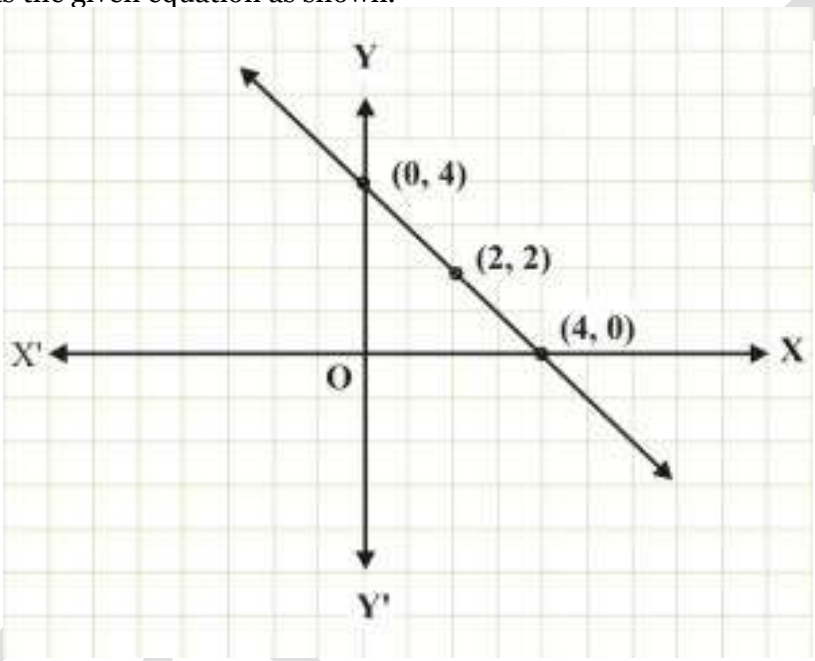
Linear Equations in Two Variables: Exercise 4.3

Q.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**
Sol.
(i) Given: x + y = 4
⇒ y = 4 – x
When x = 0, then y = 4 – 0 = 4
When x = 2, then y = 4 – 2 = 2
When x = 4, then y = 4 – 4 = 0
Thus, table:

x	0	2	4
y	4	2	0

Plot these points (0, 4) (2, 2) and (4, 0) on the graph paper and drawing a line by joining them. This graph represents the given equation as shown.

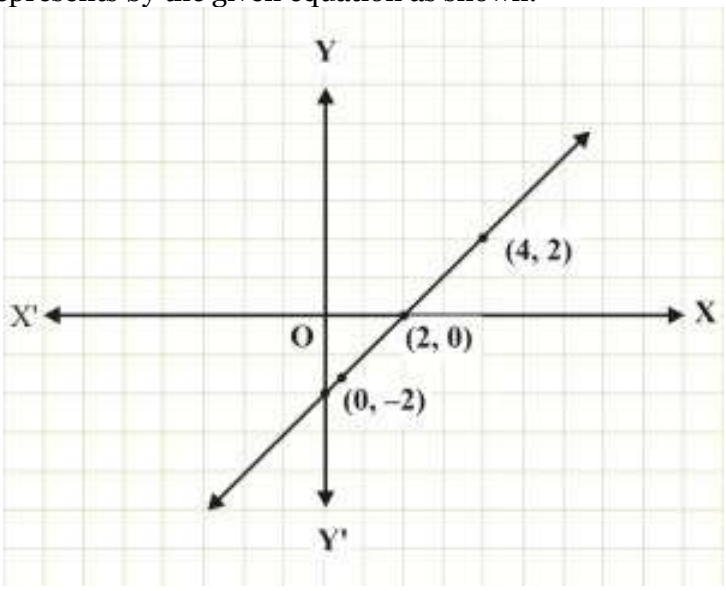


(ii) Given: x – y = 2
⇒ y = x – 2
When x = 0 , then y = 0 – 2 = – 2
When x = 2, then y = 2 – 2 = 0
When x = 4, then y = 4 – 2 = 2
Thus, table :

x	0	2	4
y	–2	0	2

Plot these points (0, –2), (2, 0) and (4, 2) on the graph paper and drawing a line by joining them,

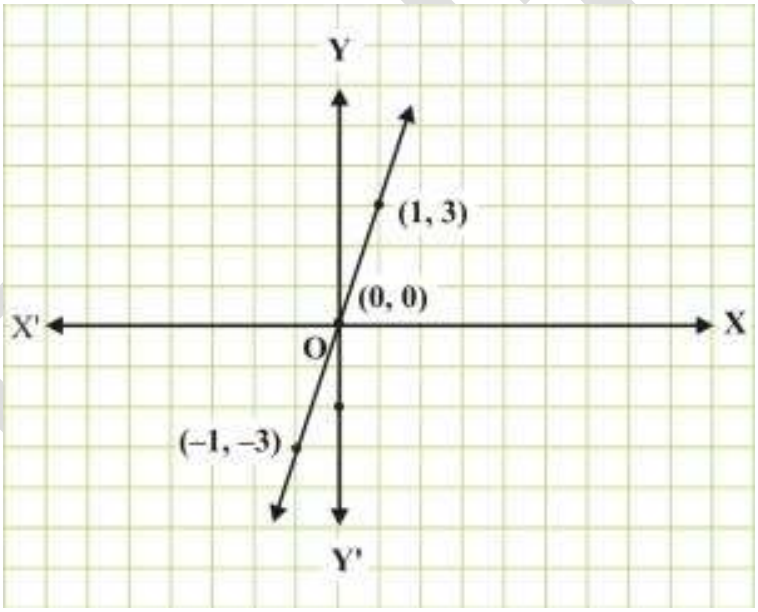
this graph represents by the given equation as shown.



(iii) Given: y = 3x
When x = 0 , then y = 3(0) = 0
When x = 1, then y = 3 (1) = 3
When x = –1, then y = 3(–1) = – 3
Thus, table :

x	0	1	–1
y	0	3	–3

Plot the points (0, 0), (1, 3) and (–1, –3) on the graph paper and drawing a line by joining them.
This graph represents the given equation as shown.

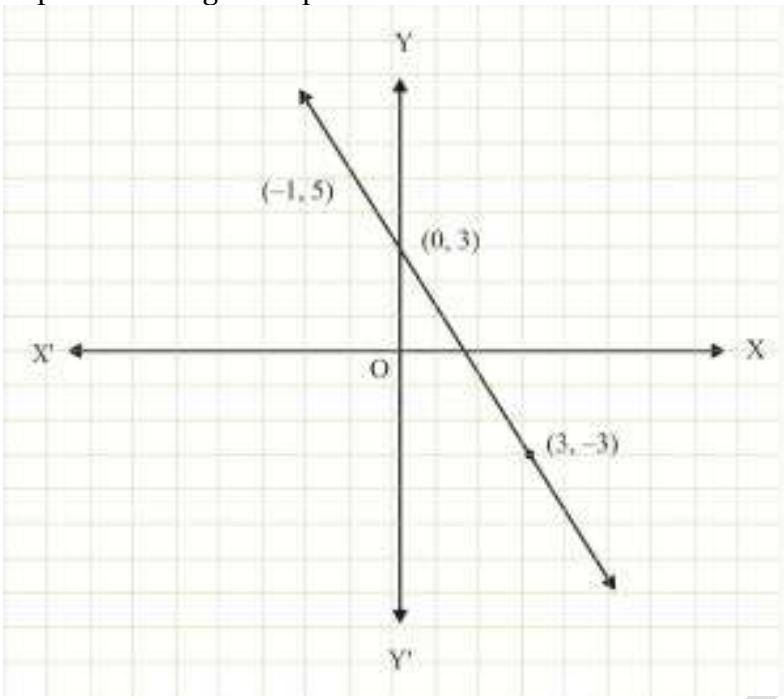


(iv) Given: 3 = 2x + y
⇒ y = 3 – 2x
When x = 0, then y = 3 – 2(0) = 3
When x = 3, then y = 3 – 2(3) = – 3
When x = – 1, then y = 3 – 2 (–1) = 5
Thus, table:

x	0	3	–1
y	3	–3	5

Plot these points (0, 3), (3, –3) and (–1, 5) on the graph paper and drawing a line by joining them.

This graph represents the given equation as shown:



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

Sol. Given: Point (2, 14) is a solution of a linear equation which we need to find out. One example of such a linear equation is $x + y = 16$. We can find more such equations $2x + y = 18$, $7x – y = 0$ and $7x + y = 28$. Which are also satisfied by the co-ordinates of the point (2, 14). Therefore, there are infinite number of lines through (2, 14).

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

Sol. Since, (3, 4) lies on the graph corresponding to $3y = ax + 7$. So, (3, 4) satisfies the given equation.

$3(4) = a(3) + 7$

$\Rightarrow 12 – 7 = 3a$

$\Rightarrow 3a = 5$

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

Thus, for value of $a = \frac{5}{3}$, point (3, 4) lie on the graph of equation $3y = ax + 7$.

Q.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.

Sol. Given: Fare of taxi for first km = Rs. 8

Fare of taxi for the subsequent km = Rs. 5

Total fare of taxi = Rs y

Total distance = x km

Linear equation for the above information:

$y = 8 \times 1 + 5(x – 1)$

$\Rightarrow y = 8 + 5x – 5$

$\Rightarrow y = 5x + 3$

$\Rightarrow 5x – y + 3 = 0$

When $x = 0$, then $y = 5 \times 0 + 3 = 0 + 3 = 3$

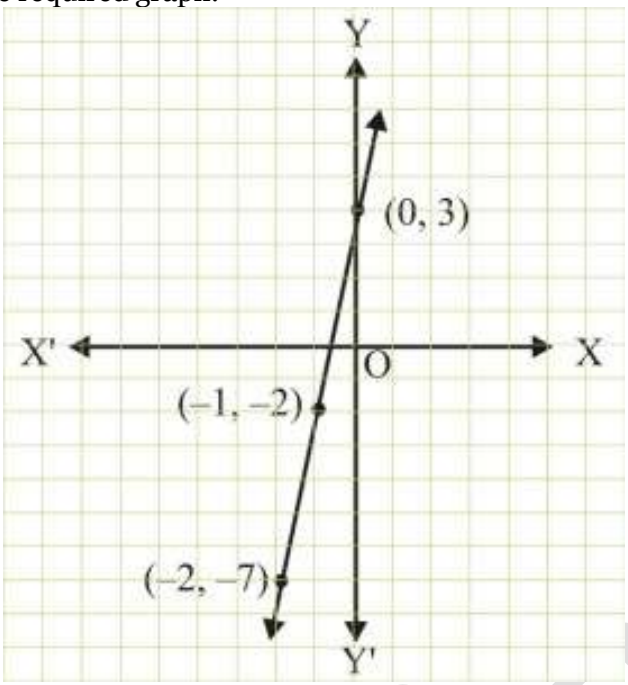
When $x = – 1$, then $y = 5 \times (– 1) + 3 = – 5 + 3 = – 2$

When $x = – 2$, then $y = 5 \times (– 2) + 3 = – 10 + 3 = – 7$

Thus, table :

x	0	–1	–2
y	3	–2	–7

Plot these points (0, 3), (–1, –2) and (–2, –7) on the graph paper and drawing a line by joining them. Thus, we obtain the required graph.



Q.5 From the choices given below, choose the equation whose graphs are given in Fig(a) and Fig(b)

For figure (a)
(i) y = x b
(ii) x + y = 0
(iii) y = 2x
(iv) 2 + 3y = 7x

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

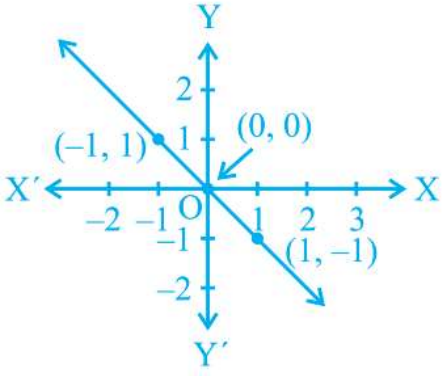


Fig. (a)

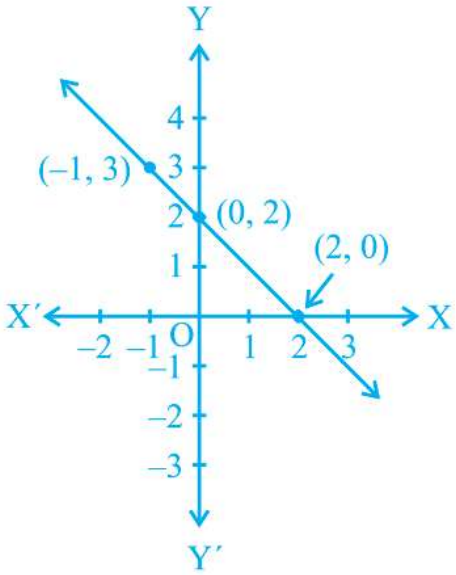


Fig. (b)

Sol.

For Fig (a), the correct equation from the choices given is x + y = 0. Because the points (–1, 1) and (1, –1) given on the graph satisfy the equation x + y = 0.

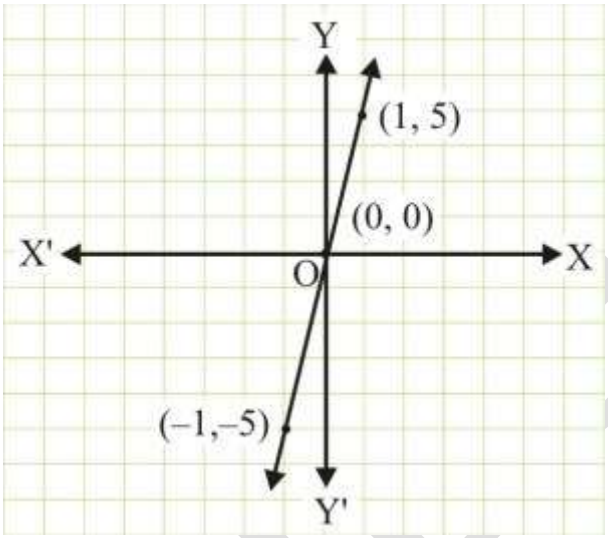
For Fig (b), the correct equation from the choices given is y = – x + 2. Because points (–1, 3) (0, 2) and (2, 0) on the graph satisfy the equation y = – x + 2.

Q.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 unit.

Sol. Suppose, x is the distance and y is the work done. So, according to the question the equation: y = 5x.
For drawing its graph :
When x = 0 , then, y = 5(0) = 0
When x = 1, then y = 5 (1) = 5
When x = – 1, then y = 5 (–1) = – 5
Therefore, table:

x	0	1	–1
y	0	5	–5

Plot (0, 0) , (1,5) and (–1, –5) on the graph paper and drawing a line by joining them we obtain the graph of the equation y = 5x as shown.



Now, from the graph,
(i) When distance travelled is 2 units, x = 2, then y = 10.
So, work done = 10
(ii) When distance travelled is 0 units, x = 0, then y = 0
So, work done = 0.

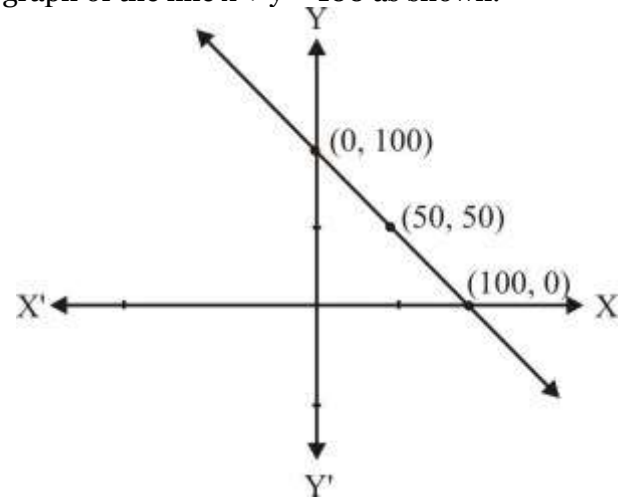
Q.7 Yamini and Fatima, two students of Class IX of a school, together contributed Rs 100 towards the Prime Minister's Relief Fund to help the earthquake victims. Write a linear equation which satisfies this data. (You may take their contributions as Rs x and Rs y). Draw the graph of the same.

Sol.
Suppose, Yamini and Fatima contributed Rs x and Rs y towards the P.M.'s Relief Fund. So, totally contributed Rs 100
So, the linear equation using the above data: x + y = 100 ⇒ y = 100 – x.
For drawing its graph:
When x = 0, then y = 100 – 0 = 100
When x = 100 then y = 100 – 100 = 0
When x = 50 , then y = 100 – 50 = 50
The table:

x	0	100	50
y	100	0	50

Plot these points (0, 100), (100, 0) and (50, 50) on the graph paper and drawing a line by joining them. We

obtain the graph of the line x + y = 100 as shown.



Q.8 In countries like the 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:

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

(i) Draw the graph of the linear equation above using Celsius for x-axis and Fahrenheit for y-axis.
(ii) Temperature is 0° C, what is the temperature in Fahrenheit and if the temperature is 0°F, ff 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 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.

Sol. **(i)** Given: $F = \frac{9}{5}C + 32 \Rightarrow C=59(F-32)$

Now, we have to calculate the vales of F for different values of C.

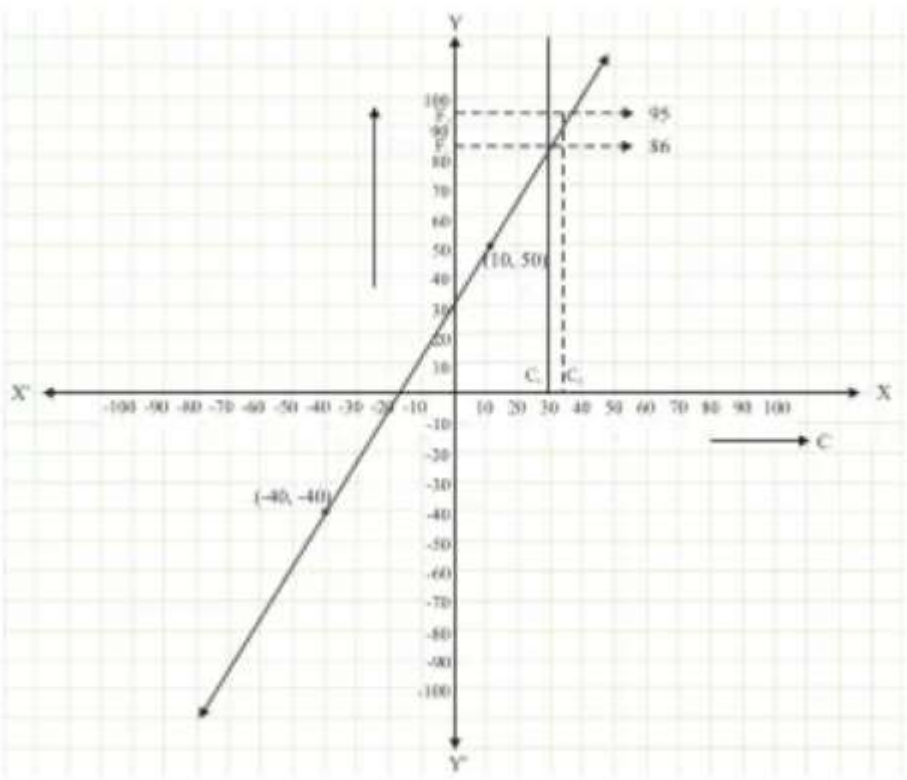
When C = −40, then, $F = \frac{9}{5} \times (-40) + 32 = -72 + 32 = -40$

When C = 10, then, $F = \frac{9}{5} \times 10 + 32 = 18 + 32 = 50$

The table:

C	-40	10
F	-40	50

Now, choose a suitable scale on the x-axis (for Celsius) and on the same scale on the y-axis (for Fahrenheit). Plot these points (– 40, – 40) and (10, 50) on the graph point. On joining these points by line segment, we obtain the graph of $F = \frac{9}{5}C + 32$.



(ii) From above the graph, when C = 30° shown C_1 on the x-axis in the positive direction, then F =86° shown by the point F_1 on the y-axis in the positive direction.
Thus, 30°C = 86°F

(iii) From above the graph, when F = 95° shown F_2 on the y-axis in the positive direction, then C = 35° shown by the point C_2 on the x-axis in the positive direction.
Thus, 95° F = 35°C

(iv) From above the graph, 0°C = 32°F and 0°F = – 17.8°F.

(v) From above the graph, the temperature which is numerically the same in both Fahrenheit and Celsius is – 40°C = – 40° F.