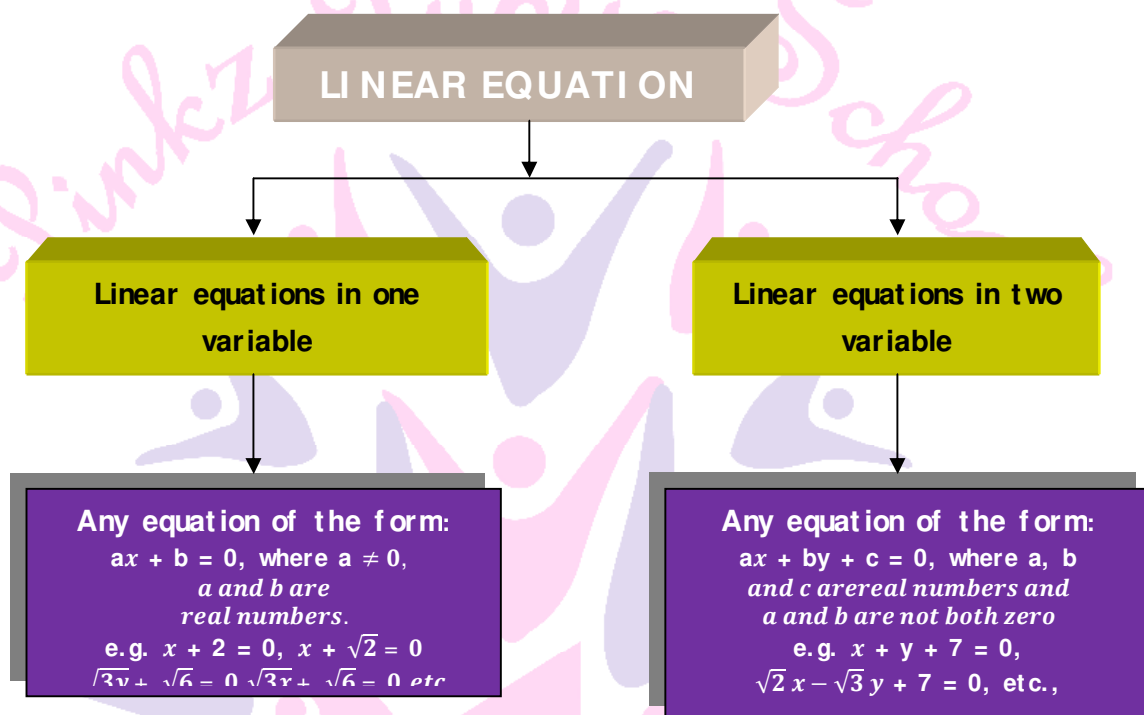


Grade IX

Lesson : 4 Linear Equations in Two variables [4.1 to 4.4]

LINEAR EQUATION



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Objective Type Questions

I. Multiple choice questions

1. A linear equation in two variables is of the form $ax+by+c=0$, where

- a) $a \neq 0, b \neq 0$ b) $a=0, b \neq 0$ c) $a \neq 0, b = 0$ d) $a=0, c=0$

a) $a \neq 0, b \neq 0$

2. Express $5x = -8y$ in the form of $ax+by+c=0$

$$5x = -8y$$

Or

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

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

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

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.

4. 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.

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

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.

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

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) $8x = 7 \Rightarrow 8x - 7 = 0 \Rightarrow 8x + 0y - 7 = 0$

This equation is in the form $ax + by + c = 0$ Now, on comparing, we have

$$a=8, b=0, c=-7$$

$$\text{viii) } 4y = \frac{8}{3} \Rightarrow 4y - \frac{8}{3} = 0 \Rightarrow 0.x + 4y - \frac{8}{3} = 0$$

This equation is in the form $ax+by+c=0$ Now, on comparing, we have

$$a=0, b=4, c=-\frac{8}{3}$$

$$\text{ix) } 5=6y \Rightarrow -6y + 5 = 0 \Rightarrow 0.x - 6y + 5 = 0$$

This equation is in the form $ax+by+c=0$ Now, on comparing, we have

$$a=0, b=-6, c=5$$

$$\text{x) } 12 = \frac{5}{2}x \Rightarrow -\frac{5}{2}x + 12 = 0 \Rightarrow -\frac{5}{2}x + 0.y - 12 = 0$$

This equation is in the form $ax+by+c=0$ Now, on comparing, we have

$$A = -\frac{5}{2}, b=0, c=-12$$

6. A rabbit covers y meters 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.

Distance covered by rabbit in x jumps is $2x$, i.e. $2x$ metres.

According to question,

$$Y = 10 + 2x$$

I Short answer questions

7. 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 Rs. x and that of a pencil by Rs. y)

Let the cost of a pen to be Rs. x and that of a pencil by Rs. y .

According to question,

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

Hence, this is required equation.

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

According to question,

$$x = y + 10$$

$$\Rightarrow x - y - 10 = 0 \Rightarrow 1x - 1y - 10 = 0$$

This equation is in the form $ax + by + c = 0$ where $a = 1$, $b = -1$, $c = -10$

Hence this is required linear equation.

9. Write the linear equation such that each point on its graph has an ordinate 3 times its abscissa.

Let x be the abscissa and y the ordinate

According to question, $y = 3x \Rightarrow y - 3x = 0$

Hence this is required linear equation.

10. When a number is divided by another number, quotient and remainder obtained are 9 and 1 respectively. Express this information in linear equation.

Let the dividend be y and the divisor be x

We know that,

$$\text{Dividend} = \text{Divisor} \times \text{Quotient} + \text{Remainder}$$

$\therefore$ According to question,

$$y = 9x + 1$$

11. The sum of a two-digit number and the number obtained by reversing the order of its digits is 88. Express this information in linear equation.

Let unit's digit be x and ten's digit be y

Then original number be $(10y + x)$

after reversing the order of digits new number be $(10x + y)$

According to question,

$$10y + x + 10x + y = 88$$

$$11x + 11y = 88$$

$$x + y = 8 \text{ (dividing both sides by 11)}$$



12. In a one-day International Cricket match, played between India and England in Kanpur, two Indian batsmen, Yuvaraj Singh and M.S. Dhoni scored 200 runs in a partnership including 5 extra runs. Express this information in the form of an equation.

Let x be the number of runs scored by Yuvaraj Singh and y be the number of runs scored by M.S. Dhoni.

According to the questions,

$$x+y+5=200$$

$$\text{Or, } x+y+5-200=0$$

$$\text{Or, } x+y-195=0$$

Hence, this is the required equation.

13. Write a linear equation on which the point of the form $(a, -a)$ always lies.

Here $x=a$, $y=-a$

That means for $x=a$, we get $y=-a$ and vice versa.

Therefore, $x+y=0$ and $-x-y=0$ are equations for which the point of the form $(a, -a)$ always lies.

II. Multiple choice questions

1. The Linear equation $3y-5=0$, represented as $ax+by+c$, has

- a) a unique solution
- b) infinitely many solutions
- c) two solutions
- d) no solution
- b) infinitely many solutions

2. $x=5$, $y=-2$ is a solution of the linear equation

- a) $2x+y=9$
- b) $2x-y=12$
- c) $x+3y=1$
- d) $x+3y=0$

Substituting $x=5$ and $y=-2$ in LHS of $2x-y=12$ we have

$$\text{LHS} = 2 \times 5 - (-2) = 10 + 2 = 12 = \text{RHS}$$

$\therefore$ Correct option is (b)

3. Let y varies directly as x . If $y=24$, when $x=8$ then the linear equation is



a) $3y=x$

b) $y=x$

c) $y= 4x$

d) $y=3x$

d) $y=3x$

4. Write one solution of $\pi x + y = 5$.

$$\pi x + y = 5.$$

$$y = 5 - \pi x \quad \dots(i)$$

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 $\pi x + y = 5$

5. Find a, if linear equation $3x - ay = 6$ has one solution as (4,3)

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, $a = 2$.

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

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

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

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

Hence, $b = 15$.

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

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

We have,

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

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

$$\Rightarrow k = -1$$

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

$$3x+ay=8 \quad \dots(i)$$

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

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

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

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

Ans: On putting $x = 1$ and $y = 1$ in equation

$$5\beta x + 30\beta y = 70, \text{ we have}$$

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

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

10. How many solution(s) of the linear equation $2x-5y=7$ has?

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

11. If (2,0) is a solution of the linear equation $2x + 3y = k$, then find the value of k.

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

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

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

II Short answer questions

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

$$4x + 3y = 24$$

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.

13. 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?

Given: $3x+2y=18$

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

On comparing, we get

$$m = -\frac{3}{2} \text{ and } c = 9$$

Substitute $x = 4$ in (i), we get

$$y = -\frac{3}{2} \times 4 + 9 = -6 + 9 = 3$$

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

III Short answer questions

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

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

According to the questions,

$$y = 1\frac{1}{2}x$$

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

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

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

$$\Rightarrow 9x = 38 \Rightarrow x = \frac{38}{9} \Rightarrow x = 2$$

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



Hence, the required point is (2,3)

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

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

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

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

This is the required value of c .

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

$\therefore$ Sum of angles of a triangle is 180°

$$\therefore 2x + 3x + 5x = 180^\circ$$

$$10x = 180^\circ$$

$$x = 18^\circ$$

The angles of the triangle are

$$2x = 2 \times 18 = 36^\circ; \quad 3x = 3 \times 18 = 54^\circ \quad \text{and} \quad 5x = 5 \times 18 = 90^\circ$$

Hence, angles are $36^\circ, 54^\circ$ and 90°



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I Long answer questions

17. 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.

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

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

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

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

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

$$\Rightarrow -4p = 8$$

$$\Rightarrow p = -2$$

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

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

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

$$\Rightarrow x + y + 1 = 0 \dots (ii)$$

(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

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

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

18. (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

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

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

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

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

$$\Rightarrow 3a = 6$$

$$\Rightarrow a = 2$$

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

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

$$\text{L.H.S.,} = 3 \times (-2) - 2 \times (-6)$$

$$= -6 + 12 = 6$$

$$= \text{R.H.S}$$

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

(ii) (a) when abscissa is zero, it means $x = 0$

From (i) we get

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

$$\Rightarrow -2y = 6$$

$$\Rightarrow y = -3$$

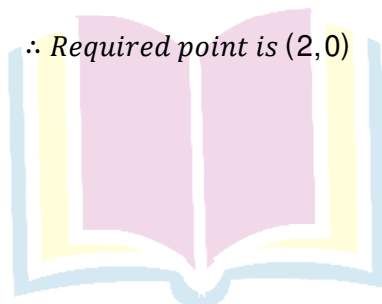
$\therefore$ Required point is $(0, -3)$

(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 $(2, 0)$



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III Multiple choice questions

1. If point (3,0) lies on the graph of the equation $2x+3y=k$, then the value of k is

- a) 6 b) 3 c) 2 d) 5

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

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

$$\Rightarrow 6 + 0 = k \Rightarrow k = 6$$

$\therefore$ Correct option is (a)

2. The graph of the linear equation $3x+5y=15$ cuts the x -axis at the point

- a) (5,0) b) (3,0) c) (0,5) d) (0,3)

At x -axis, $y=0$

On putting $y=0$ in $3x+5y=15$ we have

$$\Rightarrow 3x + 5 \times 0 = 15$$

$$\Rightarrow 3x = 15 \Rightarrow x = 5$$

$\therefore$ Correct option is (a)

3. For one of the solutions of the equation $ax+by+c=0$, x is negative and y is positive then surely a portion of line lies in the

- a) first quadrant b) second quadrant c) third quadrant d) fourth quadrant

b) second quadrant

4. If we multiply or divide both sides of a linear equation with a non-zero number, then the solution of the linear equation:

- a) changes b) remains the same
c) changes in case of multiplication only d) changes in case of division only

If we multiply or divide both sides of a linear equation with a non-zero number, then graph will be same in both cases. Thus, the solution of the linear equation remains the same.

$\therefore$ Correct option is (b)



5. How many linear equations in x and y can be satisfied by $x=1$ and $y = 2$?

- a) Only one b) Two c) Infinitely many d) Three

As point $(1,2)$ lies on graph and through one point infinite lines can pass. So, we get infinitely many linear equations.

$\therefore$ Correct option is (c)

6. Is the point $(0,3)$ lie on the graph of the linear equation $3x + 4y=12$?

$$3x + 4y=12$$

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 $3x+4y=12$

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

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 $(5,0)$

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

At y - axis $x = 0$

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

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

$$\Rightarrow 0 - y=7$$

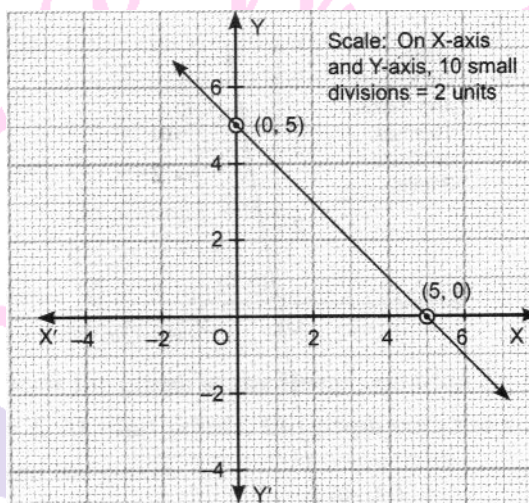
$$\Rightarrow y = -7$$

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



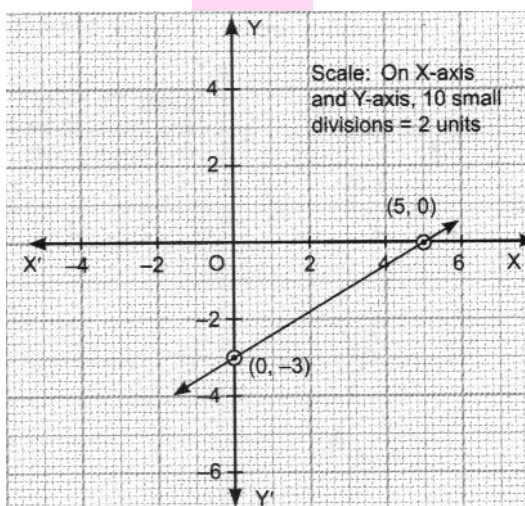
9. Draw the graph using the values of x , y as given in the table

x	0	5
Y	5	0



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

x	0	5
Y	-3	0



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IV Short Answer Questions

11. 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) $y = -x$

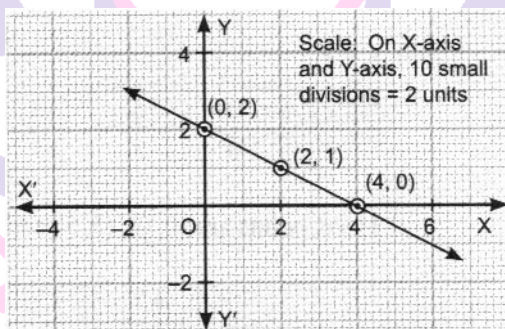
vi) $y = 5x$

vii) $15 + 3x + y = 0$

i) $x+2y = 4$

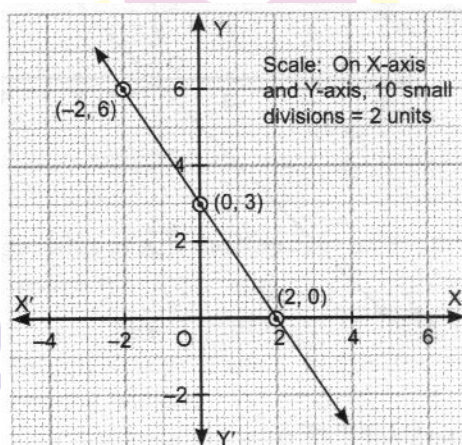
x	0	4	2
Y	2	0	1

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



ii) $3x+2y = 6$

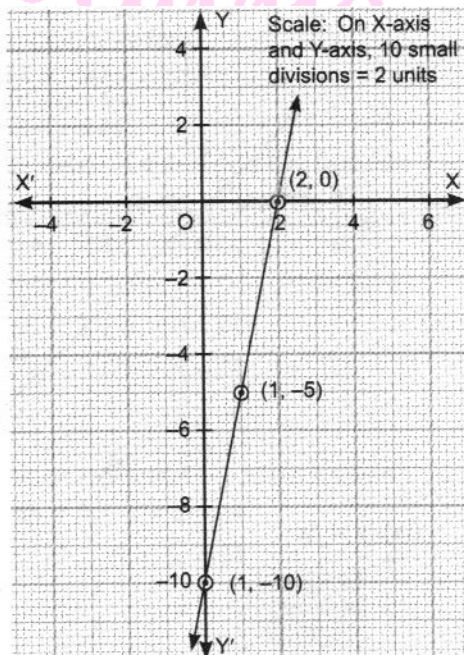
x	0	2	-2
Y	3	0	6



iii) $5x - y = 10$

x	0	2	1
Y	-10	0	-5

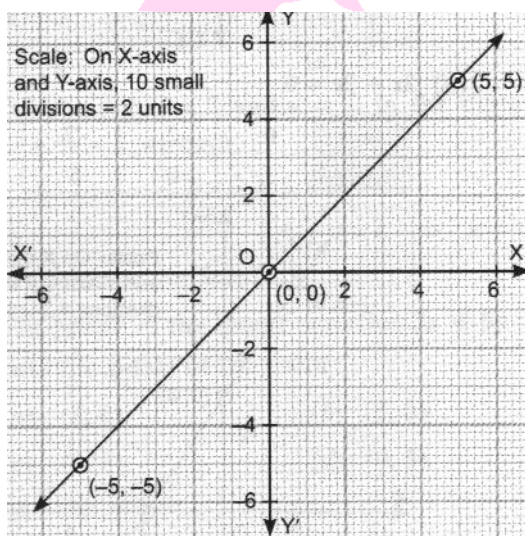
Here, points are $(0, -10)$, $(2, 0)$ and $(1, -5)$.



iv) $y = x$

x	0	5	-5
Y	0	5	-5

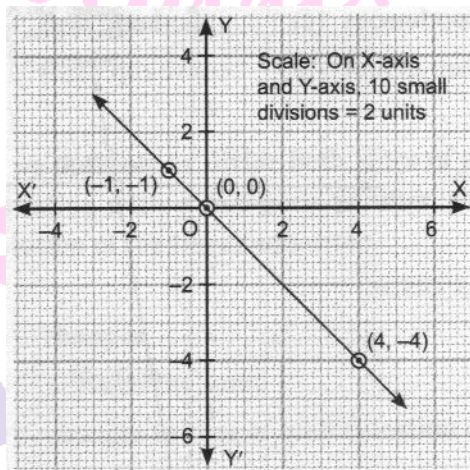
Here, points are $(0, 0)$, $(-1, 1)$ and $(4, -4)$



v) $y = -x$

x	0	-1	4
Y	0	1	-4

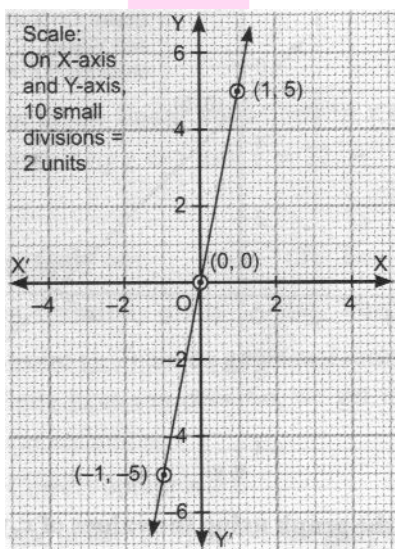
Here, Points are $(0,0)$ $(-1,1)$ and $(4,-4)$



vi) $y = 5x$

x	0	1	-1
Y	0	5	-5

Here, Points are $(0,0)$ $(1,5)$ and $(-1,-5)$

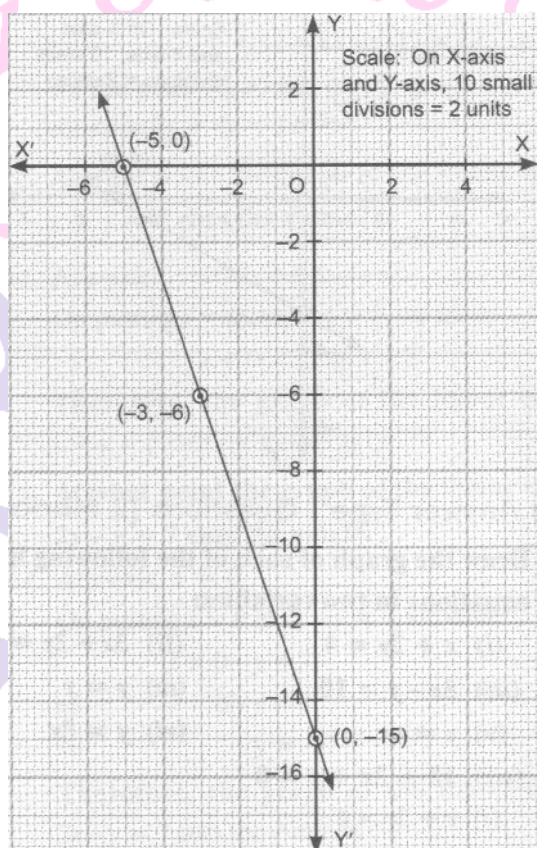


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vii) $15 + 3x + y = 0$

x	0	1	-1
Y	0	5	-5

Here, Points are (0,0) (1, 5) and (-1,-5)



12. Find the solution of the linear equation

$x + 2y = 8$. Which represents a point on the

i) x - axis ii) y - axis

(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

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

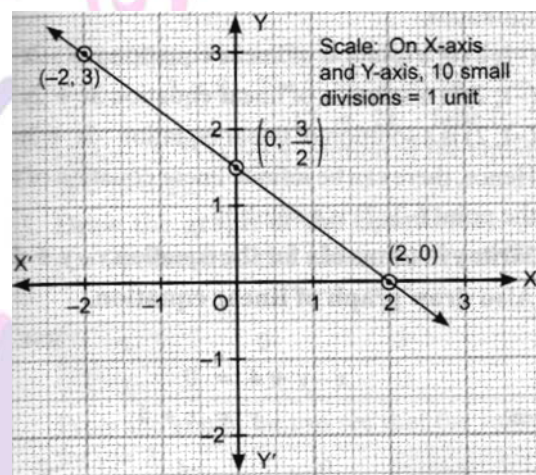
Hence, point (8,0) is a point on x - axis and the y - axis.

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

$$3x + 4y = 6$$

x	0	2	-2
y	$\frac{3}{2}$	0	3

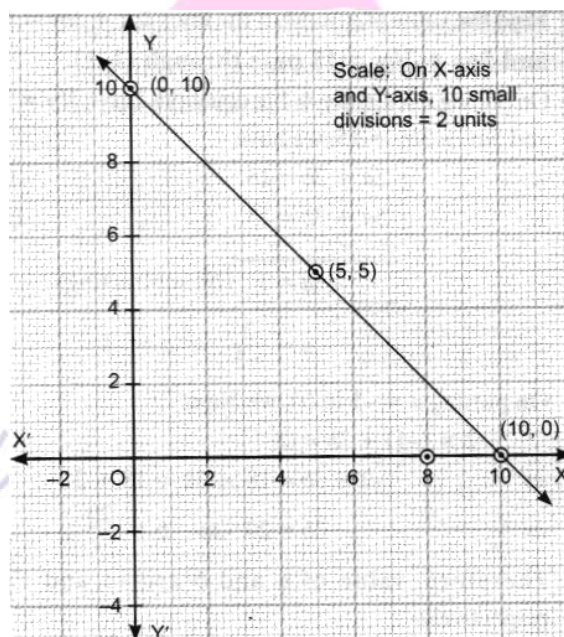
We notice, the graph cuts the x -axis at $(2, 0)$ and the y -axis at $(0, \frac{3}{2})$



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

Given the solutions are represented by the points having the sum of the coordinates as 10 units. Therefore the linear equation is $x + y = 10$.

x	0	10	5
y	10	0	5



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

$$5y = ax + 10$$

(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

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

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

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

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

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

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

$$\Rightarrow 12b + 0 = 24 \Rightarrow 12b = 24$$

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

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

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

$$\Rightarrow 0 + 2a = 24 \Rightarrow 2a = 24$$

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

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

Next Generation School

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

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

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

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

$$\begin{array}{r} - \\ - \\ - \end{array}$$

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

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

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

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

$$\Rightarrow -2 + 3b = 18 \Rightarrow 3b = 18 + 2$$

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

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

V Short Answer Questions

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

(i). $(3,4)$

(ii). $(1,2)$

(iii). $(2, -3)$

$$3y = ax + 7$$

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

$$3 \times 4 = ax + 7$$

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

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

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

$$3 \times 2 = ax + 7$$

$$\Rightarrow 6 = a + 7 \Rightarrow a = 6 - 7 \Rightarrow a = -1$$

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

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

$$\Rightarrow -9 = 2a + 7 \Rightarrow 2a = -9 - 7$$

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

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

$$y = 9x - 7$$

$$\text{or } 9x - y = 7 \dots\dots\dots(i)$$

On Putting $x = 1$ and $y = 2$ in (i) we have

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

$$\Rightarrow 7 = 7 \text{ true}$$

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

On Putting $x = -1$ and $y = -16$ in (i) we have

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

$$\Rightarrow 7 = 7 \text{ true}$$

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

On Putting $x = 0$ and $y = -7$ in (i) we have

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

$$\Rightarrow 7 = 7 \text{ true}$$

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

20. Find the equation of any two lines passing through the point (-1,2). How many such lines can be there?

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 $-5x + 3y = 11$

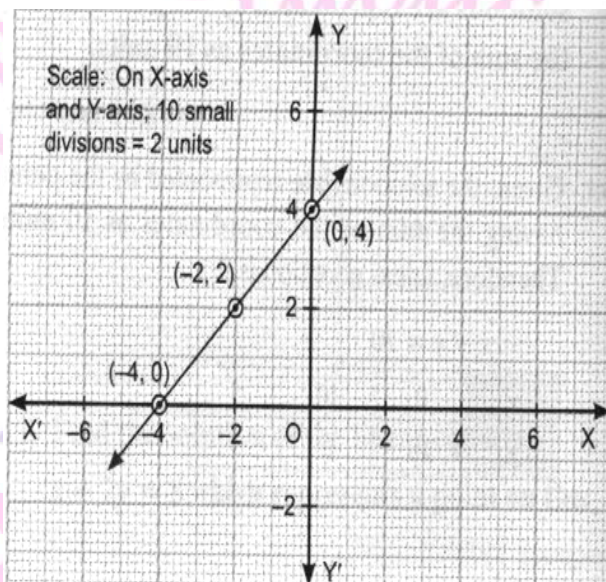
Hence, there can be infinite linear equation of which the point (-1,2) is a solution

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

$$x - y + 4 = 0$$

$$\Rightarrow y = x + 4$$

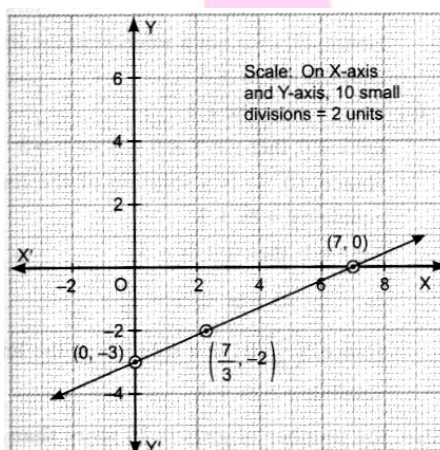
x	0	-4	-2
Y	4	0	2



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

$$3x - 7y = 21 \quad \dots(i)$$

x	0	7	$7/3$
Y	-3	0	-2



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

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

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

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

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

$$x - y = 3$$

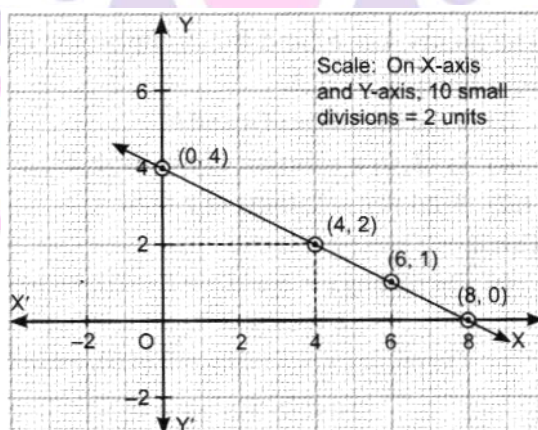
x	0	3	5
y	-3	0	2

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

24. 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.

$$x + 2y = 8$$

x	0	8	6
y	4	0	1



Given, $x = 2y$

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

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

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

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

Next Generation School

II Long answer Questions

25. Which of the following points

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

$$2(x + 1) + 3(y - 2) = 13.$$

$$\Rightarrow 2x + 2 + 3y - 6 = 13 \Rightarrow 2x + 3y = 13 + 4$$

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

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

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

$$\Rightarrow 0 + 17 = 17 \Rightarrow 17 = 17, \text{true}$$

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

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

$$2 \times 2 + 3 \times 6 = 17$$

$$\Rightarrow 4 + 18 = 17 \Rightarrow 22 = 17, \text{false}$$

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

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

$$\Rightarrow 2 + 15 = 17 \Rightarrow 17 = 17 \text{ true}$$

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

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

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

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

26. 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 $y = 8x + 3$.

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

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

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

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

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

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

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

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

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

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

(iii) $y = 8x + 3$

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

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27. 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.

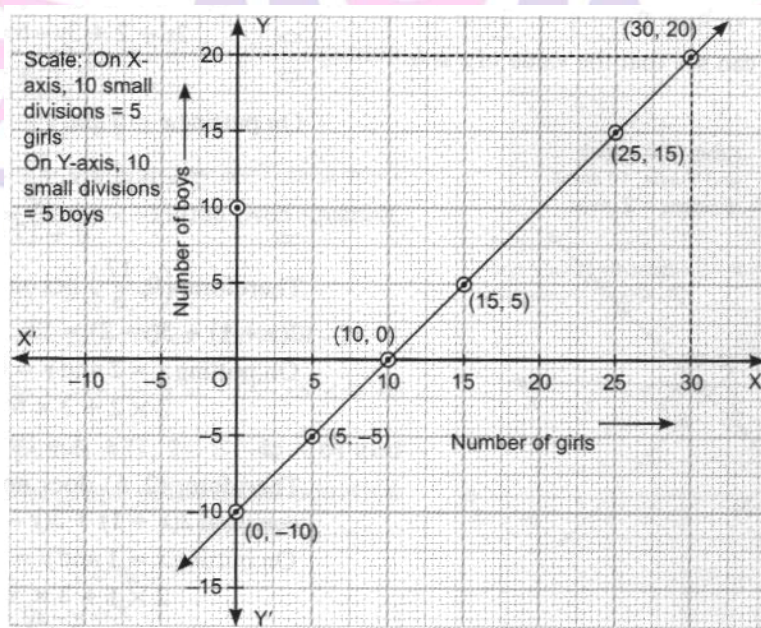
Given number of girls and boys are x and y respectively

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 number of girls is 30.



Next Generation School

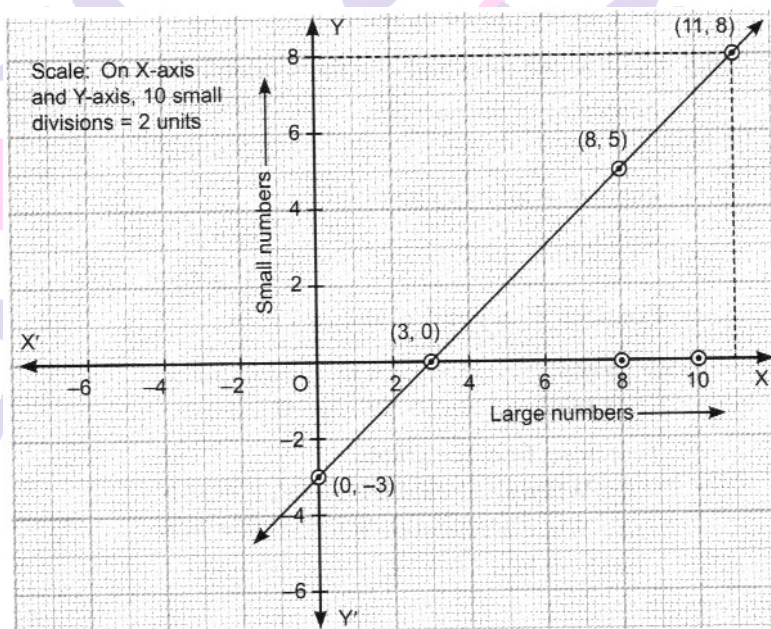
28. The difference between two numbers is 3. Write the given data in form of a linear equation in two variables. Also, represent it graphically, if smaller number is 8, then find graphically the value of the larger number.

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.



29. 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

The linear equation in two variables is of the form

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

Since, point $(6, -2)$ satisfy the linear equation,

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

Since point $(-6, 10)$ satisfy the linear equation

So $-6a - 10b = c$ (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

We get

$$30a - 10b = 5c \quad \text{.....(iv)}$$

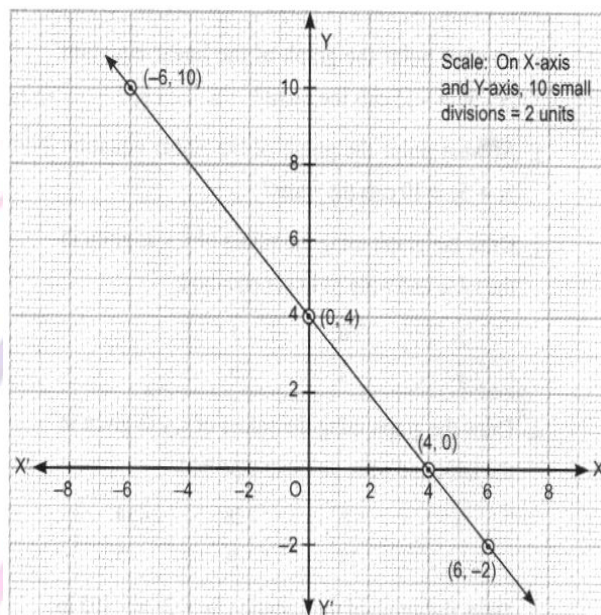
$$\begin{array}{r} -6a + 10b = c \quad \text{.....(iii)} \\ \hline \end{array}$$

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

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 $(0,4)$



30. 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 6kg. Read from the graph, the force required when the acceleration produced is (i) 5 m/sec^2 , (ii). 6 m/sec^2 ,

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, $m = 6$

$$\therefore F = 6a$$

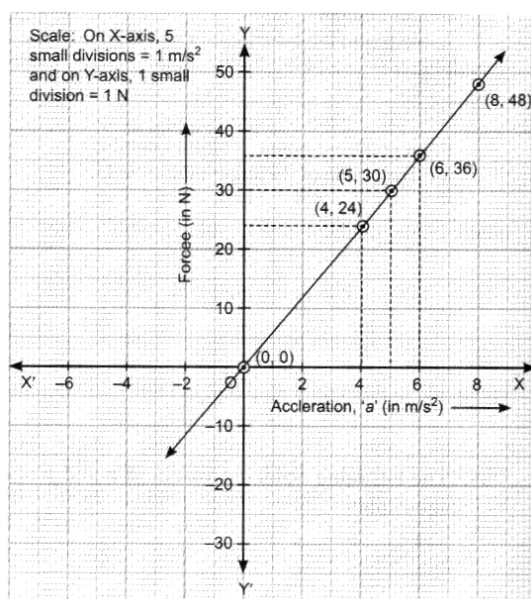
Consider ' F ' as y and ' a ' as x . $\Rightarrow y = 6x$

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

Therefore from the graph,

(i) When acceleration is 5 m/s^2 , $F = 30 \text{ N}$

(ii) When acceleration is 6 m/s^2 , $F = 36 \text{ N}$



V Short Answer Questions

1. The graph of $x = \pm a$ is a straight line parallel to the

- a) x -axis b) y -axis c) line $y = x$ d) line $x + y = 0$

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

$\therefore$ Correct option is (b)

2. Represent the following equations on the number line:

(i) $x = 5$

(ii) $y = 2$

(iii) $x = -3$

(iv) $y = 7$

(v) $y = -4$

(vi) $x - 5 = 2$

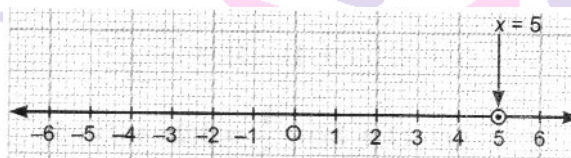
(vii) $y = 2y - 4$

(viii) $1 + x = 2(x+5)$

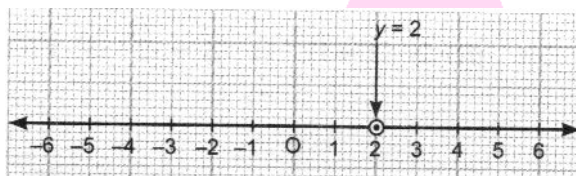
(ix) $2y - 1 = 11$

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

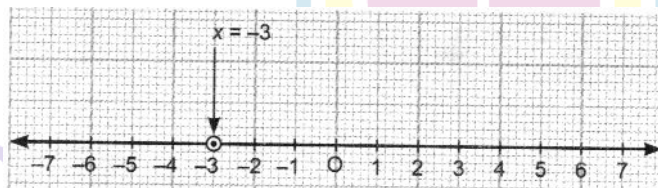
(i) $x = 5$



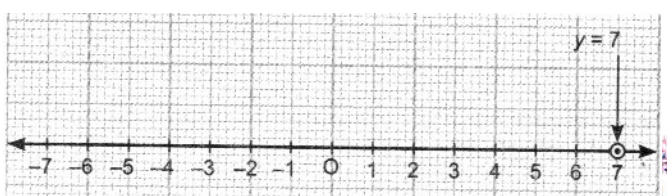
(ii) $y = 2$



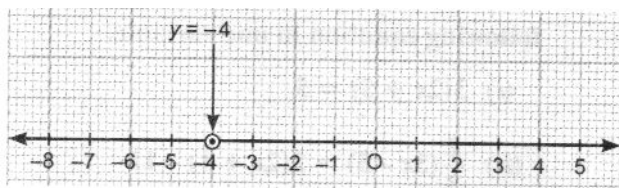
(iii) $x = -3$



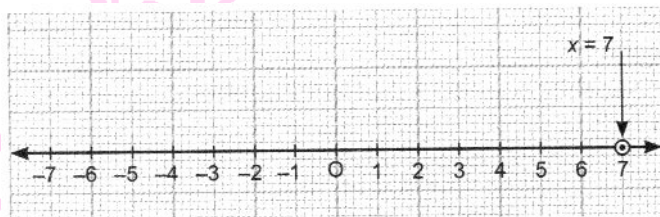
(iv) $y = 7$



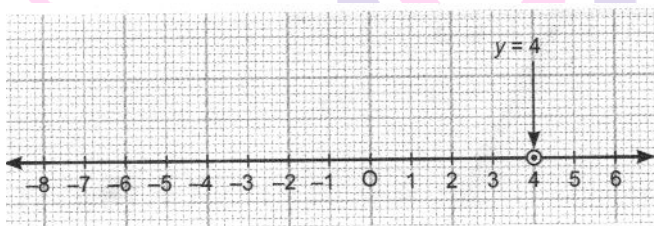
(v) $y = -4$



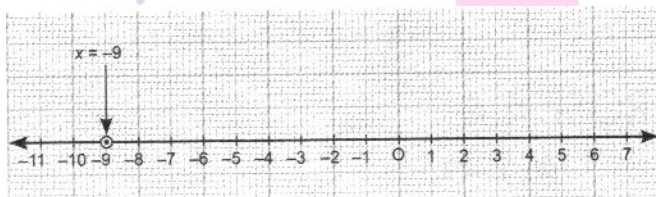
(vi) $x - 5 = 2 \Rightarrow x = 7$



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



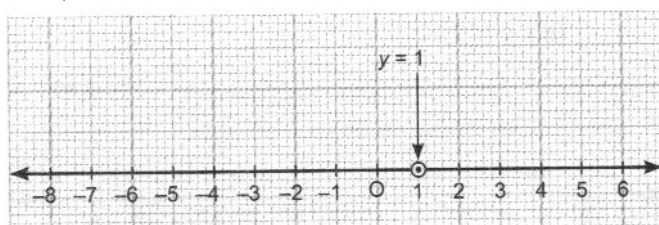
(viii) $1 + x = 2(x + 5) \Rightarrow 1 + x = 2x + 10 \Rightarrow x = -9$



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



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



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

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

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

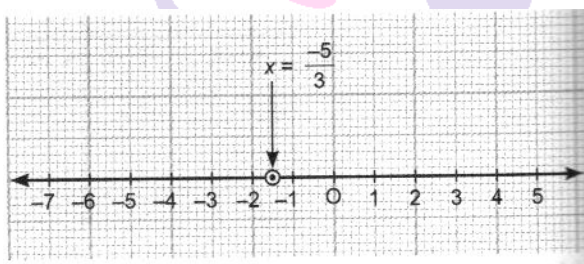
(i) $3(2x+5) = 5$

$\Rightarrow 6x + 15 = 5$

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

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

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



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

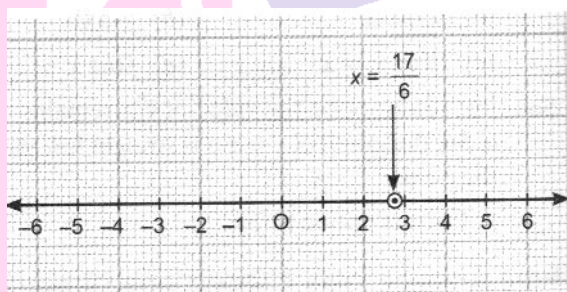
$\Rightarrow 2(3x - 5) = 3[2(2x + 1) - 11]$

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

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

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

$\Rightarrow 17 = 6x \Rightarrow x = \frac{17}{6}$



4. 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) $x+15 = 7$

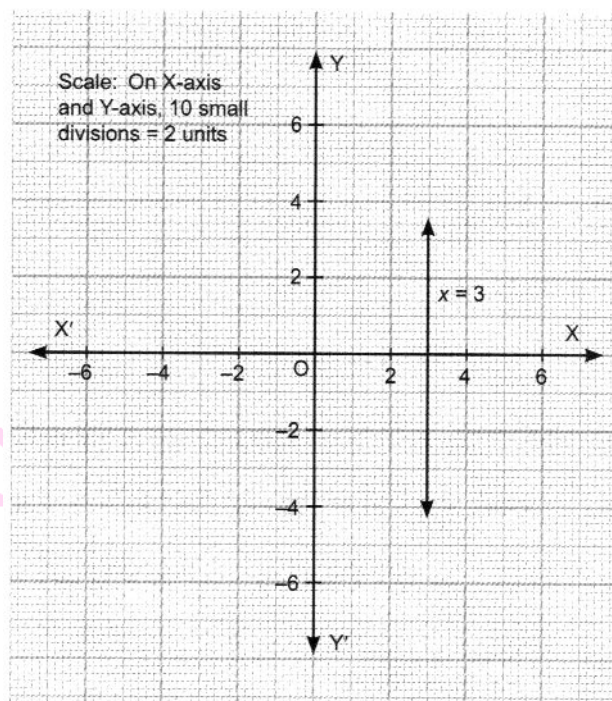
(vii) $y + 7 = -2$

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

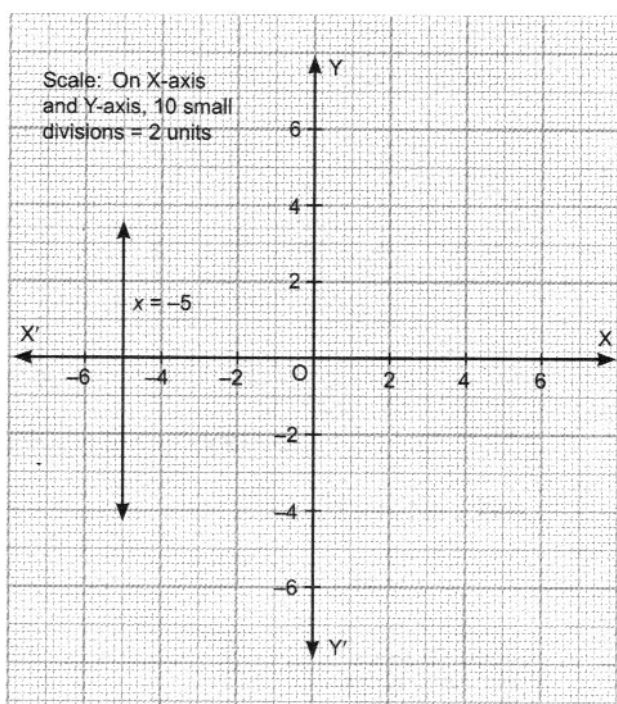
(ix) $2[(2x+1)-3] = \frac{(5-x)}{3}$

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

(i) $x = 3$

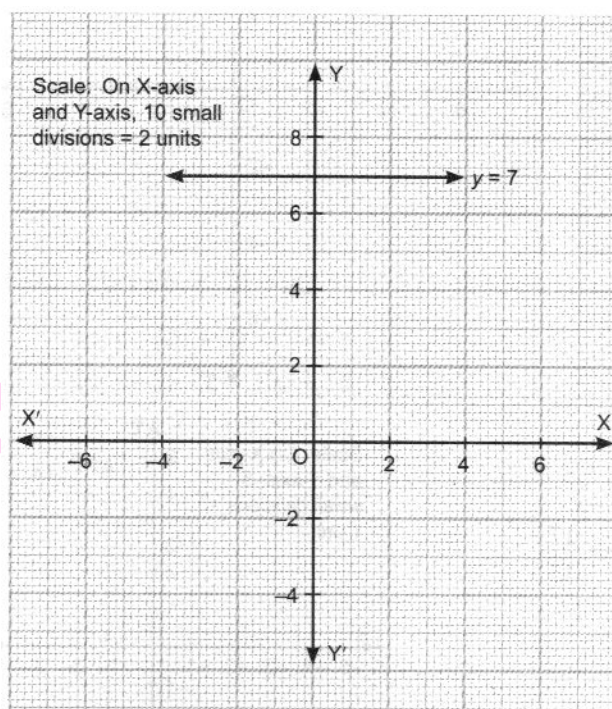


(ii) $x = -5$

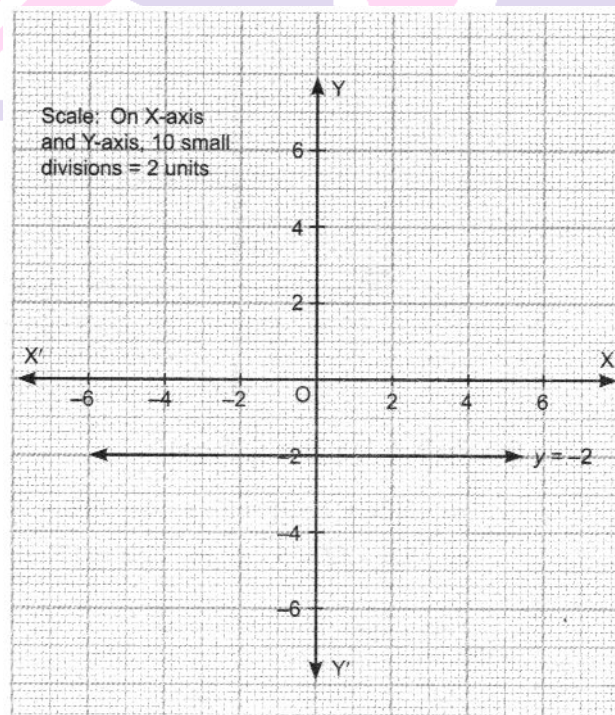


Next Generation School

(iii) $y = 7$

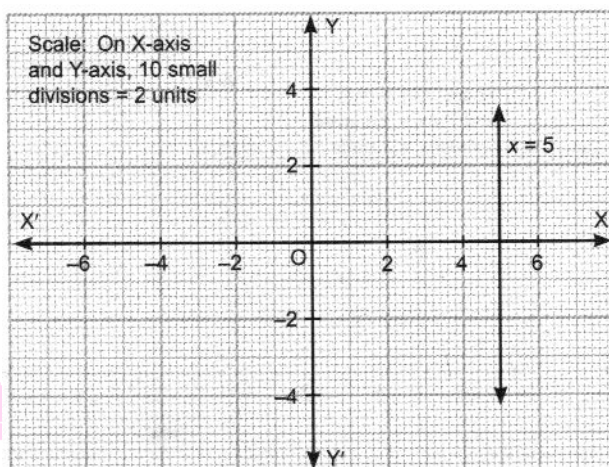


(iv) $y = -2$

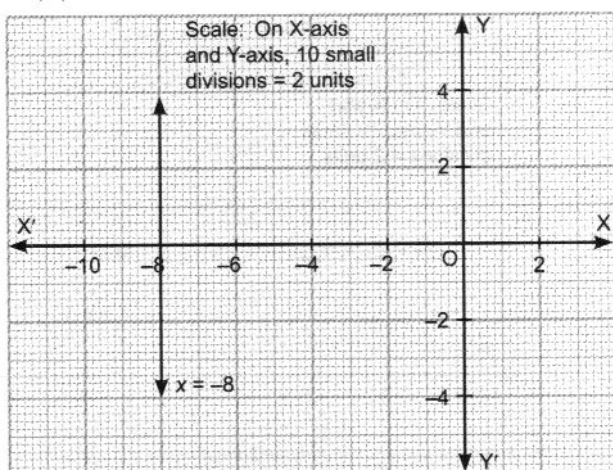


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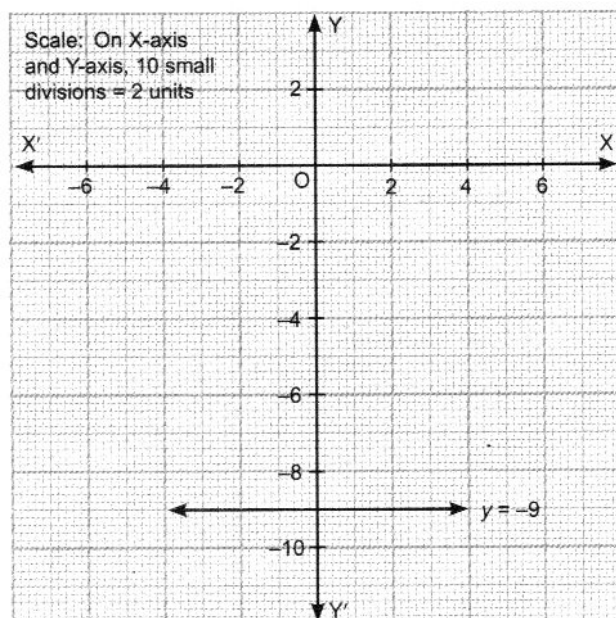
(v) $x + 5 = 10 \Rightarrow x = 5$



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

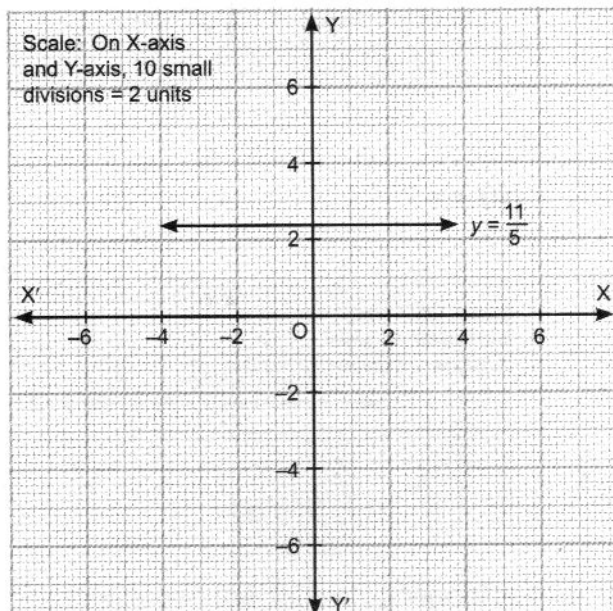


(vii) $y + 7 = -2 \Rightarrow y = -9$



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

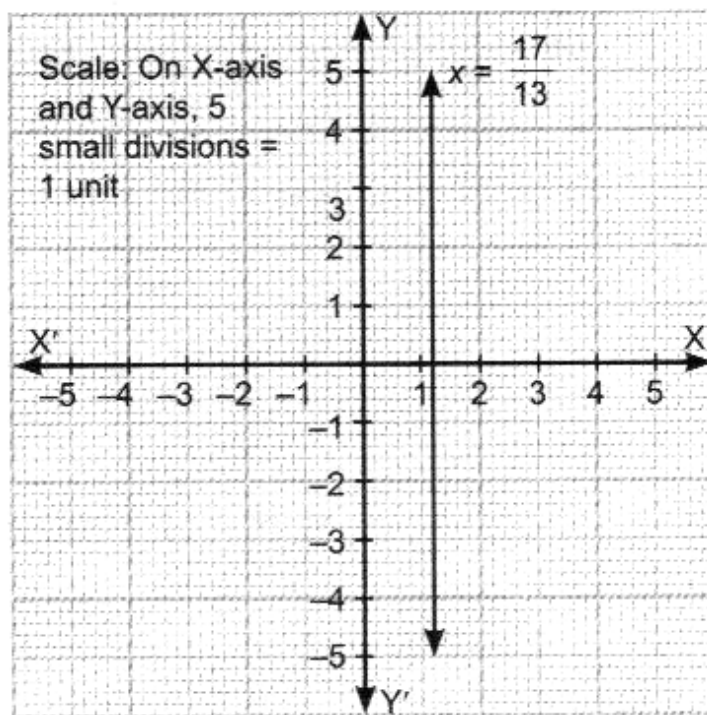
$$\Rightarrow 3y - 9 = 2 - 2y \Rightarrow 5y = 11 \Rightarrow y = \frac{11}{5}$$



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

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

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

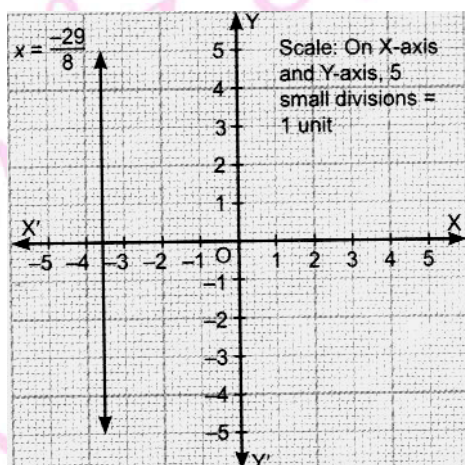


$$(x) (2+2x) - \frac{1}{2} = 3(2x + 7) - 5$$

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

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

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



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

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

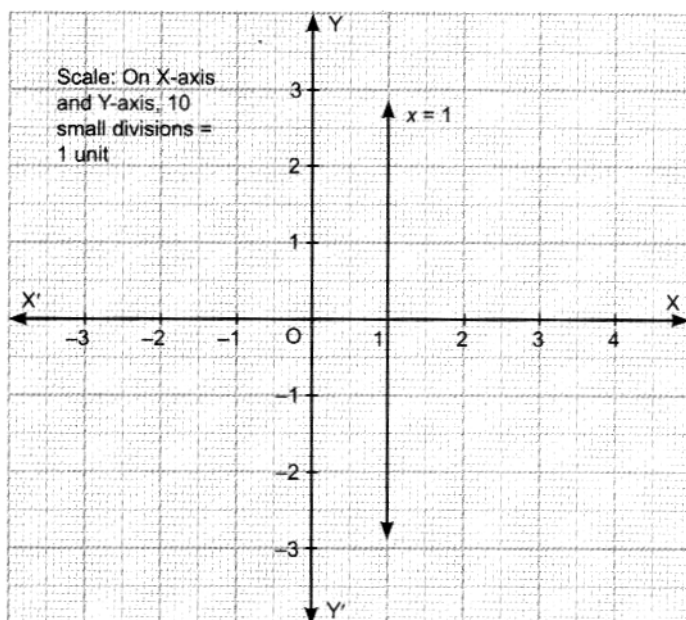
$$(ii) \frac{1}{2}[y - (2y + 2)] = 5[y + 1]$$

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

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

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

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



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

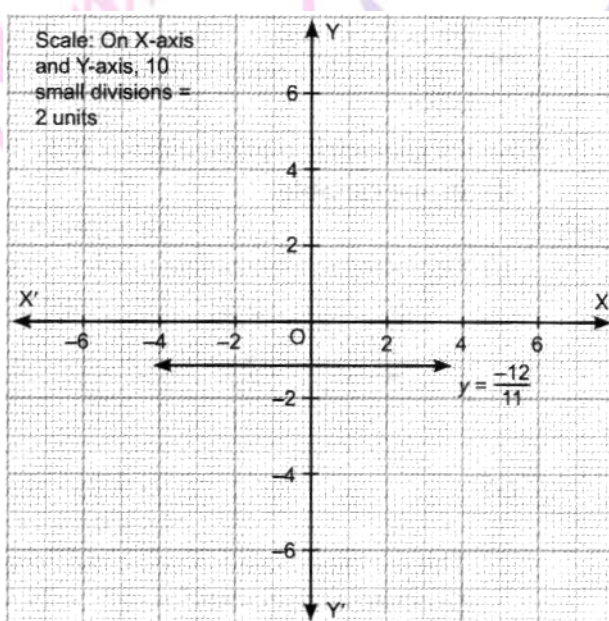
$$\Rightarrow y - (2y + 2) = 10(y + 1)$$

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

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

$$\Rightarrow 11y = -12$$

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



VII Short Answer Questions

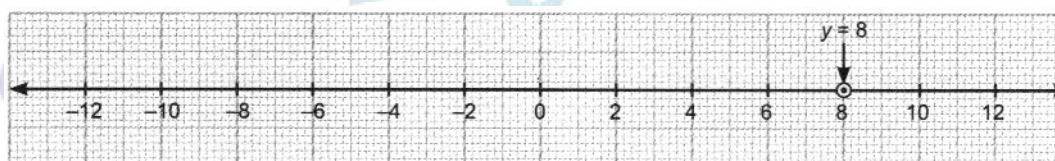
6. Give the geometric representations of $y = 8$ as an equation

(i) in one variable

(ii) in two variable

$$y = 8$$

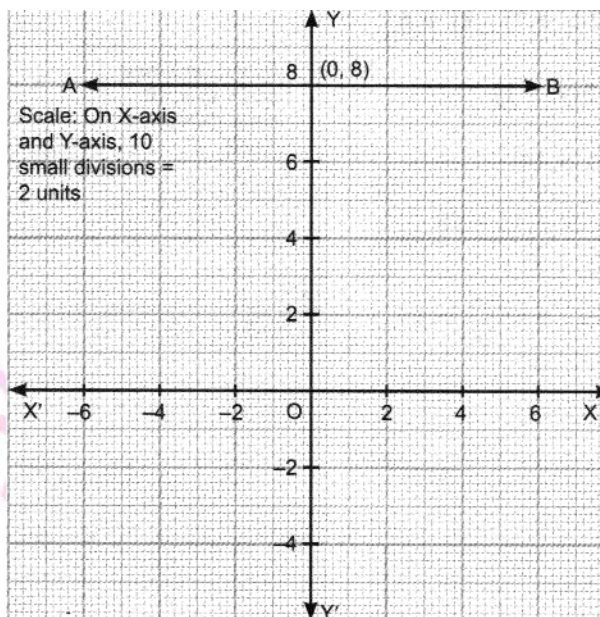
(i) Geometrical representation of $y = 8$ in one variable is given by the number line.



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

$$Y=8 \text{ or } 1 \cdot y + 0 \cdot x = 8 \text{ or } 0 \cdot x + 1 \cdot y = 8$$

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 every time. As a result of which, we get a line AB parallel to x -axis, separated by $y = 8$ everywhere from the x -axis.

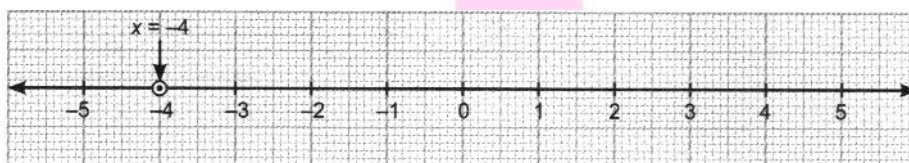
7. Give the geometric representations of $6x+24=0$ as an equation

(i) in one variable

(ii) in two variable

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

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

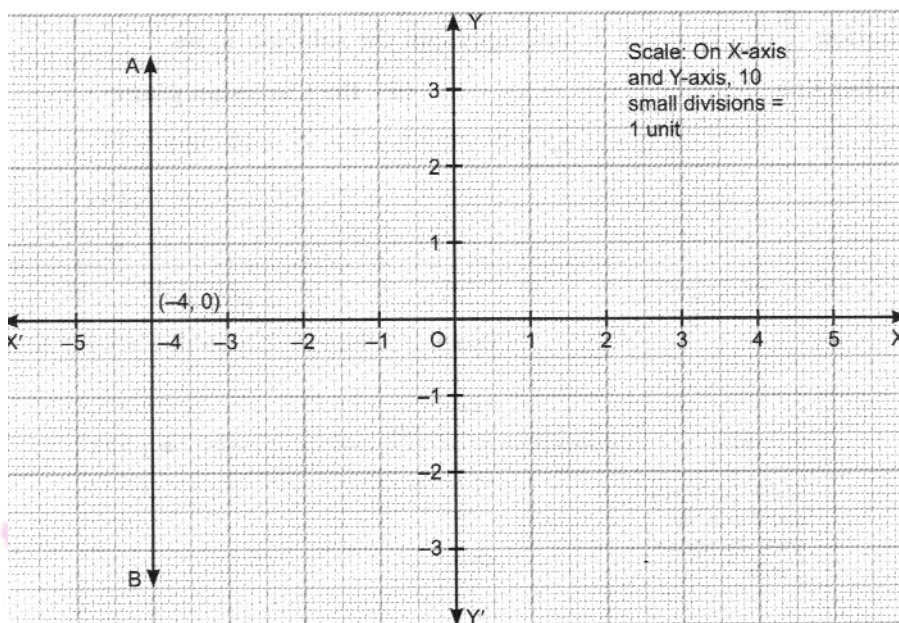


(ii) $6x+24=0 \Rightarrow 6x = -24 \Rightarrow x = -4$

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

This is a linear equation in two variable, 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 every time. As a result of which, we get a line AB parallel to y -axis, separated by $x = -4$ everywhere from y -axis.

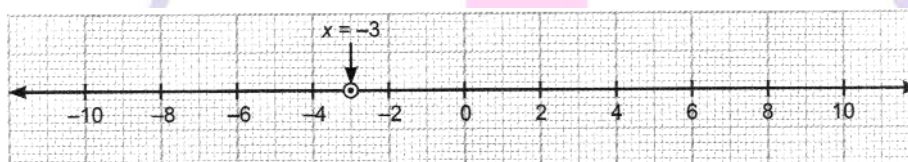
8. Solve the equation $2x+1=2\left(\frac{1}{2}x-1\right)$ and represent the solution(s) on

(i) the number line

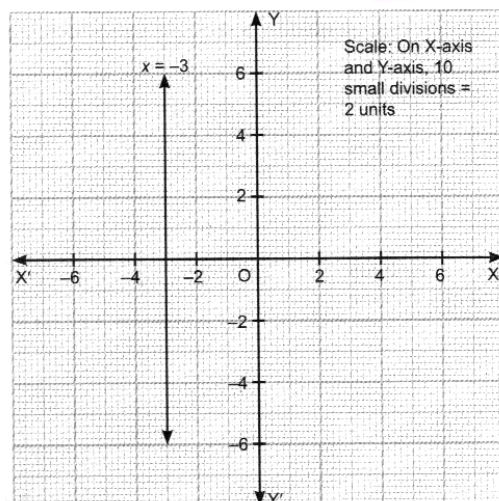
(ii) the Cartesian plane

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

$x=-3$



(ii)

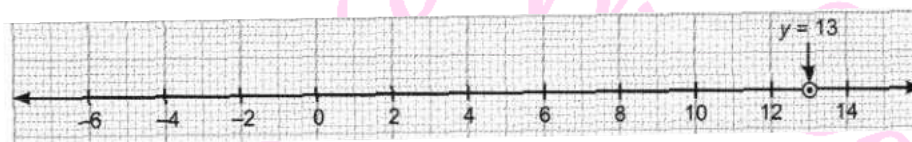


9. Solve the equation $\frac{3}{2}(y - 1) = y + 5$, and represent the solution(s) on

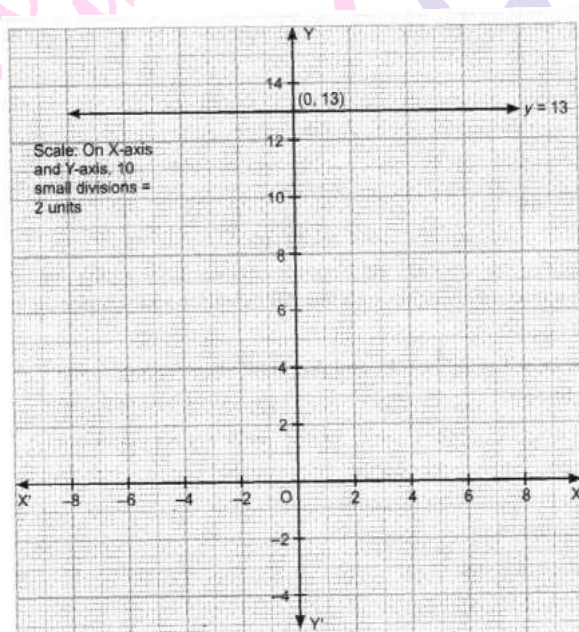
(i) the number line

(ii) the Cartesian plane

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



(ii)



10. Draw the graph of the equation represented by a straight line which is parallel to the x -axis and at a distance 3 unit below it.

Any straight line parallel to x -axis is given by

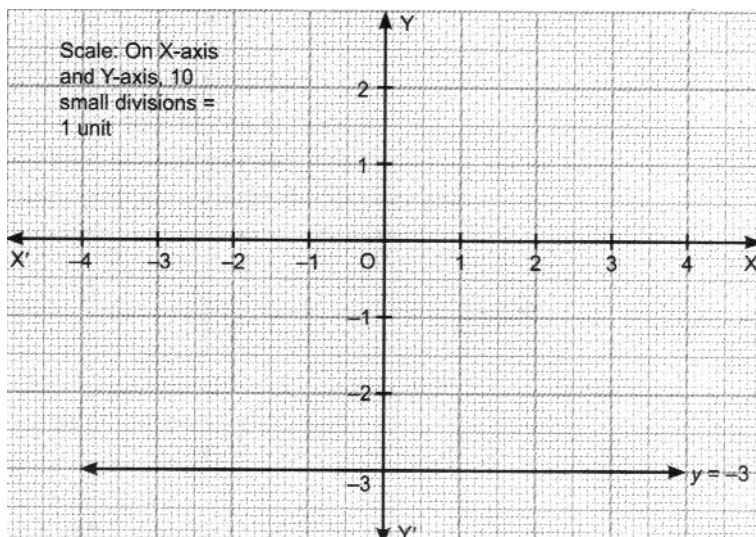
$$y = \pm a \text{ (i.e. } y = a \text{ or } y = -a)$$

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

Hence, $a = 3$ 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.



11. 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.

$$5x = 20$$

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

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

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

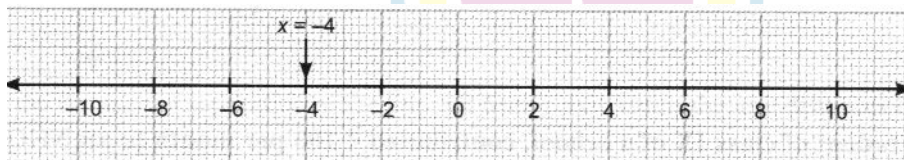
y -axis

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

(i) Number line

(ii) Cartesian plane

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

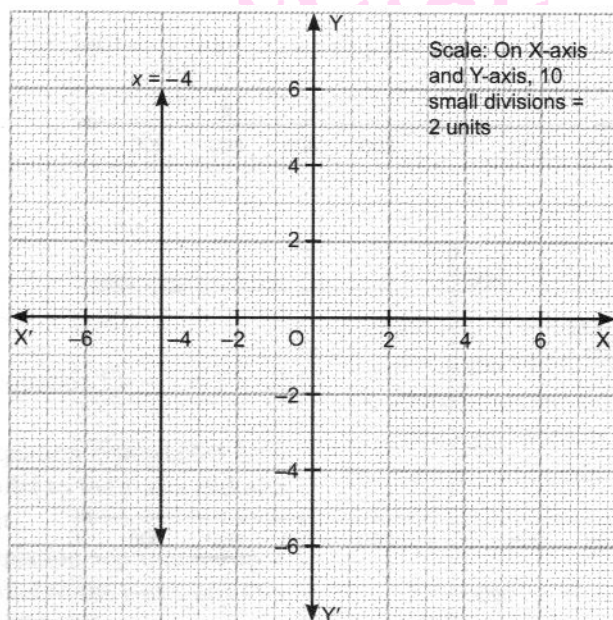


On the number line, $x = -4$ is the only solution of the equation $2x + 1 = x - 3$

(ii) $x = -4$

There are infinite solutions of the equation $2x+1=x-3$ on the Cartesian plane.

Points $(-4,1), (-4,2), (-4,3), (-4,4), \dots$ satisfy the given equation. Hence, there are infinite solutions.



III Long Answer Questions

13. 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 solutions(s) and also, determine the position of the point where graph cuts the y-axis

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

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

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

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

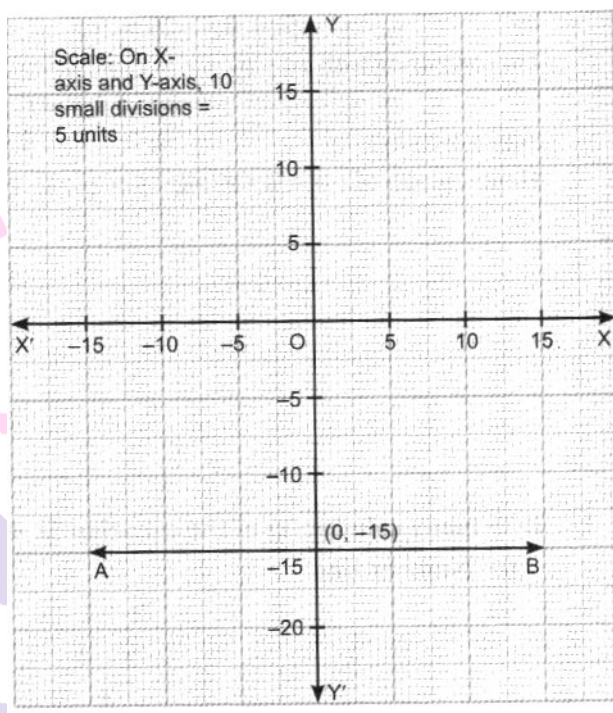
$$\Rightarrow 5[y+7] = 2[3y+25]$$

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

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

$$\Rightarrow y = -15$$

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)



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

Taking total contribution as Rs. Y for 6 months.

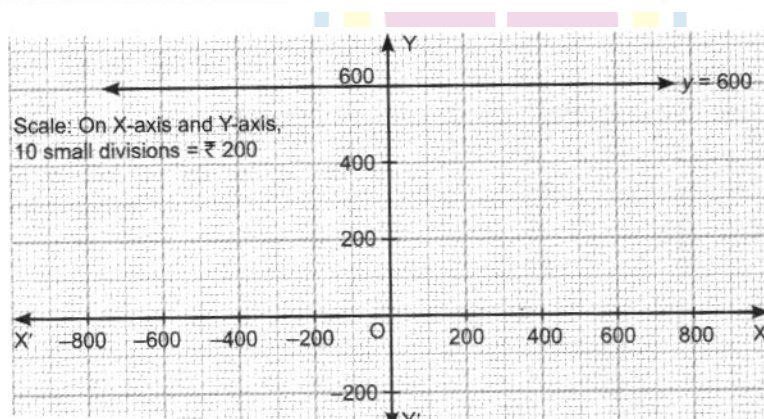
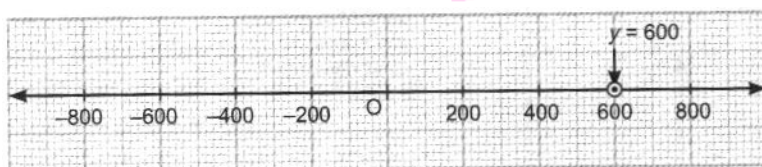
(i) Form a linear equation of the above information.

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

(i) According to question.

$$y = 6 \times 100 \Rightarrow y = 600$$

(ii)



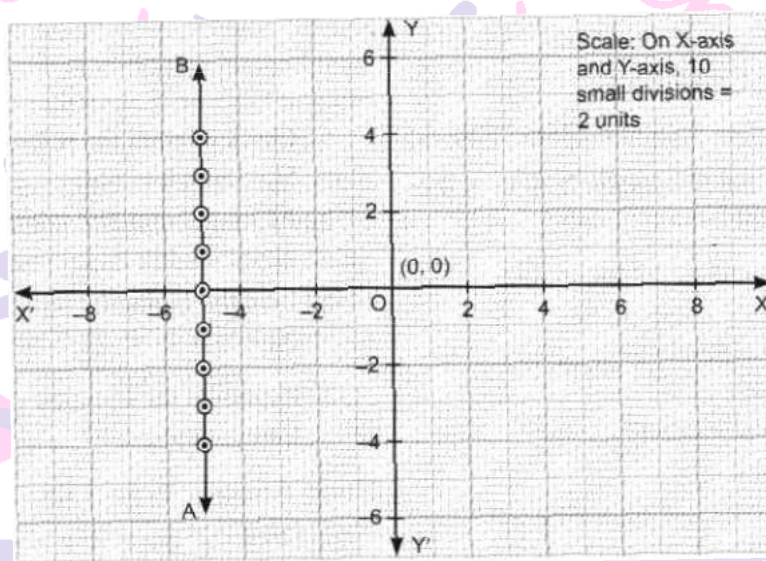
15. The following observed values of x and y are given by the table.

x	- 5	- 5	- 5	- 5	- 5	- 5	- 5	- 5	- 5
Y	0	- 1	- 2	- 3	- 4	1	2	3	4

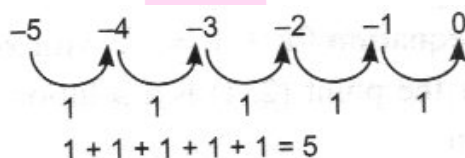
(i) Draw the graph of this information

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

(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 .



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



Next Generation School