Exercise 13.1

Page No: 13.3

Question 1: Express the following linear equations in the form ax + by + c = 0 and indicate the values of a, b and c in each case:

(i) -2x + 3y = 12 **(ii) x – y/2 – 5 = 0** **(iii) 2x + 3y = 9.35**
(iv) 3x = -7y **(v) 2x + 3 = 0** **(vi) y – 5 = 0**
(vii) 4 = 3x **(viii) y = x/2**

Solution:

(i) Given equation, -2x + 3y = 12

Or - 2x + 3y – 12 = 0

Comparing the given equation with ax + by + c = 0
We get, a = – 2; b = 3; c = -12

(ii) Given equation, x – y/2 – 5= 0

Comparing the given equation with ax + by + c = 0 ,

We get, a = 1; b = -1/2, c = -5

(iii) Given equation, 2x + 3y = 9.35

or 2x + 3y – 9.35 =0

Comparing the given equation with ax + by + c = 0

We get, a = 2 ; b = 3 ; c = -9.35

(iv) Given equation, 3x = -7y

or 3x + 7y = 0

Comparing the given equation with ax+ by + c = 0,

We get, a = 3 ; b = 7 ; c = 0

(v) Given equation, 2x + 3 = 0
or 2x + 0y + 3 = 0

Comparing the given equation with ax + by + c = 0,

We get, a = 2 ; b = 0 ; c = 3

(vi) Given equation, y – 5 = 0
or 0x + y – 5 = 0

Comparing the given equation with ax + by+ c = 0,

We get, a = 0; b = 1; c = -5

(vii) Given equation, 4 = 3x

or 3x + 0y – 4 = 0

Comparing the given equation with ax + by + c = 0,

We get, a = 3; b = 0; c = -4

(viii) Given equation, y = x/2

Or x - 2y = 0
Or x - 2y + 0 = 0

Comparing the given equation with ax + by + c = 0 ,

We get, a = 1; b = -2; c = 0

Question 2: Write each of the following as an equation in two variables:

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

Solution:

(i) Given equation, 2x = -3

The above equation can be written in two variables as,

2x + 0y + 3 = 0

(ii) Given equation, y = 3

The above equation can be written in two variables as,

0 x + y – 3 = 0

(iii) Given equation, 5x = 7/2
The above equation can be written in two variables as,

5x + 0y - 7/2 = 0

or 10x + 0y - 7 = 0

(iv) Given equation, y = 3/2 x
The above equation can be written in two variables as,
2y = 3x
3x – 2y = 0
3x – 2y + 0 = 0

Question 3: The cost of ball pen is Rs 5 less than half of the cost of fountain pen. Write this statement as a linear equation in two variables.

Solution:

Let the cost of a fountain pen be y and cost of a ball pen be x.

According to the given statement,
x = y/2 − 5

or 2x = y – 10

or 2x – y + 10 = 0

Which is required linear equation.

Exercise 13.2

Question 1: Write two solutions for each of the following equations:

(i) 3x + 4y = 7

(ii) x = 6y

(iii) x + πy = 4

(iv) 2/3x – y = 4.

Solution:
(i) 3x + 4y =7 ….(1)

Step 1: Isolate above equation in y.

Subtract 3x from both the sides,
3x + 4y – 3x = 7 – 3x

4y = 7 – 3x

Divide each side by 4

y = 1/4 x (7 – 3x) ….(2)

Step 2: Find Solutions

Substituting x = 1 in (2)

y = 1/4 x (7 – 3) = 1/4 x 4 = 1

Thus x = 1 and y = 1 is the solution of 3x + 4y = 7

Again, Substituting x = 2 in (2)

y = 1/4 x (7 – 3 x 2) = 1/4 x 1 = 1/4

Thus x = 2 and y = 1/4 is the solution of 3x + 4y = 7

Therefore, (1, 1) and (2, 1/4) are two solution of 3x + 4y = 7.

(ii) Given: x = 6y

Substituting x =0 in the given equation,

0 = 6y

or y = 0

Thus (0,0) is one solution

Again, substituting x=6

6 = 6y

or y = 1

Thus, (6, 1) is another solution.

Therefore, (0, 0) and (6, 1) are two solutions of x = 6y.

(iii) Given: $x + \pi y = 4$

Substituting x = 0 => $0 + \pi y = 4 \Rightarrow y = 4/\pi$

Substituting y = 0 => x + 0 = 4 => x = 4

Therefore, $(0, 4/\pi)$ and (4, 0) are two solutions of $x + \pi y = 4$.

(iv) Given: $2/3\ x - y = 4$

Substituting x = 0 => 0 – y = 4 => y = -4

Substituting x = 3 => $2/3 \times 3 - y = 4 \Rightarrow 2 - y = 4 \Rightarrow y = -2$

Therefore, (0, -4) and (3, -2) are two solutions of $2/3\ x - y = 4$.

Question 2: Write two solutions of the form x = 0, y = a and x = b, y = 0 for each of the following equations :
(i) 5x – 2y =10
(ii) -4x + 3y =12
(iii) 2x + 3y = 24

Solution:

(i) Given: 5x – 2y = 10

Substituting x = 0 => 5 × 0 – 2y = 10 => – 2y = 10 => – y = 10/2 => y = – 5

Thus x =0 and y = -5 is the solution of 5x-2y = 10

Substituting y = 0 => 5x - 2 x 0 = 10 => 5x = 10 => x = 2

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

(ii) Given, - 4x + 3y = 12

Substituting x = 0 => -4 × 0 + 3y = 12 => 3y = 12 => y = 4

Thus x = 0 and y = 4 is a solution of the -4x + 3y = 12

Substituting y = 0 => -4 x + 3 x 0 = 12 => – 4x = 12 => x = -3

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

(iii) Given, 2x + 3y = 24

Substituting x = 0 => 2 x 0 + 3y = 24 => 3y =24 => y = 8

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

Substituting y = 0 => 2x + 3 x 0 = 24 => 2x = 24 => x =12

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

Question 3: Check which of the following are solutions of the equation 2x - y = 6 and which are not:

(i) (3 , 0) **(ii) (0 , 6)** **(iii) (2 , -2)** **(iv) (√3, 0)** **(v) (1/2 , -5)**

Solution:

(i) Check for (3, 0)
Put x = 3 and y = 0 in equation 2x - y = 6
2(3) – (0) = 6
6 = 6
True statement.
=> (3,0) is a solution of 2x - y = 6.

(ii) Check for (0, 6)
Put x = 0 and y = 6 in 2x - y = 6
2 x 0 - 6 = 6
-6 = 6
False statement.

=> (0, 6) is not a solution of 2x - y = 6.

(iii) Check for (2, -2)
Put x = 0 and y = 6 in 2x - y = 6

2 x 2 - (-2) = 6

4 + 2 = 6
6 = 6
True statement.

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

(iv) Check for (√3, 0)
Put x = √3 and y = 0 in 2x - y = 6

2 x √3 – 0 = 6
2 √3 = 6
False statement.

=>(√3, 0) is not a solution of 2x - y = 6.

(v) Check for (1/2, -5)
Put x = 1/2 and y = -5 in 2x - y = 6

2 x (1/2) – (-5) = 6

1 + 5 = 6
6 = 6

True statement.

=> (1/2, -5) is a solution of 2x - y = 6.

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

Solution:
Given, 3 x + 4 y = k

(-1, 2) is the solution of 3x + 4y = k, so it satisfy the equation.

Substituting x = -1 and y = 2 in 3x + 4y = k, we get

3 (– 1) + 4(2) = k

- 3 + 8 = k

k = 5

The value of k is 5.

Question 5: Find the value of λ, if x = –λ and y = 5/2 is a solution of the equation x + 4y - 7 = 0

Solution:
Given, (-λ, 5/2) is a solution of equation 3x + 4y = k

Substituting x = – λ and y = 5/2 in x + 4y – 7 = 0, we get

– λ + 4 (5/2) – 7 =0

-λ + 10 – 7 = 0

λ = 3

Question 6: If x = 2 α + 1 and y = α -1 is a solution of the equation 2x – 3y + 5 = 0, find the value of α.

Solution:

Given, (2 α + 1, α – 1) is the solution of equation 2x – 3y + 5 = 0.

Substituting x = 2 α + 1 and y = α – 1 in 2x – 3y + 5 = 0, we get

2(2 α + 1) – 3(α – 1) + 5 = 0

4 α + 2 – 3 α + 3 + 5 = 0

α + 10 = 0

α = – 10

The value of α is -10.

Question 7: If x = 1 and y = 6 is a solution of the equation 8x – ay + a^2 = 0, find the values of a.

Solution:
Given, (1 , 6) is a solution of equation 8x - ay + a^2 = 0

Substituting x = 1 and y = 6 in 8x – ay + a^2 = 0, we get

8 x 1 – a x 6 + a^2 = 0

=> a^2 – 6a + 8 = 0 (quadratic equation)

Using quadratic factorization

a^2 – 4a – 2a + 8 = 0

a(a – 4) – 2 (a – 4) = 0

(a – 2) (a – 4)= 0

a = 2, 4

Values of a are 2 and 4.

Exercise 13.3

Page No: 13.23

Question 1: Draw the graph of each of the following linear equations in two variables:

(i) x + y = 4 **(ii) x - y = 2** **(iii) -x + y = 6**
(iv) y = 2x **(v) 3x + 5y = 15** **(vi) x/2 – y/3 = 2**
(vii) (x–2)/3 = y - 3 **(viii) 2y = -x +1**

Solution:

(i) Given : x + y = 4

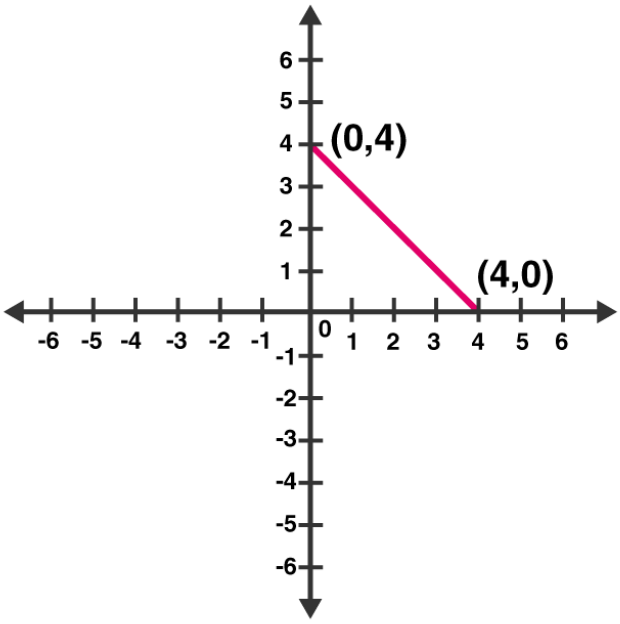
or y = 4 – x,

Find values of x and y:

Putting x = 0 => y = 4

Putting x = 4 => y = 0

Graph:
Mark points (0, 4) and (4, 0) on the graph and join them.



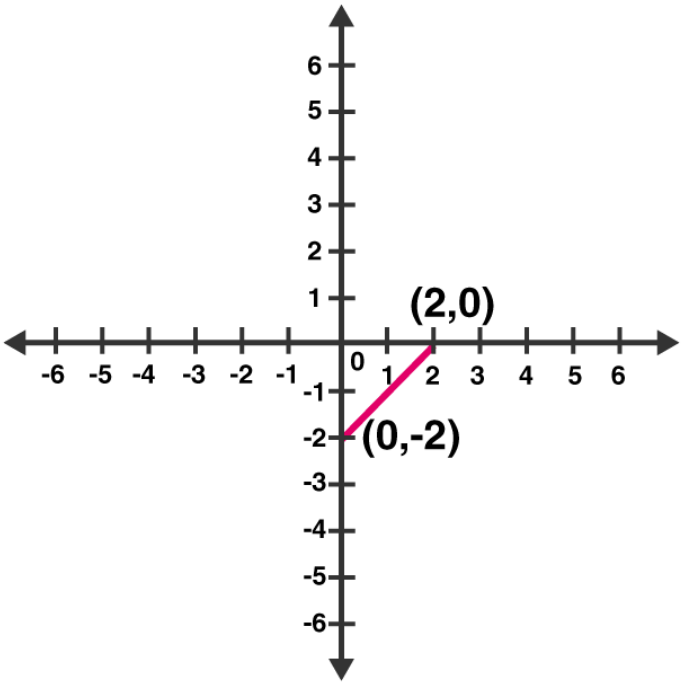
(ii) Given: x – y = 2

So, y = x - 2

Putting x = 0 => y = – 2

Putting x = 2 => y = 0

Graph:
Mark points (0, -2) and (2, 0) on the graph and join them.

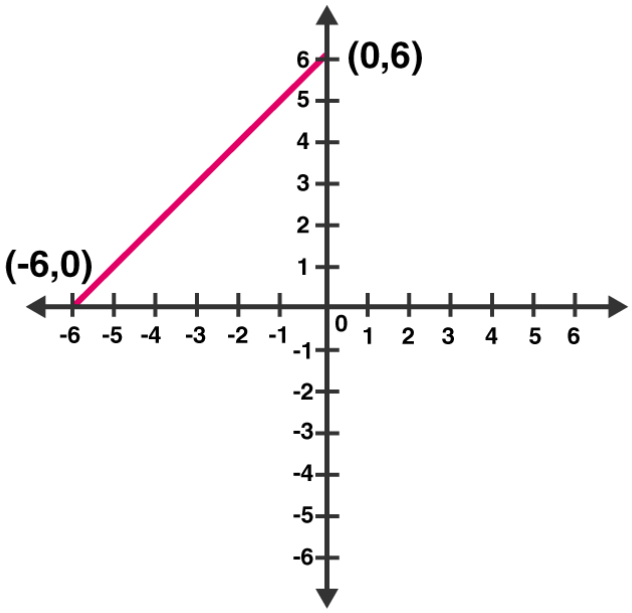


(iii) Given: – x + y = 6

So, y = 6 + x

Putting x = 0 => y =6

Putting x = -6 => y = 0
Graph:
Mark points (0, 6) and (-6, 0) on the graph and join them.

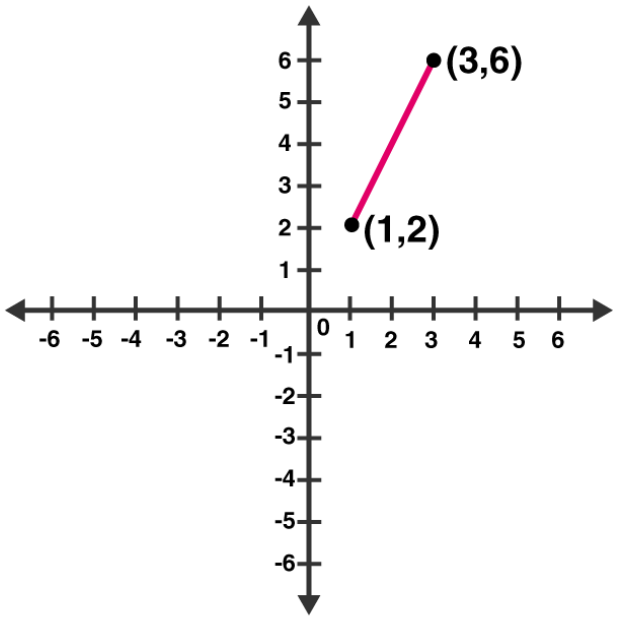


(iv) Given: y = 2x

Put x = 1 => y = 2

Put x = 3 => y = 6

Graph:
Mark points (1, 2) and (3, 6) on the graph and join them.



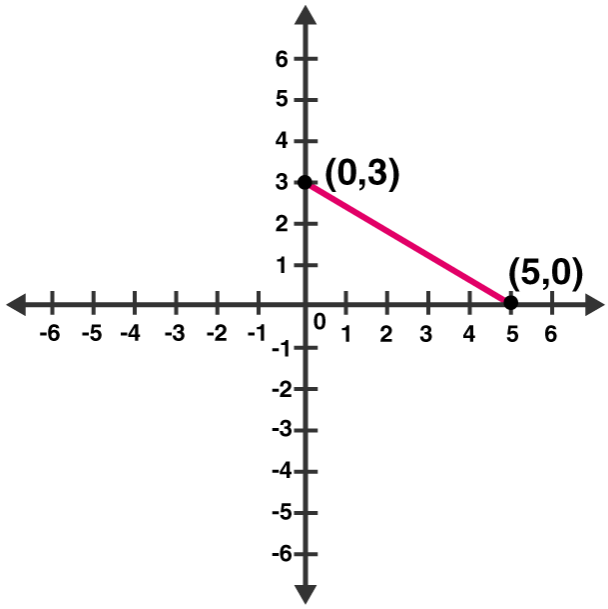
(v) Given: 3x + 5y = 15

Or 5y = 15 – 3x

Putting x = 0 => 5y = 15 => y =3

Putting x = 5 => 5y = 0 => y = 0

Graph:
Mark points (0, 3) and (5, 0) on the graph and join them.



(vi) Given: x/2 – y/3 = 2

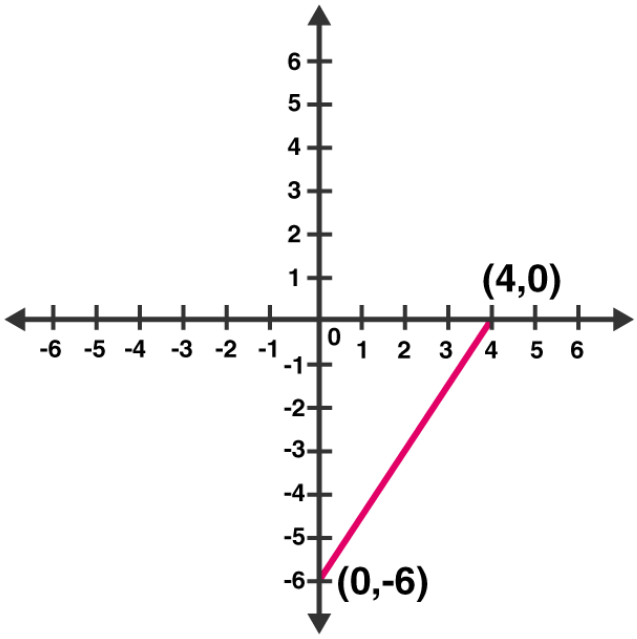
3x – 2y = 12

y = (3x–12)/2

Putting x = 0 => y = -6

Putting x = 4 => y = 0

Graph:
Mark points (0, -6) and (4, 0) on the graph and join them.



(vii) Given: (x −2)/3 = y − 3

x - 2 = 3(y - 3)

x – 2 = 3y – 9

x = 3y – 7

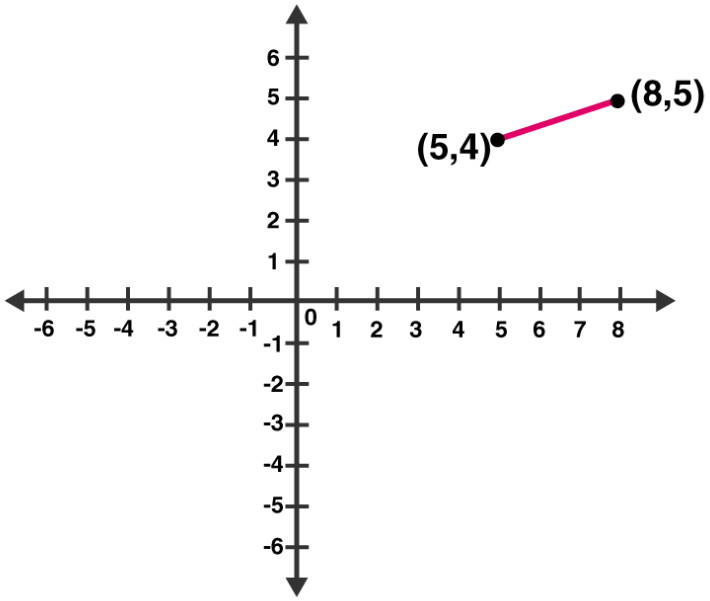
Now, put x = 5 in x = 3y – 7

y = 4

Putting x = 8 in x = 3y – 7,

y = 5

Graph:
Mark points (5, 4) and (8, 5) on the graph and join them.



(viii) Given: $2y = – x + 1$

$2y = 1 – x$

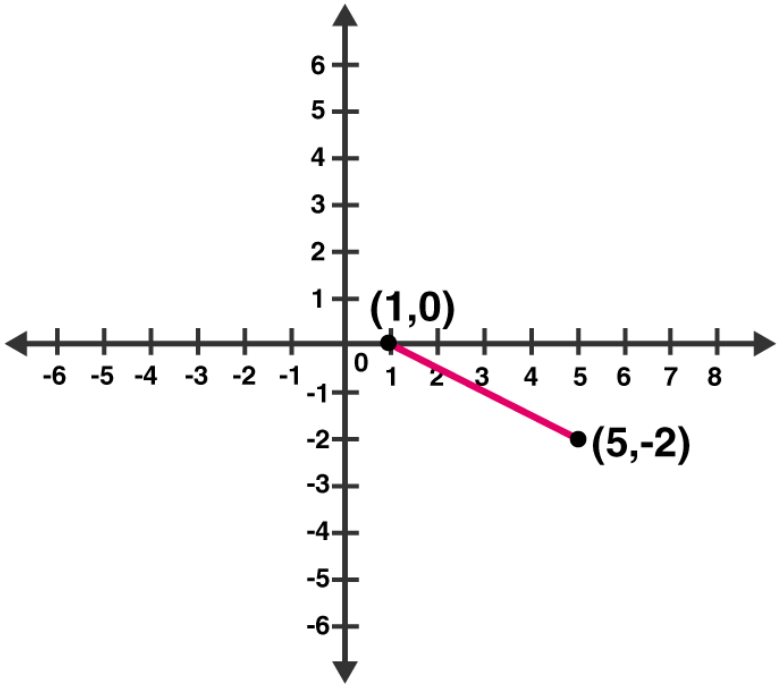
Now, putting $x = 1$ in $2y = 1 – x$, we get;

$y = 0$

Again, putting $x = 5$ in $2y = 1 – x$, we get;

$y = -2$

Graph:
Mark points (1, 0) and (5, -2) on the graph and join them.



Question 2: Give the equations of two lines passing through (3, 12). How many more such lines are there, and why?

Solution:

Since a = 3 and b = 12 is the solution of required equations. So we have to find the set of any two equations which satisfy this point.

Consider 4a – b = 0 and 3a – b + 3 = 0 set of lines which are passing through (3, 12).

We know, infinite lines can be pass through a point.

So, there are infinite lines passing through (3, 12).

Question 3: A three-wheeler scooter charges Rs 15 for first kilometer and Rs 8 each for every subsequent kilometer. For a distance of x km, an amount of Rs y is paid. Write the linear equation representing the above information.

Solution:

Let, total fare for covering the distance of 'x' km is given by Rs y

As per the given statement;

$y = 15 + 8(x – 1)$

$y = 15 + 8x – 8$

$y = 8x + 7$

Above equation represents the linear equation for the given information.

Question 4: A lending library has a fixed charge for the first three days and an additional charge for each day thereafter. Aarushi paid Rs 27 for a book kept for seven days. If fixed charges are Rs x and per day charges are Rs y. Write the linear equation representing the above information.

Solution:

Aarushi paid Rs 27, of which Rs. x for the first three days and Rs. y per day for 4 more days is given by

$x + (7 – 3) y = 27$

$x + 4y = 27$

Above equation represents the linear equation for the given information.

Question 5: A number is 27 more than the number obtained by reversing its digits. If its unit's and ten's digit are x and y respectively, write the linear equation representing the statement.

Solution:

Given: The original number is 27 more than the number obtained by reversing its digits

The given number is in the form of $10y + x$.
Number produced by reversing the digits of the number is $10x + y$.

As per statement:

$10y + x = 10x + y + 27$

$10y – y + x – 10x = 27$

$9y – 9x = 27$

9 (y – x) = 27

y – x = 3

x – y + 3 = 0

Above equation represents the required linear equation.

Question 6: The Sum of a two digit number and the number obtained by reversing the order of its digits is 121. If units and ten's digit of the number are x and y respectively, then write the linear equation representing the above statement.

Solution:

As per the statement given, the number is 10y + x.

On reversing the digits of the number, we get, 10x + y

Sum of the two numbers is 121. (Given)

10y + x + 10x + y = 121

11x + 11y = 121

x + y = 11

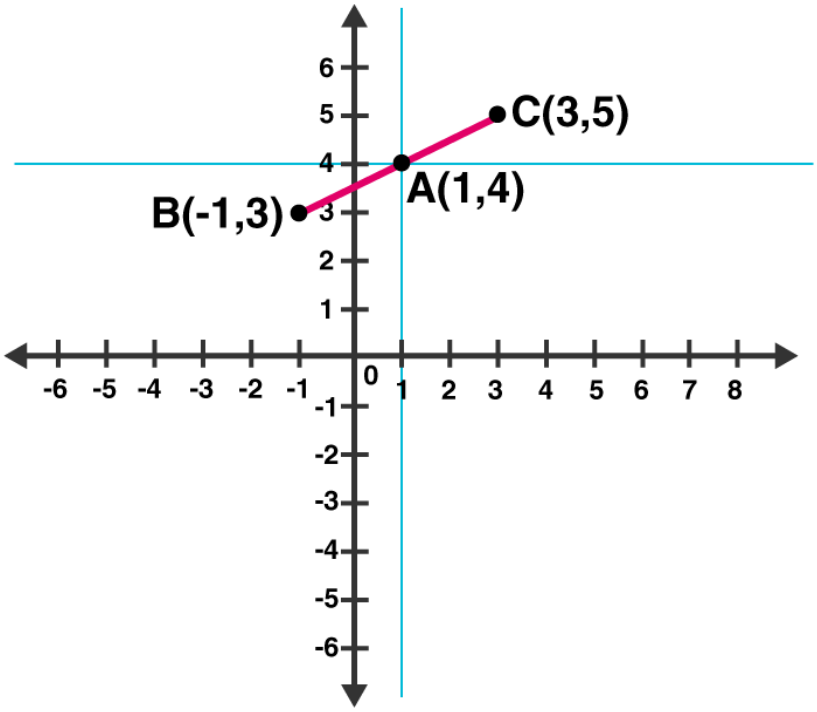
Which represents the required linear equation.

Question 7: Plot the Points (3, 5) and (-1, 3) on a graph paper and verify that the straight line passing through the points, also passes through the point (1, 4).

Solution:

Plot points (3, 5), (-1, 3) and (1, 4) on a graph.

Let A(1, 4), B(3, 5) and C(-1, 3)

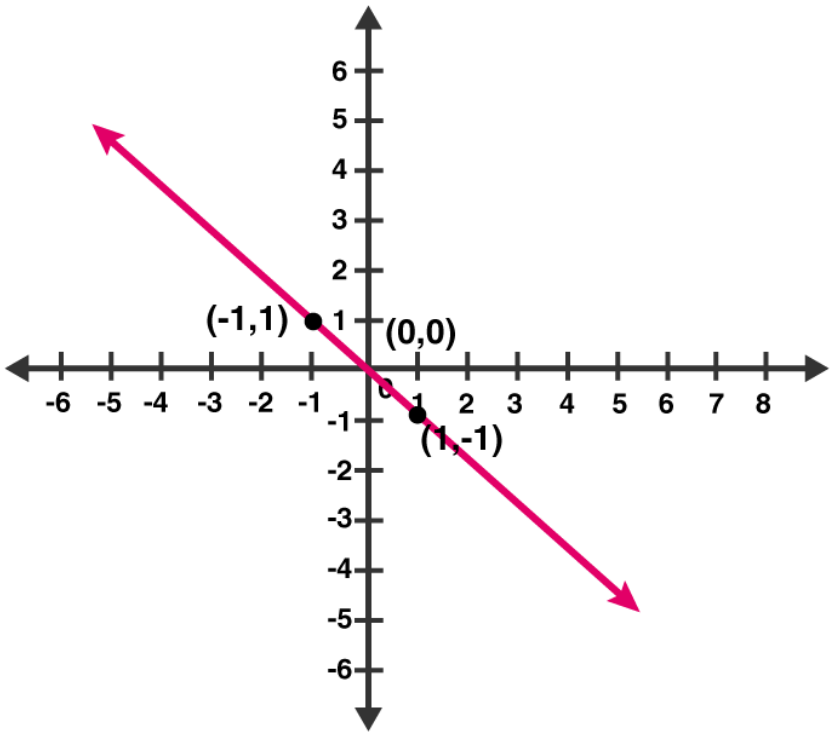


From above graph, we can see that, Point A (1, 4) is already plotted on the graph, and a point of intersection of two intersecting lines.

Hence, it is proved that the straight line passing through (3, 5) and (-1, 3) and also passes through A (1, 4).

Question 8: From the choices given below, choose the equations whose graph is given in figure.

(i) y = x (ii) x + y = 0 (iii) y = 2x (iv) 2 + 3y = 7x



Solution:

From graph, co-ordinates (1, -1) and (-1, 1) are solutions of one of the equations.

We will put the value of all the co-ordinates in each equation and check which equation satisfy them.

(i) y = x

Put x = 1 and y = -1 ,

Thus, 1 ≠ -1

L.H.S ≠ R.H.S

Putting x = -1 and y = 1 ,

-1 ≠ 1

L.H.S ≠ R.H.S

Therefore, y = x does not represent the graph in the given figure.

(ii) x + y = 0

Putting x = 1 and y = -1 ,

=> 1 + (-1) = 0

=> 0 = 0

L.H.S = R.H.S

Putting x = -1 and y = 1 ,

(-1) + 1 = 0

0 = 0

L.H.S = R.H.S

Thus, the given solutions satisfy this equation.

(iii) y = 2x
Putting x = 1 and y = -1
-1 = 2 (Not True)

Putting x = -1 and y = 1
1 = -2 (Not True)

Thus, the given solutions does not satisfy this equation.

(iv) 2 + 3y = 7x

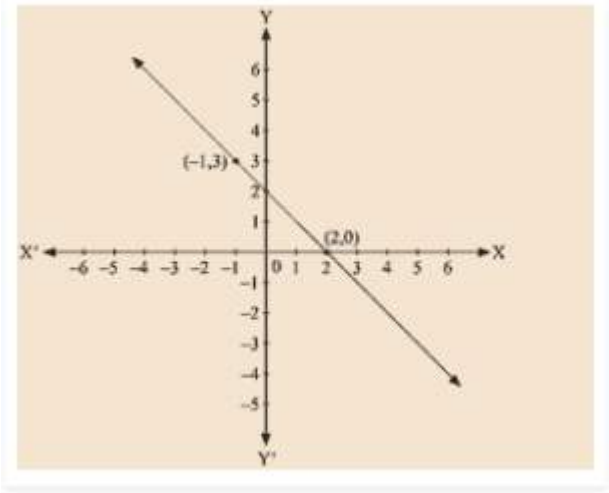
Putting x = 1 and y = -1
2 - 3 = 7
-1 = 7 (Not true)

Putting x = -1 and y = 1
2 + 3 = -7
5 = -7 (Not True)

Thus, the given solutions does not satisfy this equation.

Question 9: From the choices given below, choose the equation whose graph is given fig:

(i) y = x + 2 (ii) y = x – 2 (iii)y = – x + 2 (iv) x + 2y = 6



Solution:

Given: (-1, 3) and (2, 0) are the solution of one of the following given equations. Check which equation satisfy both the points.

(i) y = x + 2

Putting, x = -1 and y = 3

3 ≠ – 1 + 2

L.H.S ≠ R.H.S

Putting, x = 2 and y = 0

0 ≠ 4

L.H.S ≠ R.H.S

Thus, this solution does not satisfy the given equation.

(ii) y = x – 2

Putting, x = -1 and y = 3

3 ≠ – 1 – 2

L.H.S ≠ R.H.S

Putting, x = 2 and y = 0

0 = 0

L.H.S = R.H.S

Thus, the given solutions does not satisfy this equation completely.

(iii) y = – x + 2

Putting, x = – 1 and y = 3
3 = – (– 1) + 2
L.H.S = R.H.S
Putting x = 2 and y = 0
0 = -2 + 2
0 = 0
L.H.S = R.H.S
Therefore, (0, 2) and (-1,3) satisfy this equation.

Hence, this is the graph for equation y = -x + 2 .

(iv) x + 2y = 6
Putting, x = -1 and y = 3
-1 + 2(3) = 6
-1 + 6 = 6
5 ≠ 6
L.H.S ≠ R.H.S
Putting x = 2 and y = 0
2 + 2(0) = 6
2 ≠ 6
L.H.S ≠ R.H.S
Thus, this solution does not satisfy the given equation.

Question 10 : If the point (2, -2) lies on the graph of linear equation, 5x + ky = 4, find the value of k.

Solution:

Point (2,-2) lies on the given linear equation, which implies (2, -2) satisfy this equation 5x + ky = 4.

Now, putting x = 2 and y = -2 in 5x + ky = 4

5 × 2 + (-2) k = 4
10 – 2k = 4
2k = 10 – 4
2k = 6
k = 6/2 = 3

The value of k is 3.

Exercise 13.4

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Question 1: Give the geometric representations of the following equations

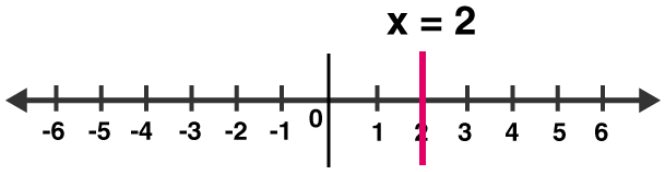
(a) on the number line (b) on the Cartesian plane:

(i) x = 2 (ii) y + 3 = 0 (iii) y = 3 (iv) 2x + 9 = 0 (v) 3x – 5 = 0

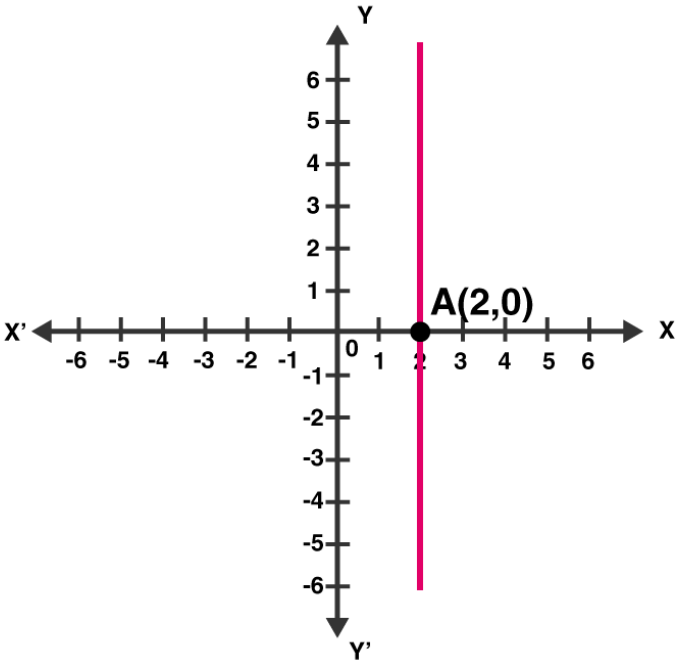
Solution:

(i) x = 2

The representation of equation on the number line:



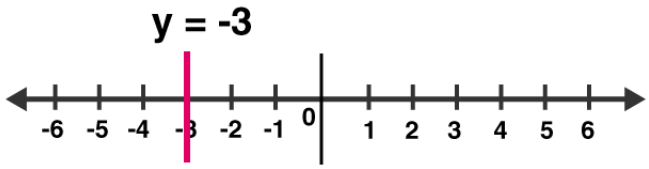
The representation of equation on the Cartesian plane:



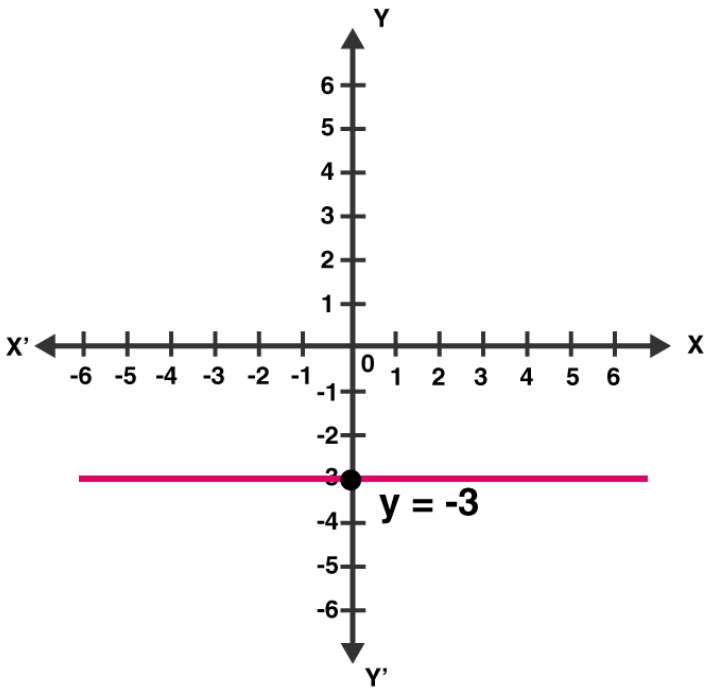
(ii) y + 3 = 0

or y = -3

The representation of equation on the number line:

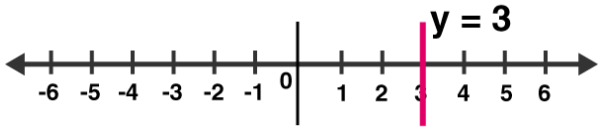


The representation of equation on the Cartesian plane:

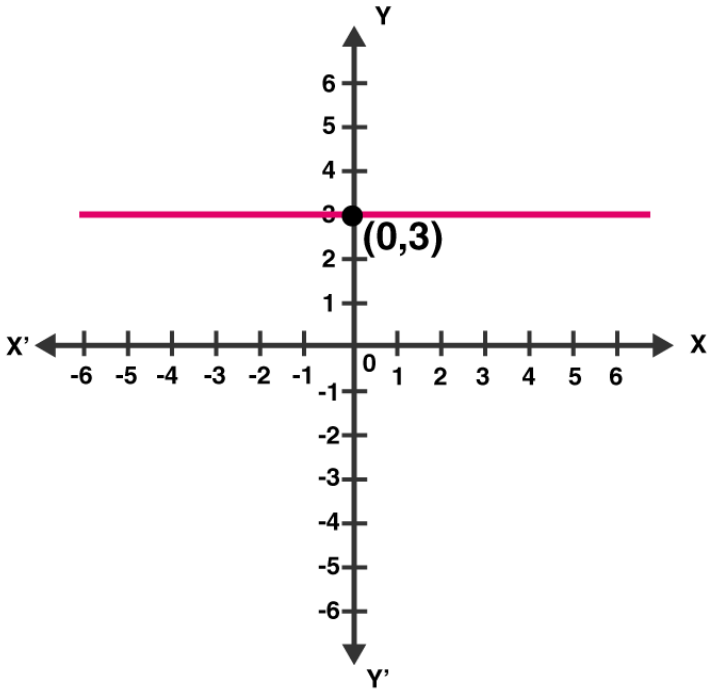


(iii) y = 3

The representation of equation on the number line:



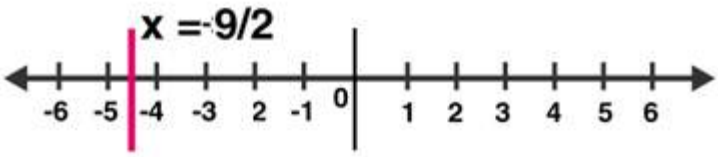
The representation of equation on the Cartesian plane:



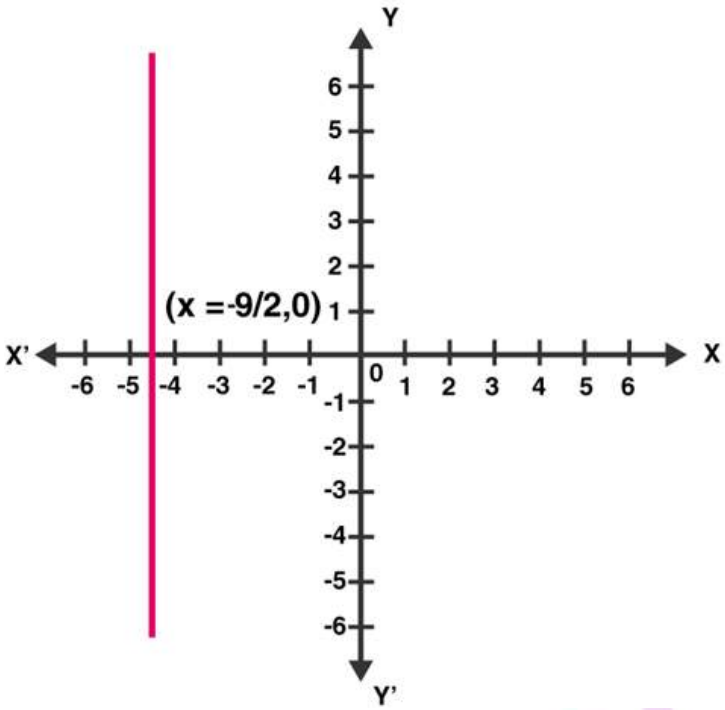
(iv) 2x + 9 = 0

or x = -9/2

The representation of equation on the number line:



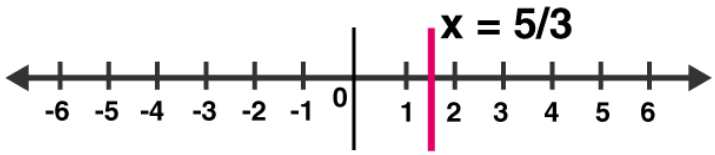
The representation of equation on the Cartesian plane:



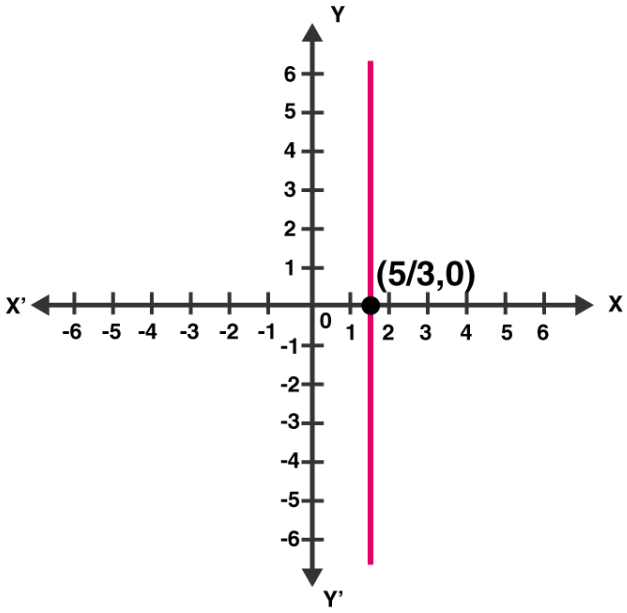
(v) 3x - 5 = 0

or x = 5/3

The representation of equation on the number line:



The representation of equation on the Cartesian plane:



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

(i) one variable (ii) two variables

Solution:
2x + 13 = 0

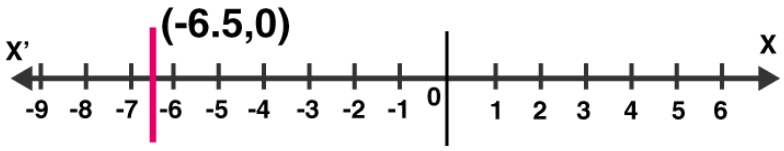
(i) Isolate given equation in x

Subtract 13 from both the sides
2x + 13 – 13 = 0 – 13

2x = -13
Divide each side by 2

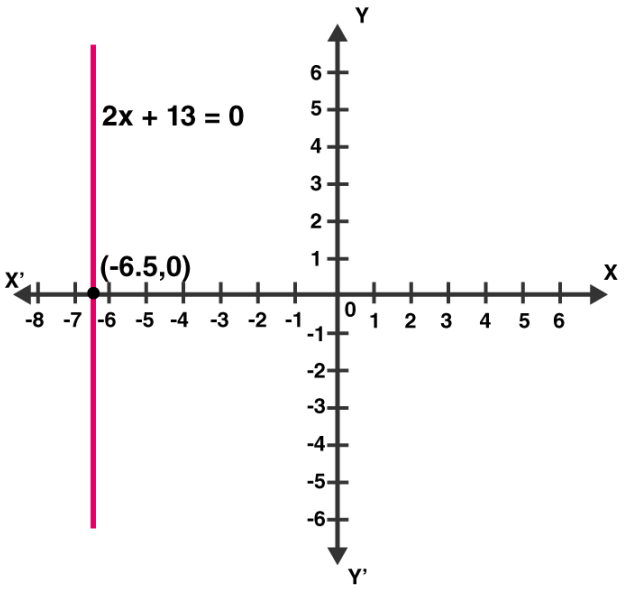
x = -13/2 = -6.5

Which is an equation in one variable.



(ii) 2x + 13 = 0 can be written as 2x + 0y + 13 = 0

The representation of the solution on the Cartesian plane: A line parallel to y axis passing through the point (-13/2 , 0):



Exercise VSAQs

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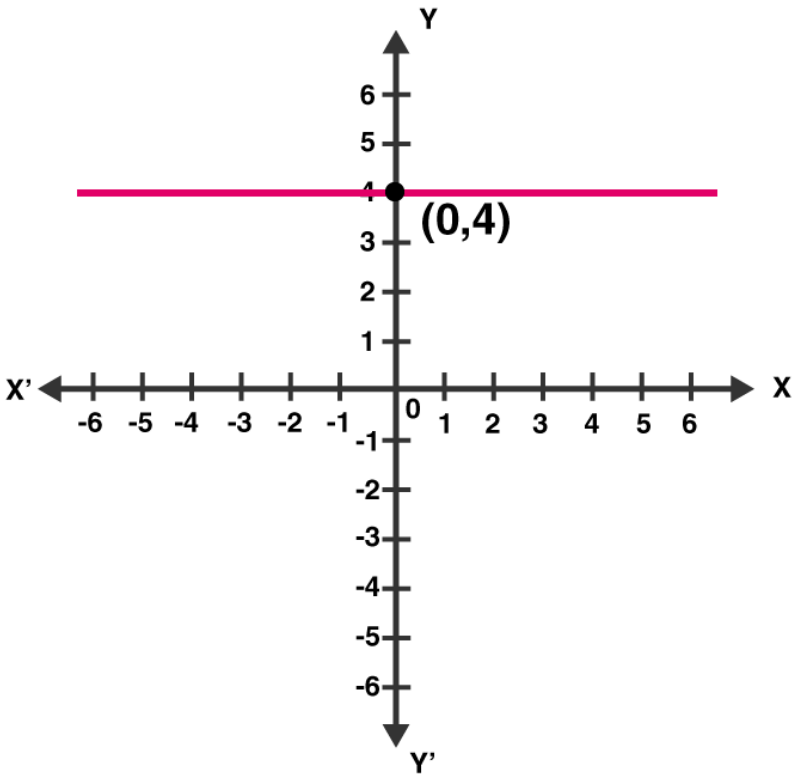
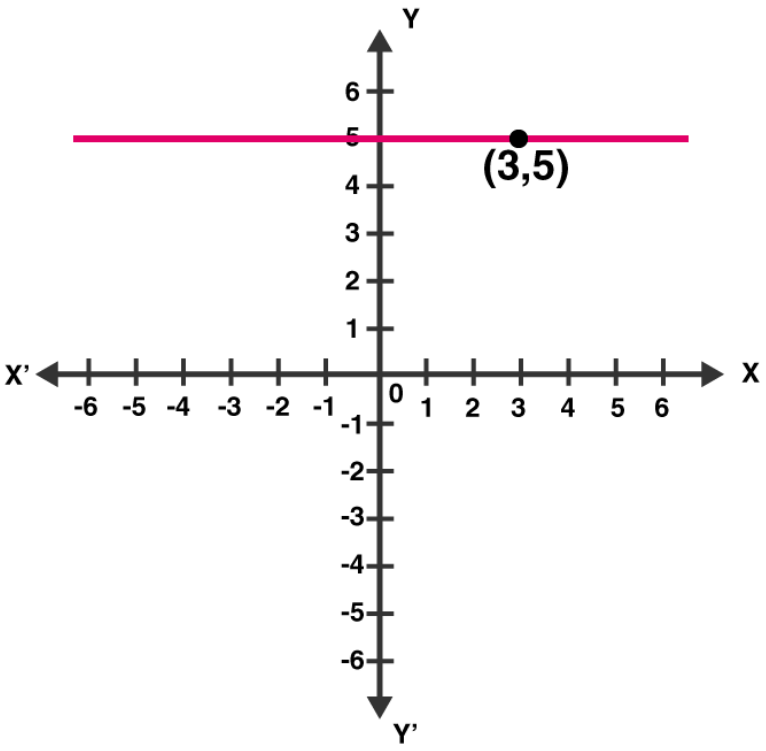
Question 1: Write the equation representing x-axis.
Solution: y = 0

Question 2: Write the equation representing y-axis.
Solution: x = 0

Question 3: Write the equation of a line passing through the point (0, 4) and parallel to x-axis.
Solution: Here, x-coordinate is zero and y-coordinate is 4, so equation of line passing through the point (0, 4) is **y = 4**.



Question 4: Write the equation of a line passing through the point (3, 5) and parallel to x-axis.
Solution: Here x-coordinate = 3 and y-coordinate = 5
Since required line is parallel to x-axis, so equation of line is **y = 5**.



Question 5: Write the equation of a line parallel to y-axis and passing through the point (-3, -7)

Solution:

Here x-coordinate = -3 and y-coordinate = -7

Since required line is parallel to y-axis, so equation of line is **x = -3**.