CBSE Class 9 Mathematics

NCERT Solutions

CHAPTER 4

Linear Equations in Two Variables(Ex. 4.3)

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

(i) $x+y=4$

(ii) $x-y=2$

(iii) $y=3x$

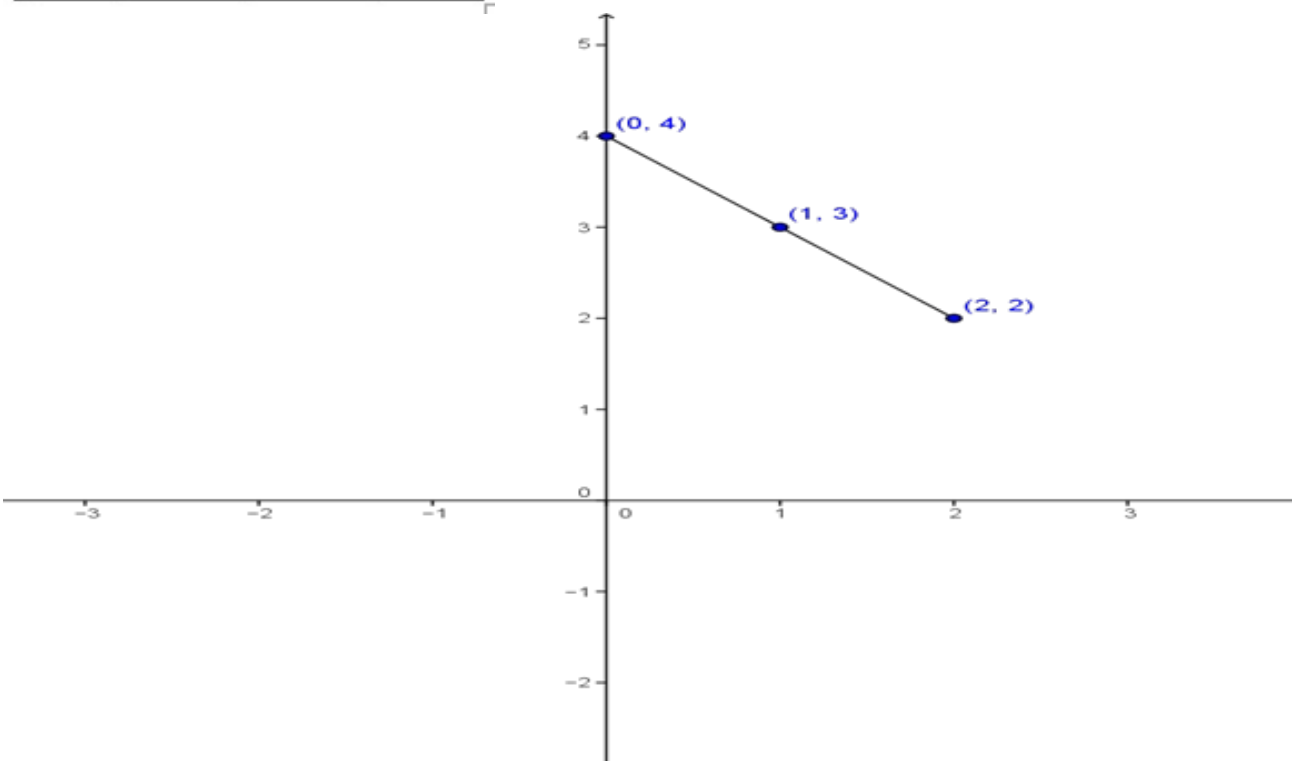
(iv) $3=2x+y$

(i) $x+y=4$

Ans. We can conclude that $x=0, y=4; x=1, y=3$ and $x=2, y=2$ are the solutions of the linear equation $x+y=4$.

We can optionally consider the given below table for plotting the linear equation $x+y=4$ on the graph.

X	0	1	2
y	4	3	2

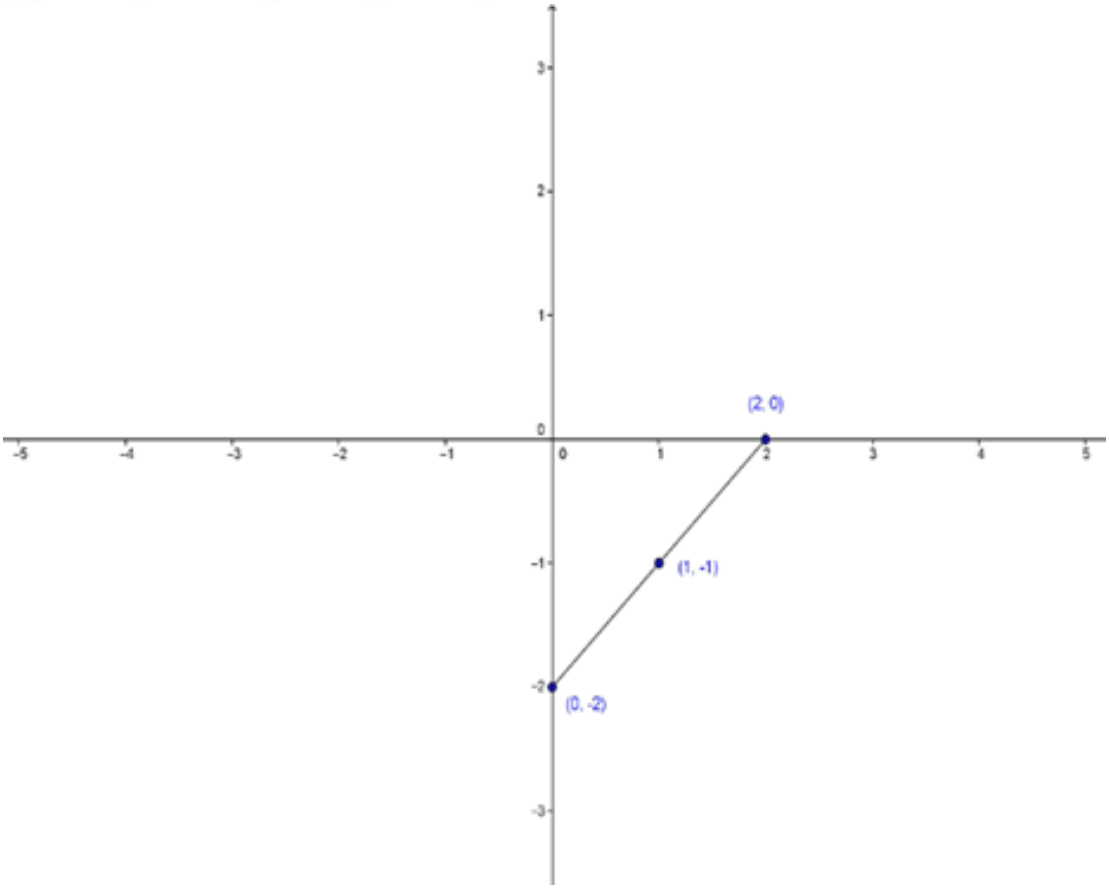


(ii) $x-y=2$

We can conclude that $x=0, y=-2; x=1, y=-1$ and $x=2, y=0$ are the solutions of the linear equation $x-y=2$.

We can optionally consider the given below table for plotting the linear equation $x-y=2$ on the graph.

X	0	1	2
y	-2	-1	0



(iii) $y=3x$

We can conclude that $x=0, y=0; x=1, y=3$ and $x=2, y=6$ are the solutions of the linear equation $y=3x$.

We can optionally consider the given below table for plotting the linear equation $y=3x$ on the graph.

X	0	1	2
y	0	3	6

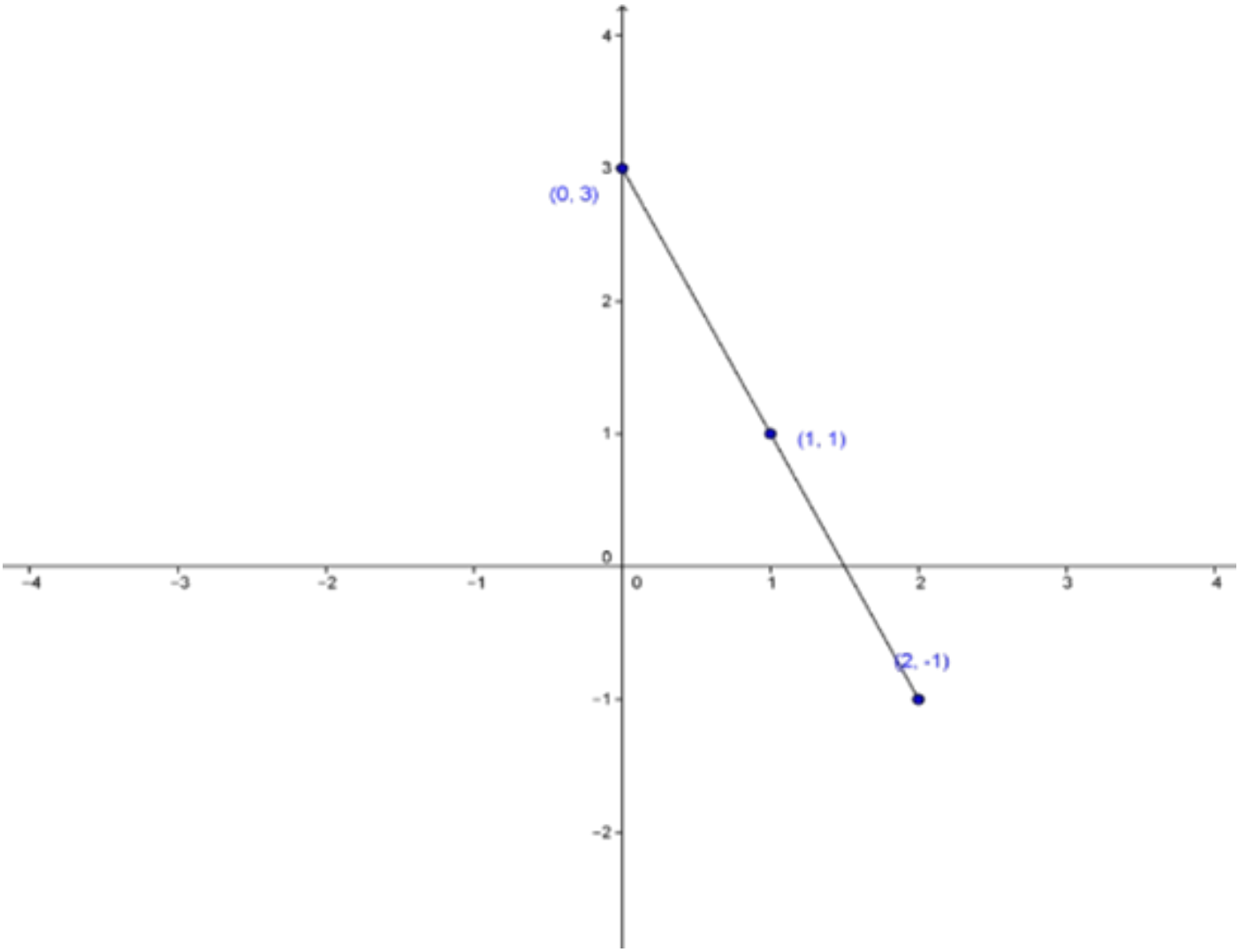
so

(iv) $3 = 2x + y$

We can conclude that $x = 0, y = 3; x = 1, y = 1$ and $x = 2, y = -1$ are the solutions of the linear equation $3 = 2x + y$.

We can optionally consider the given below table for plotting the linear equation $3 = 2x + y$ on the graph.

X	0	1	2
y	3	1	-1



2. Give the equations of two lines passing through (2, 14). How many more such lines are there, and why?

Ans. We need to give the two equations of the line that passes through the point $(2,14)$.

We know that infinite number of lines can pass through any given point.

We can consider the linear equations $7x-y=0$ and $2x+y=18$.

We can conclude that on putting the values $x=2$ and $y=14$ in the above mentioned linear equations, we get LHS=RHS.

Therefore, we can conclude that the line of the linear equations $7x-y=0$ and $28x-4y=0$ will pass through the point $(2,14)$. so infinitely many lines can be drawn through (2,14)

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3. If the point (3, 4) lies on the graph of the equation $3y=ax+7$, find the value of *a*.

Ans. We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

We can conclude that $(3,4)$ is a solution of the linear equation $3y=ax+7$.

We need to substitute $x=3$ and $y=4$ in the linear equation $3y=ax+7$, to get

$3(4)=a(3)+7 \Rightarrow 12=3a+7$

$\Rightarrow 3a=12-7 \quad \Rightarrow 3a=5 \Rightarrow a=\frac{5}{3}$

Therefore, we can conclude that the value of *a* will be $\frac{5}{3}$.

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4. The taxi fare in a city is as follows: For the first kilometre, the fare is Rs 8 and for the subsequent distance it is Rs 5 per km. Taking the distance covered as *x* km and total fare as Rs *y*, write a linear equation for this information, and draw its graph.

Ans. From the given situation, we can conclude that the distance covered at the rate Rs 5 per km will be $(x-1)$, as first kilometer is charged at Rs 8 per km.

We can conclude that the linear equation for the given situation will be:

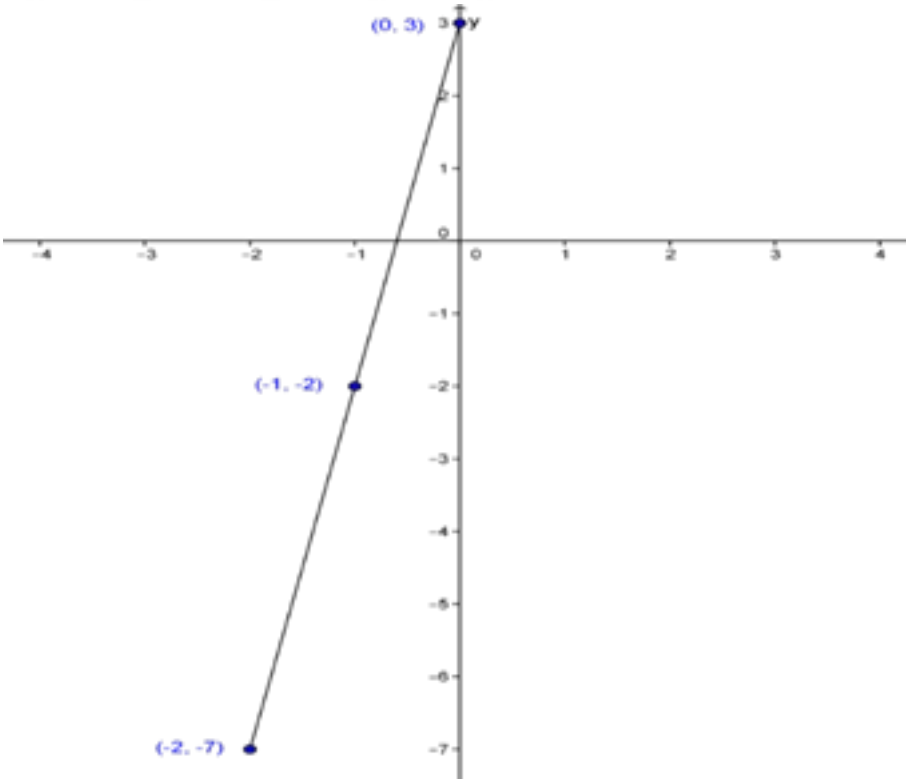
$8+5(x-1)=y \Rightarrow 8+5x-5=y \Rightarrow 3+5x=y.$

We need to draw the graph of the linear equation $3+5x=y$.

We can conclude that $x = 0, y = 3; x = 1, y = 1$ and $x = 2, y = -1$ are the solutions of the linear equation $3 + 5x = y$.

We can optionally consider the given below table for plotting the linear equation $3 + 5x = y$ on the graph.

X	0	-1	-2
y	3	-2	-7



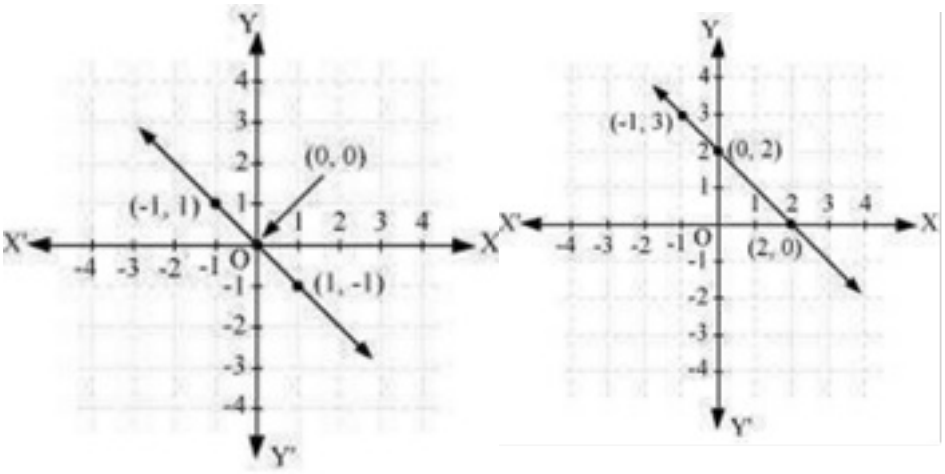
5. From the choices given below, choose the equation whose graphs are given in the given figures.

For the first figure

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

For the second figure

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



Ans. For First figure

(i) $y = x$

We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

Let us check whether $x = -1, y = 1; x = 0, y = 0$ and $x = 1, y = -1$ are the solutions of the linear equation $y = x$.

For $x = -1, y = 1$, we get

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

Therefore, the given graph does not belong to the linear equation $y = x$.

(ii) $x + y = 0$

We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

For $x = -1, y = 1$, we get

$-1 + 1 = 0 \quad \Rightarrow \quad 0 = 0.$

For $x = 0, y = 0$, we get

$0 + 0 = 0 \quad \Rightarrow \quad 0 = 0.$

For $x = 1, y = -1$, we get

$1 + (-1) = 0 \quad \Rightarrow 1 - 1 = 0 \Rightarrow 0 = 0.$

Therefore, the given graph belongs to the linear equation $x+y=0$.

(iii) $y=2x$

We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

For $x=-1, y=1$, we get

$y=2x \qquad \Rightarrow -1=2(1) \Rightarrow -1 \neq 2.$

Therefore, the given graph does not belong to the linear equation $y=2x$.

(iv) $2+3y=7x$

We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

For $x=-1, y=1$, we get

$2+3(1)=7(-1) \Rightarrow 2+3=-7 \quad \Rightarrow 5 \neq -7.$

Therefore, the given graph does not belong to the linear equation $2+3y=7x$.

For Second figure

(i) $y=x+2$

We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

For $x=-1, y=3$, we get

$3=-1+2 \qquad \Rightarrow 3 \neq 1.$

Therefore, the given graph does not belong to the linear equation $y=x+2$.

(ii) $y=x-2$

We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

For $x=-1, y=3$, we get

$3=-1-2 \qquad \Rightarrow 3 \neq -3.$

Therefore, the given graph does not belong to the linear equation $y=x-2$.

(iii) $y=-x+2$

We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

For $x=-1, y=3$, we get

$3=-(-1)+2 \quad \Rightarrow 3=1+2 \Rightarrow 3=3.$

For $x=0, y=2$, we get

$2=-(0)+2 \quad \Rightarrow 2=2.$

For $x=2, y=0$, we get

$0=-(2)+2 \quad \Rightarrow 0=0.$

Therefore, hat the given graph belongs to the linear equation $y=-x+2$.

(iv) $x+2y=6$

We know that if any point lie on the graph of any linear equation, then that point is the solution of that linear equation.

For $x=-1, y=3$, we get

$(-1)+2(3)=6 \quad \Rightarrow -1+6=6 \Rightarrow 5 \neq 6.$

Therefore, the given graph does not belong to the linear equation $x+2y=6$.

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6. If the work done by a body on application of a constant force is directly proportional to the distance travelled by the body, express this in the form of an equation in two variables and draw the graph of the same by taking the constant force as 5 units. Also read from the graph the work done when the distance travelled by the body is:

(i) 2 units

(ii) 0 units

Ans. We are given that the work done by a body on application of a constant force is directly proportional to the distance travelled by the body.

Let the work done be *W* and let constant force be *F*.

Let distance travelled by the body be *D*.

According to the question,

$W \propto D \qquad \Rightarrow W = F \cdot D.$

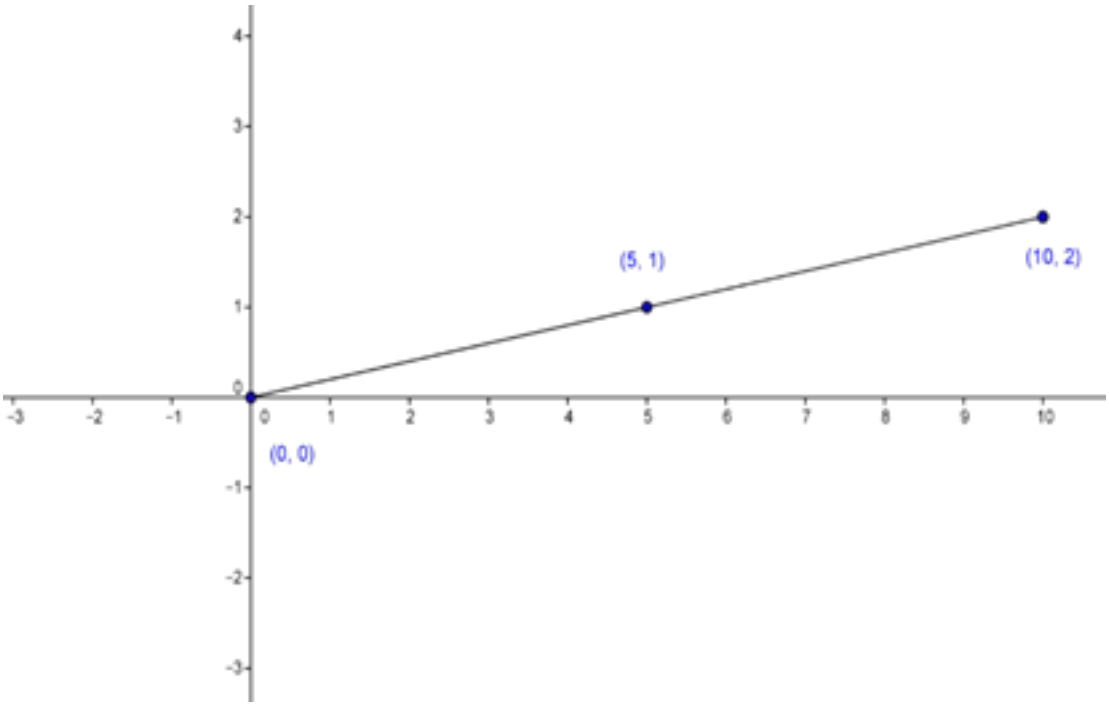
We need to draw the graph of the linear equation $W = F \cdot D$, when the force is constant as 5 units, i.e., $W = 5D$.

Work done W is along x-axis and distance D is along y-axis.

We can conclude that W=0,D=0

W=5,D=1 and W=10,D=2 are the solutions of the linear equation $W = 5D$.

W	0	5	10
D	0	1	2



Therefore, we can conclude from the above mentioned graph, the work done by the body, when the distance is 2 units will be 10 units and when the distance is 0 units, the work done will be 0 unit.

7. Yamini and Fatima, two students of Class IX of a school, together contributed Rs 100 towards the Prime Minister's Relief Fund to help the earthquake victims. Write a linear equation which satisfies this data. (You may take their contributions as Rs x and Rs y.) Draw the graph of the same.

Ans. The contribution made by Yamini is Rs *x* and the contribution made by Fatime is Rs *y*.

We are given that together they both contributed Rs 100.

We get the given below linear equation from the given situation.

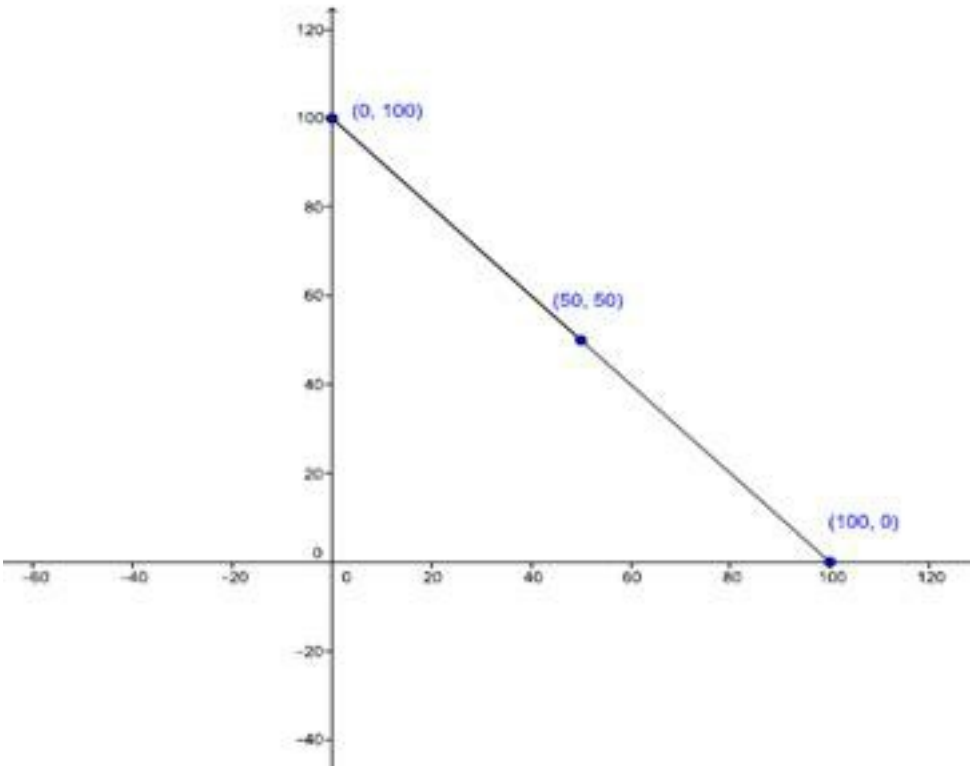
$x+y=100$.

We need to consider any 3 solutions of the linear equation $x+y=100$, to plot the graph of the linear equation $x+y=100$.

We can conclude that x=0,y=100,x=50,y=50 and x=100,y=0 are the solutions of the linear equation $x+y=100$.

We can optionally consider the given below table for plotting the linear equation $x+y=100$ on the graph.

X	0	50	100
y	100	50	0



8. In countries like USA and Canada, temperature is measured in Fahrenheit, whereas in countries like India, it is measured in Celsius. Here is a linear equation that converts Fahrenheit to Celsius:

$$F = \left(\frac{9}{5}\right)C + 32$$

(i) Draw the graph of the linear equation above using Celsius for x-axis and Fahrenheit for y-axis.

(ii) If the temperature is $30°C$, what is the temperature in Fahrenheit ?

(iii) If the temperature is $95°F$, what is the temperature in Celsius ?

(iv) If the temperature is $0°C$, what is the temperature in Fahrenheit and if the temperature is $0°F$, what is the temperature in Celsius ?

(v) Is there a temperature which is numerically the same in both Fahrenheit and Celsius? If yes, find it.

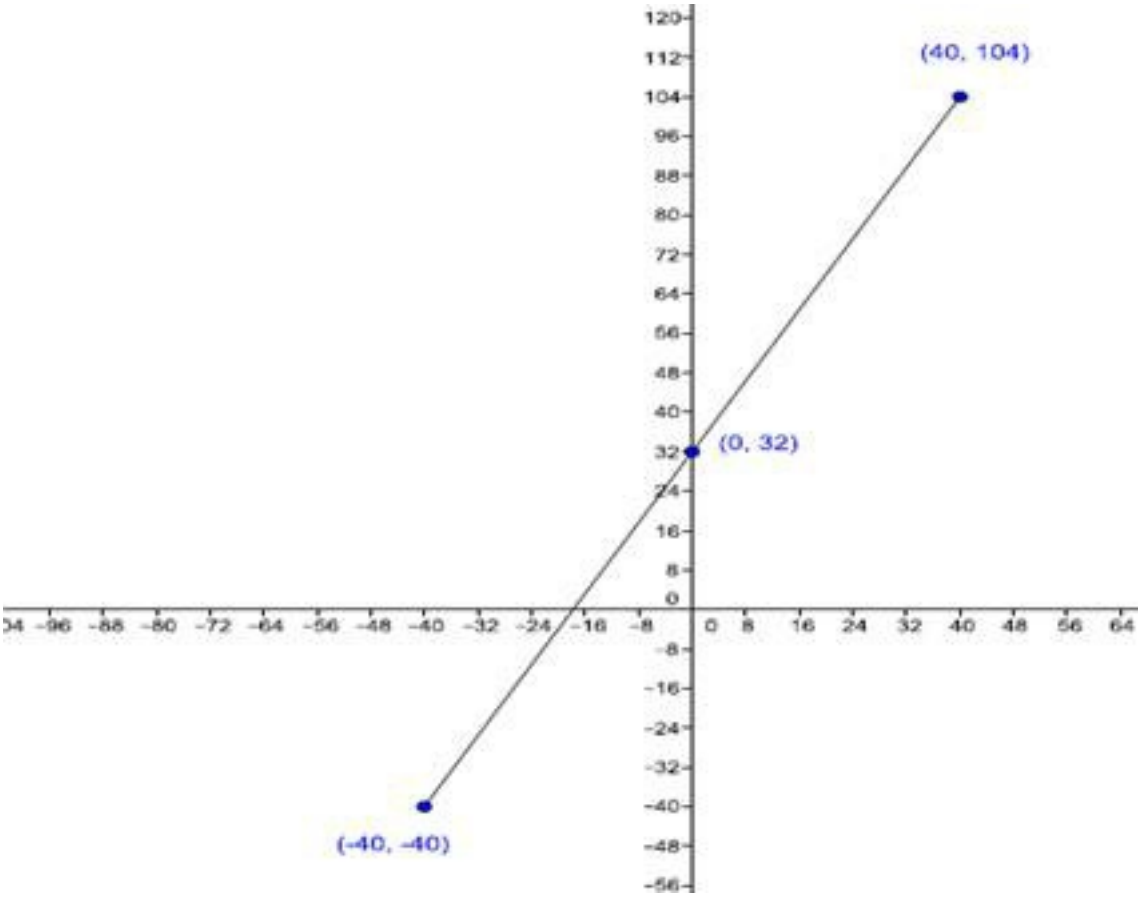
Ans. We are given a linear equation that converts the temperature in Fahrenheit into degree Celsius.

$$F = \left(\frac{9}{5}\right)C + 32$$

(i) We need to consider any 3 solutions of the linear equation $F = \left(\frac{9}{5}\right)C + 32$, to plot the graph of the linear equation $F = \left(\frac{9}{5}\right)C + 32$.

We can conclude that C=-40,F=-40,C=0,F=32 and C=40,F=104 are the solutions of the linear equation $F = \left(\frac{9}{5}\right)C + 32$.

C	−40	0	40
F	−40	32	104



(ii) We need to find the temperature in Fahrenheit, when the temperature in degree Celsius is 30° .when C= 30°

$$F=\left(\frac{9}{5}\right)(30)+32 \ =9\times 6+32=86^{\circ}$$

Therefore, we can conclude that the temperature in Fahrenheit will be $86^{\circ}F$.

(iii) We need to find the temperature in degree Celsius, when the temperature in Fahrenheit is 95° .

$$95=\left(\frac{9}{5}\right)C+32\Rightarrow\frac{9}{5}C=95-32\Rightarrow C=63\times\frac{5}{9}\ =35^{\circ}.$$

Therefore, we can conclude that the temperature in degree Celsius will be 35° .

(iv) We need to find the temperature in Fahrenheit, when the temperature in degree Celsius is 0° .

$$F=\left(\frac{9}{5}\right)(0)+32=32^{\circ}$$

Therefore, we can conclude that the temperature in Fahrenheit will be 32° .

We need to find the temperature in degree Celsius, when the temperature in Fahrenheit is 0°

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$$0=\left(\frac{9}{5}\right)C+32\Rightarrow\frac{9}{5}C=0-32\Rightarrow C=-32\times\frac{5}{9}=-17.77^{\circ}.$$

Therefore, we can conclude that the temperature in degree Celsius will be -17.77°

(v) We need to find a temperature that is numerically same in both Fahrenheit and degree Celsius.So F=C

$$F=\left(\frac{9}{5}\right)F+32\Rightarrow F-\frac{9F}{5}=32\Rightarrow-\frac{4F}{5}=32\Rightarrow F=-40^{\circ}.$$

Therefore, we can conclude that the temperature that is numerically same in Fahrenheit and degree Celsius will be -40°.