = -12$

$\Rightarrow y = \frac{-12}{11}$



Short Answer Type Questions II [3 Marks]

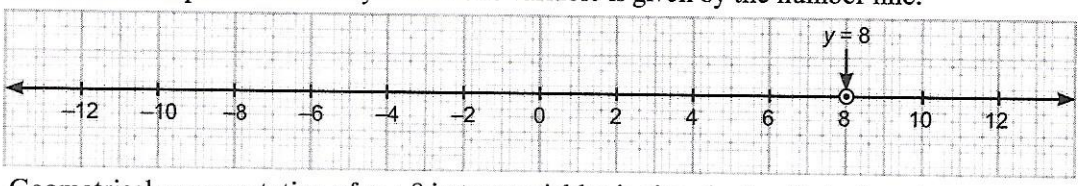
5. Give the geometric representations of $y = 8$ as an equation

(i) in one variable **(ii) in two variables**

Sol.

$y = 8$

(i) Geometrical representation of $y = 8$ in one variable is given by the number line.

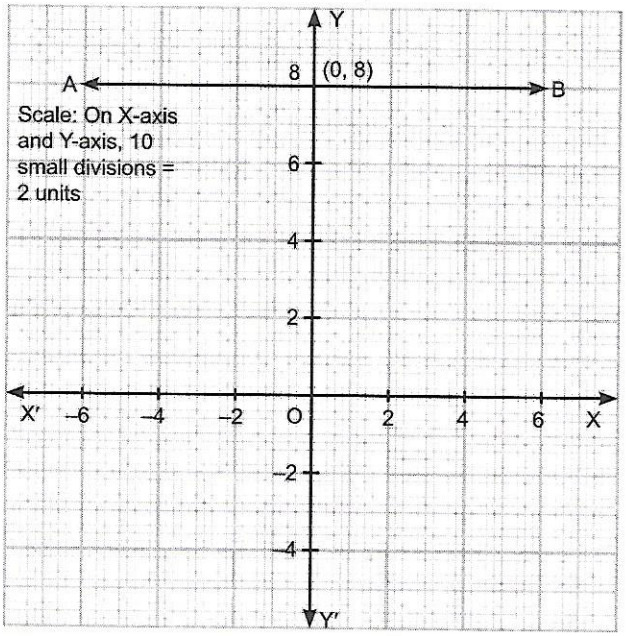


(ii) Geometrical representation of $y = 8$ in two variables is given by the Cartesian plane.

$y = 8$ or $1.y + 0.x = 8$

or $0.x + 1.y = 8$ ...(i)

This is a linear equation in two variables, i.e. x and y.



From (i), we notice, the value of y will remain fixed by variation in the value of x because $0.x$ will be zero everytime. As a result of which, we get a line AB parallel to x-axis, separated by $y = 8$ everywhere from the x-axis.

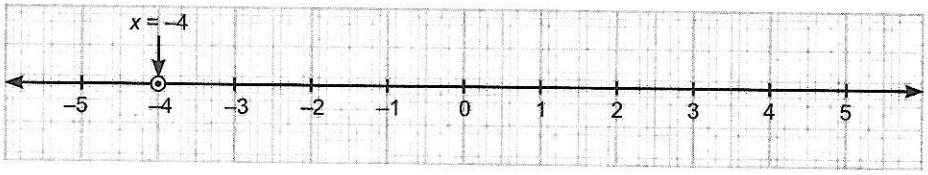
6. Give the geometric representations of $6x + 24 = 0$ as an equation

(i) in one variable **(ii) in two variables**

Sol.

$6x + 24 = 0 \Rightarrow 6x = -24 \Rightarrow x = -4$

(i) Geometric representations of $x = -4$ in one variable is given by the number line.

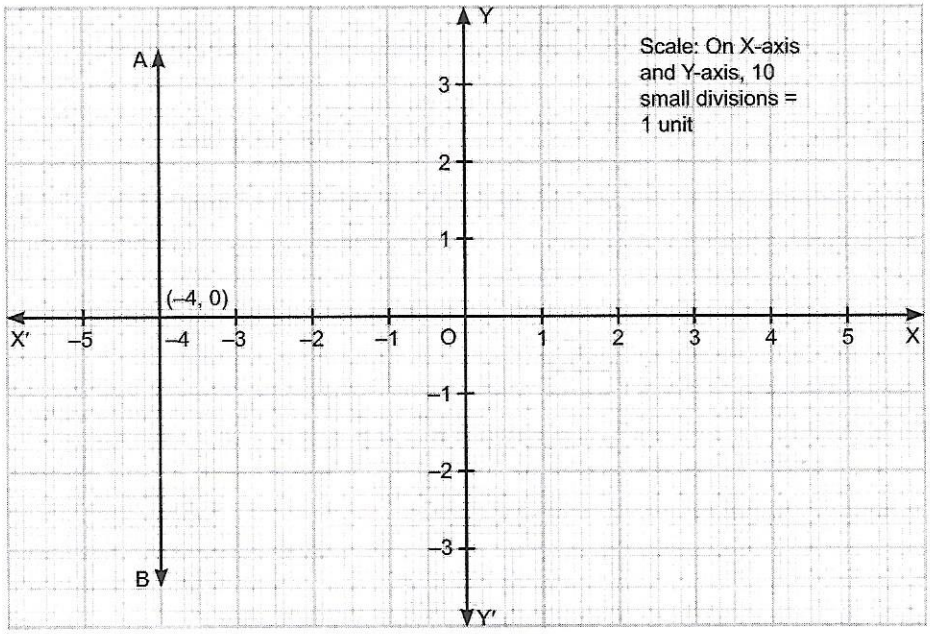


(ii) $6x + 24 = 0 \Rightarrow 6x = -24 \Rightarrow x = -4$

$\Rightarrow$ $5.x + 0.y = -4$ ...(i)

This is a linear equation in two variables, i.e. in x and y.

Geometrical representation of $6x + 24 = 0$ in two variables is given by the Cartesian plane.



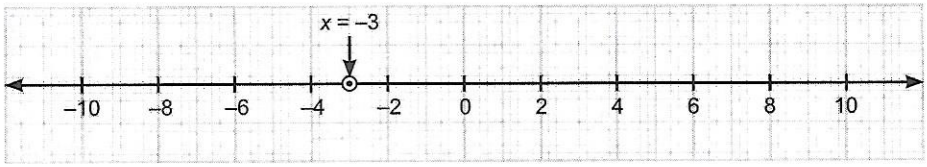
From (*i*), we notice, the value of x will remain fixed by variation in the value of y because $0.y$ will be zero everytime. As a result of which, we get a line AB parallel to y-axis, separated by $x = -4$ everywhere from y-axis.

7. Solve the equation $2x + 1 = 2\left(\frac{1}{2}x - 1\right)$ and represent the solution(s) on

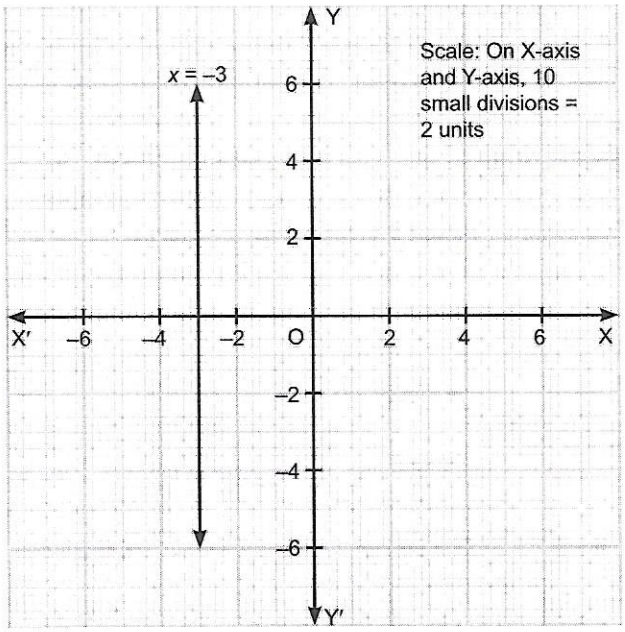
(*i*) the number line **(*ii*) the Cartesian plane**

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

(*i*) $x = -3$



(*ii*)

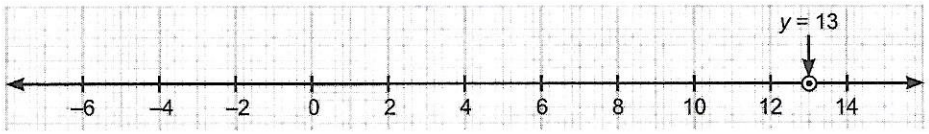


8. Solve the equation $\frac{3}{2}(y-1) = y + 5$, and represent the solution(s) on

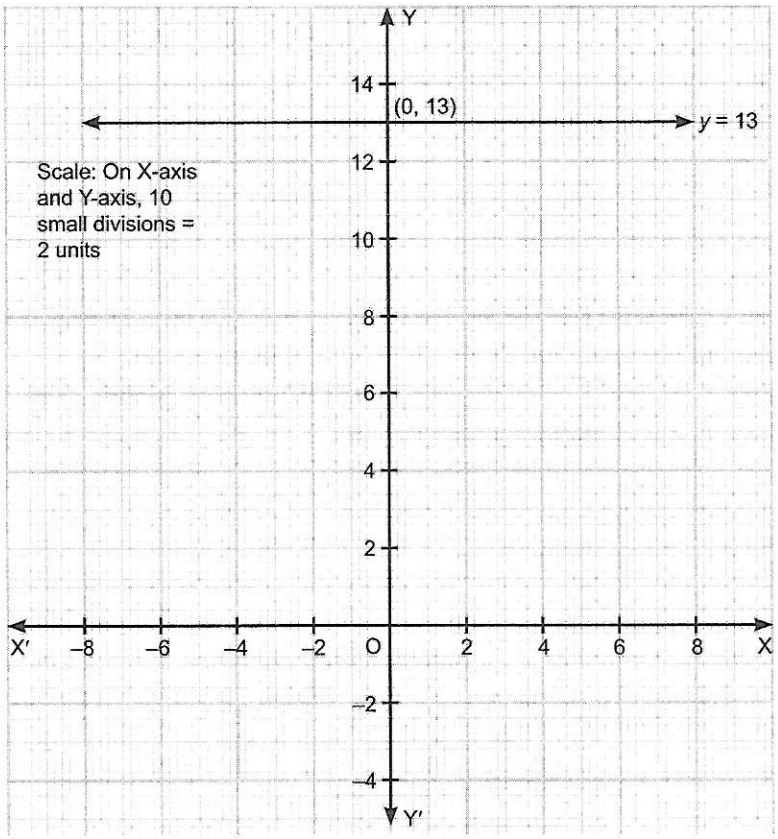
(*i*) the number line **(*ii*) the Cartesian plane**

Sol. $\frac{3}{2}(y-1) = y + 5 \Rightarrow 3y - 3 = 2y + 10 \Rightarrow y = 13$

(*i*)



(*ii*)



9. Draw the graph of the equation represented by a straight line which is parallel to the x-axis and at a distance 3 units below it. **[NCERT Exemplar]**

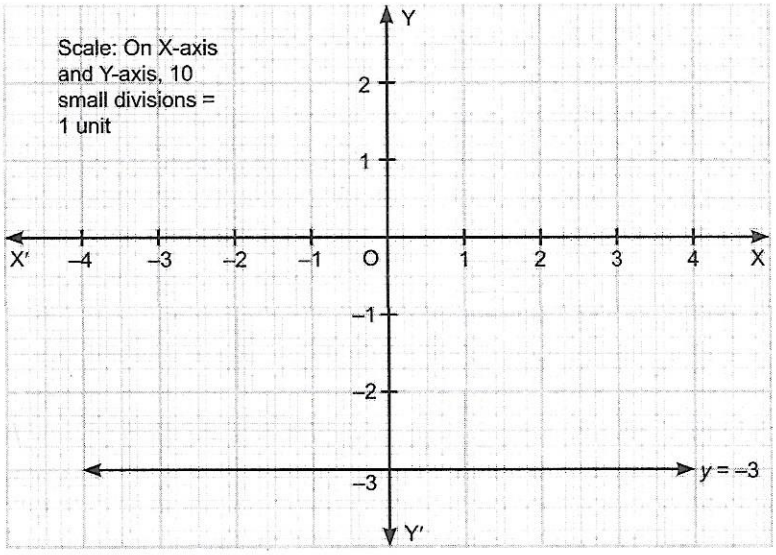
Sol. Any straight line parallel to x-axis is given by $y = \pm a$ (i.e. $y = a$ or $y = -a$).

$y = a$ for above the x-axis and $y = -a$ below the x-axis.

Here, $a = 3$ units, below x-axis.

$\therefore\ y = -3$

Hence, $y = -3$ is a straight line equation which is parallel to x-axis and at a distance of 3 units below it.



10. Express the linear equation $5x = 20$ in the form $ax + by + c = 0$ and find the values of a, b and c. Also, draw the graph of this equation in two variables.

Sol. $5x = 20$

$\Rightarrow \quad 5x - 20 = 0$

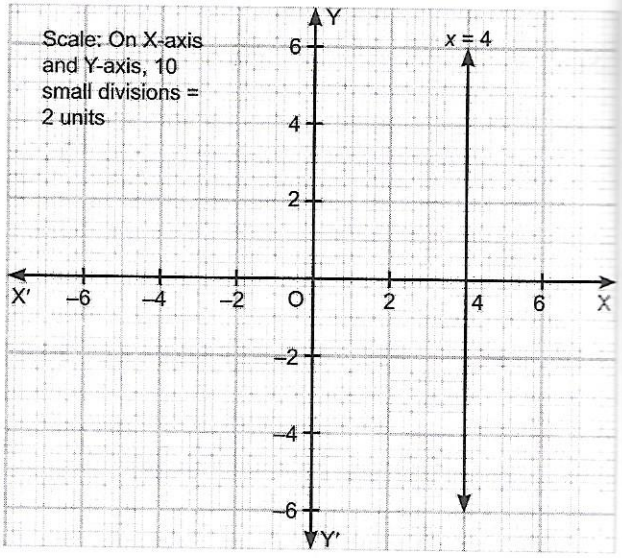
$\Rightarrow \quad 5x + 0.y - 20 = 0$

On comparing with $ax + by + c = 0$, we have

$a = 5, b = 0, c = -20$

Again, we have $5x = 20 \Rightarrow x = 4$

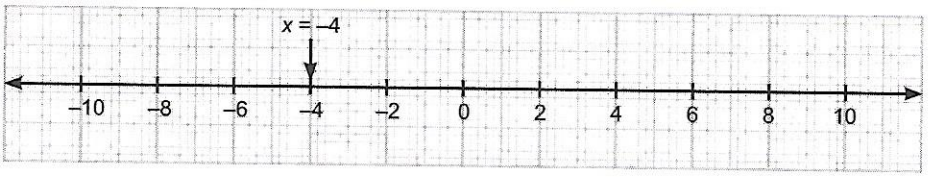
Hence, graph of $x = 4$ is a straight line parallel to y-axis.



11. How many solution(s) of the equation $2x + 1 = x - 3$ are there on the:

(i) Number line **(ii) Cartesian plane** **[NCERT Exemplar]**

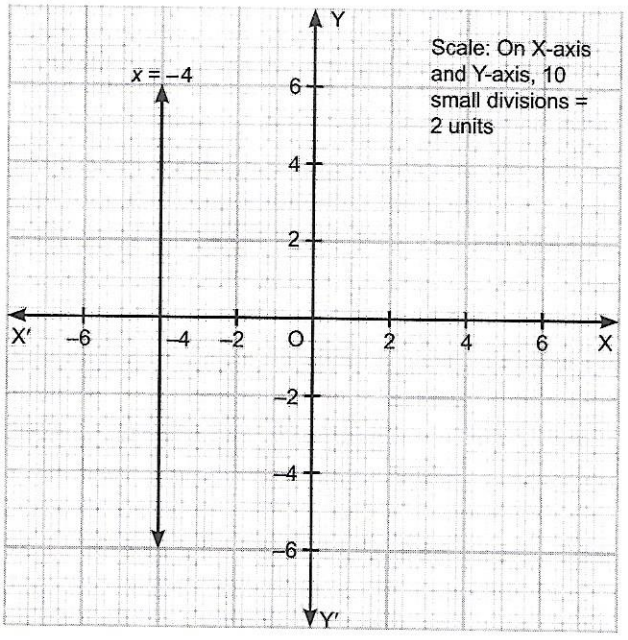
Sol. (i) $2x + 1 = x - 3 \Rightarrow 2x - x = -3 - 1 \Rightarrow x = -4$



On the number line, $x = -4$ is the only solution of the equation $2x + 1 = x - 3$.

(ii) $x = -4$

There are infinite solutions of the equation $2x + 1 = x - 3$ on the Cartesian plane. Points $(-4, 1)$, $(-4, 2)$, $(-4, 3)$, $(-4, 4)$, ... satisfy the given equation. Hence, there are infinite solutions.



Long Answer Type Questions [4 Marks]

12. Draw the graph of the equation $\frac{1}{2}(y-5)+6=\frac{3}{5}(y+5)+2$ on the Cartesian plane. Explain the number of solution(s) and also, determine the position of the point where graph cuts the y-axis.

Sol.

$$\frac{1}{2}(y-5)+6 = \frac{3}{5}(y+5)+2$$

$$\Rightarrow \quad \frac{y-5+12}{2} = \frac{3(y+5)+10}{5}$$

$$\Rightarrow \quad \frac{y+7}{2} = \frac{3y+15+10}{5}$$

$$\Rightarrow \quad \frac{y+7}{2} = \frac{3y+25}{5}$$

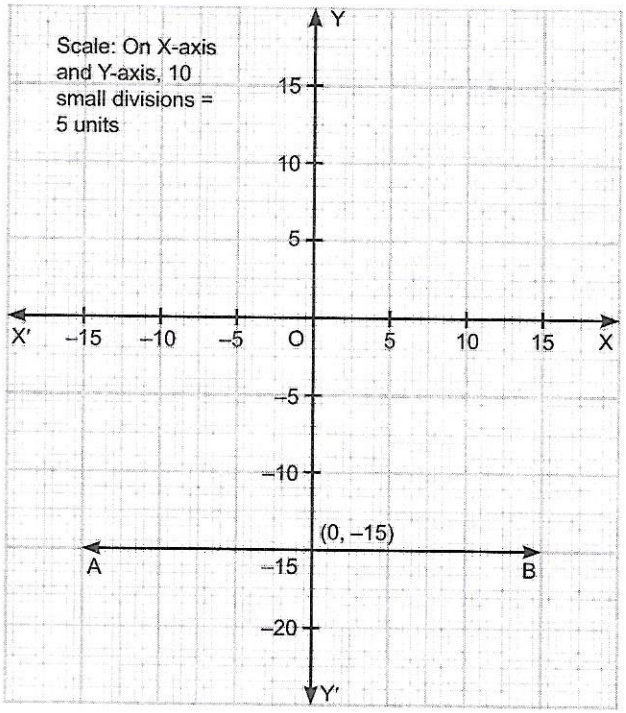
$$\Rightarrow \quad 5[y+7] = 2[3y+25]$$

$$\Rightarrow \quad 5y+35 = 6y+50$$

$$\Rightarrow \quad 6y-5y = 35-50$$

$$\Rightarrow \quad y = -15$$

From the graph, we notice, the line AB can have infinite solutions. From the graph, we have (0, –15), (1, –15), (2, –15), ... upto ∞ points. Hence, there are infinite solutions. Graph cuts the y-axis at (0, –15).



13. Reshma, a student of class IX of a school, contributed ₹ 100 per month to an NGO to help the blind children.

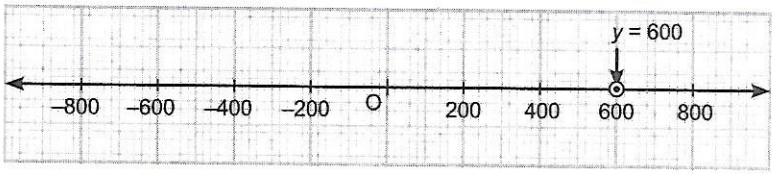
Taking total contribution as ₹ y for 6 months.

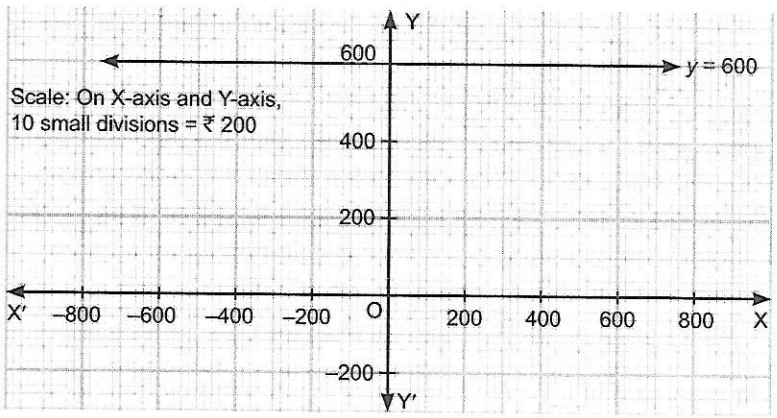
(*i*) Form a linear equation of the above information.

(*ii*) Draw it on the number line and also, on the Cartesian plane.

Sol. (*i*) According to question, $y = 6 \times 100 \Rightarrow y = 600$

(*ii*)





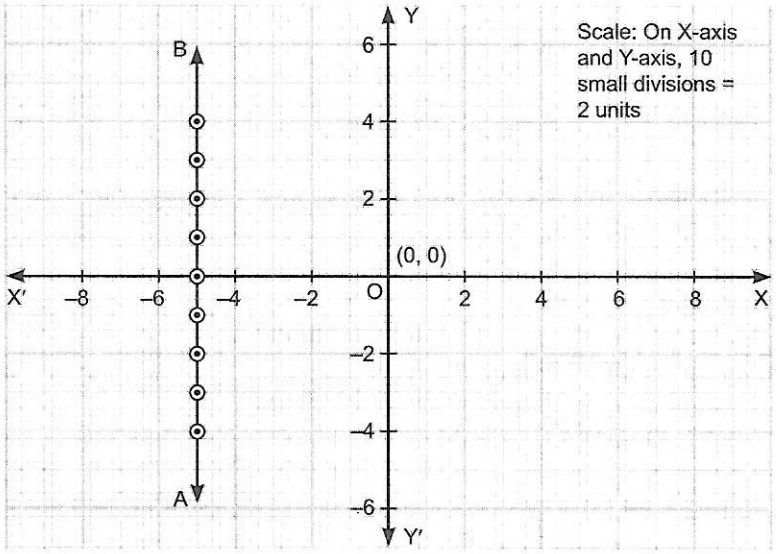
14. The following observed values of x and y are given by the table:

x	−5	−5	−5	−5	−5	−5	−5	−5	−5
y	0	−1	−2	−3	−4	1	2	3	4

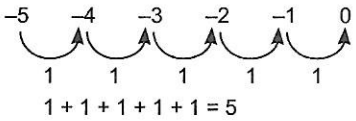
(*i*) Draw the graph of this information.

(*ii*) Determine the distance of separation between the line formed and the y-axis.

Sol. (*i*) Given points are (−5, 0), (−5, −1), (−5, −2), (−5, −3), (−5, −4), (−5, 1), (−5, 2), (−5, 3) and (−5, 4).



(*ii*) To find the distance of separation of the line AB from y-axis, count the unit distances from −5 to 0.



1 + 1 + 1 + 1 + 1 = 5

Hence, the distance of separation between the line AB and the y-axis is 5 units.

PRACTICE QUESTIONS BASED ON EXERCISE 4.4

1. Represent the equation $2(3 - 7y) - 4y - 25 = y$ on the Cartesian plane.
2. Give the geometric representation of the equation $\frac{7x-4}{4} - \frac{(x-7)}{2} = \frac{-5}{4}$ in two variables.
3. Solve the equation $2y + 5 = 9y - 9$, and represent the solution (s) on (*i*) the number line, (*ii*) the Cartesian plane.
4. How many solution (s) of equation $13x + 1 = 17x - 7$ are there?
5. Draw the graph of the equation represented by a straight line which is parallel to the x-axis and at a distance of 5 units above it.
6. Draw the graph of the equation represented by a straight line which is parallel to the y-axis and at a distance of 7 units in the right of it.
7. Express the linear equation $3y = -18$ in the form $ax + by + c = 0$ and find the values of a, b and c. Also, represent it on the Cartesian plane.
8. Draw the graph of the equation $\frac{3}{2}(x + 1) + 3 = \frac{1}{4}(x - 1) + 3$ on the Cartesian plane. Explain the number of solution (s) and also, find the position of the graph where it cuts the x-axis.
9. Determine the distance of separation between two lines $y = 2$ and $y = -5$ on number line.
10. At a party function, a waiter served 3 cups of coffee to each person.

    Taking number of people as 100 and total served cups of coffee as y

(*i*) Form a linear equation of the above information.

(*ii*) Draw it on the Cartesian plane.

(*iii*) Find the position of the point where graph cuts the y-axis.

11. A shopkeeper sales 20 burgers in an hour. Taking number of hours as 8 hours and total burgers sold as y

(*i*) Form a linear equation of the above information.

(*ii*) Draw it on the number line and also, on the Cartesian plane.

Value Based Questions

1. A city school is celebrating "Plantation Week" programme around its locality under the guidance of their physical education teachers. If the students of class X planted 50 more trees than the students of class IX, then

(*i*) Establish it in linear equation form.

(*ii*) Mention the values developed among the students.

2. A city welfare society has organised "An Eye Camp" under prominent eye surgeons in which 100 persons visited the camp. If 70 persons belong to senior citizens who are above the age of 65 years, then

(*i*) Formulate the word problem in a linear equation in two variables.

(*ii*) Which values are being promoted by the welfare society?

3. A father after returning home from office, purchased 150 chocolates from market on way to home and gave equal chocolates to his son and daughter.

(*i*) Formulate it in a linear equation from.

(*ii*) Mention the values promoted by father.

4. On a rainy day, water from the roof was flowing in the underground water tank at the rate of 40 cm^3/sec.

(*i*) If the volume of water collected in x sec is y cubic cm, represent this as a linear equation and find the volume of water collected in 10 sec.

(*ii*) Which environmental value has been promoted by this activity?

5. A man hired an auto for 5 km. The fare was ₹ 10 for first km and ₹ 3 for every subsequent km. He paid ₹ 50, to which the auto driver said that its not the correct amount. The actual fare is somewhat less than that the amount you have paid to me.

(*i*) Calculate the correct fare.

(*ii*) Which value is being promoted by the auto driver?

INTEGRATED EXERCISE

Very Short Answer Type Questions [1 Mark]

1. Express linear equation $x - y = \sqrt{3}y$ in standard form $ax + by + c = 0$, find the value of a, b, c.
2. Tell whether the equation $x(x-1) - x + y + 7 = 0$ is an equation of linear equation in two variables or not.
3. How many solution(s) of the linear equation $y = 4x - 3$ has?
4. If the point $x = 2, y = 2$ is a solution of the equation $2x + 3k = y$, than find the value of k.
5. Check whether the point (3, 1) lies on the equation $5x - 15y = 0$ or not?
6. At what point the graph of the linear equation $-x + y = -10$ cuts the y-axis.
7. Give the geometric representation of the equation $2(x-3) + 4y = -18$ in two variables.
8. Represent the equation $\frac{1}{3}(x-3) = \frac{1}{2}(1-x)$ on the Cartesian plane.

Short Answer Type Questions I [2 Marks]

9. Draw the graph of $y = -2x$. Show that the point $(2, -5)$ is not on the given line.
10. Find the point of intersection of the line represented by the equation $7x + y = -2$ with x-axis. Check whether the point (2, 1) is a solution of the given equation.
11. Which of the following is a solution of the equation $3x + 2y = 10$

(*i*) (2, 2) (*ii*) (1, 5)

12. Write the coordinates of any two points which lie on the line $-x + y = -7$. How many such point exists?
13. Draw the graph of the equation $2x + 3y = 6$. From the graph, find the value of y, when $x = 4$.

14. Express the linear equation $6 = 4x$ in the form $ax + by + c = 0$ and indicate the value of a, b, c. Also give the geometrical representation of above equation in two variables.

15. Draw the graph of the equation $2x + 5y = 13$. Find the points where the line meets two axes.

Short Answer Type Questions II [3 Marks]

16. Check whether $x = -2$ and $y = 6$ is a solution of $3(x - 2) + 2(y + 3) = 6$. Find one more solution. How many more solution(s) can you find?

17. Find the value of 'a'. If each of the following equation has $x = 1, y = 1$ as a solution:
    (*i*) $3x + ay = 6$
    (*ii*) $5x + 2ay = 3a$
    (*iii*) $9ax + 12ay = 63$

18. If x years, represents the present age of the father and y years represents the present age of the son, then find the statement "present age of the father is 4 more than 7 times age of the son" in mathematical term equation and represent it on the Cartesian plane.

19. A part of monthly expenses of a family on milk is fixed which is ₹500 and the remaining varies with the quantity of milk taken extra at the rate of ₹20 per kg. Taking the quantity of milk required extra as x kg and total expenditure on milk ₹y. Write a linear equation for this information and draw its graph.

Long Answer Type Questions [4 Marks]

20. Find the solutions of the form $x = a, y = 0$ and $x = 0, y = b$ for each of the following pairs of equations? Do they have any common such solution?
    (*i*) $3x + 2y = 6$ and $5x - 2y = 10$
    (*ii*) $5x + 3y = 15$ and $5x + 2y = 10$

21. Plot the graph of the following linear equation $2(x + 3) - 3(y + 1) = 0$. Also answer the following questions:
    (*i*) Write the quadrant in which the line segment intercepted between the axes lie.
    (*ii*) Shade the triangular region formed by the line and the axes.
    (*iii*) Write the vertices of the triangle so formed.

ASSESS YOURSELF

1. Write the equation $y + 5 = \sqrt{3}y$ in standard form $ax + by + c = 0$. Also, mention the values of a, b and c.

2. How many solution (s) are (is) possible for the linear equation $3x - 7 = 0$, represented as $ax + by + c = 0$.

3. At what point, the graph of the linear equation $3x - 5y = 45$ cuts the x-axis.

4. Find the linear equation which has the following solutions $(-5, 5)$, $(0, 0)$ and $(5, -5)$.

5. Let y varies directly as x. If $y = 12$, when $x = 4$, then find the linear equation.

6. Draw the graph of $y = x$. Show that point $(4, 4)$ is on the graph.

7. Express x in terms of y, given that $3x + 4y = 6$. Check whether the point $(3, 2)$ is on the given line.

8. Show that the points A$(1, 2)$, B$(-1, -16)$, C$(0, -7)$ are on the graph $y = 9x - 7$.

9. Give the geometrical representation of $2x + 9 = 0$ as an equation in (a) one variable (b) two variables.

10. Find the three solutions of the equation $3 = 2x + y$.

11. Draw the graph of $2x + y = 7$. Write the points where line meets x and y-axis.

12. Find three solutions of equation $2x + 3(y - 1) = 12$. How many solutions this equation has?

13. For what value of c, the linear equation $2x + cy = 8$ has equal values of x and y for its solution.

14. The following observed values of x and y are thought to satisfy a linear equation. Write the linear equation:

x	6	-6
y	-2	6

Draw the graph using the values of x, y as given in the above table.

15. Find m, if point $(7, -3)$ lie on the equation $\left(y - \frac{3}{7}\right) = m\left(x - \frac{2}{7}\right)$.

16. For the first kilometer, the fare is ₹ 5 and for successive distance it is ₹ 2 per km. Taking distance covered as x and total fare as ₹ y. Write a linear equation.

17. The cost of petrol in a city is ₹ 50 per litre. Write an equation with x as number of litres and y total cost.

18. The following observed values of x and y are thought to fulfil the equation $y = ax + b$. Find the values of a and b.

x	0	2
y	5	19

19. Find the value of α in the equation $\alpha x + y = 5$, if $x = 2$ and $y = 3$.

20. Ram is half of his father's age. Twenty years ago the age of father was six times age of Ram. Find the age of Ram and his father.

21. Draw the graph of the linear equation $y = mx + c$ for $m = \frac{1}{2}$ and $c = \frac{3}{2}$. Read from the graph, the value of x, when $y = 4.5$.

22. Draw the lines $x = 4, y = 2$ and $x = y$, on the same graph paper and then identify what type of figure obtained? Also write the point of vertices of this figure formed.

23. Give the geometric representation of $3x + 12 = 0$ as an equation (*i*) in one variable, (*ii*) on the Cartesian plane.