NCERT QUESTIONS WITH SOLUTIONS

EXERCISE : 4.1

1. The cost of notebook is twice the cost of a pen. Write a linear equation in two variables to represent this statement.

Sol. Let the cost of a pen be Rs. x and that of a notebook be Rs. y. We are given that $y = 2 \times x$ i.e., $y = 2x$. Hence, the required linear equation is $y = 2x$

2. 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) $2x + 3y = 9.3\overline{5}$ (ii) $x - y/5 - 10 = 0$

(iii) $-2x + 3y = 6$ (iv) $x = 3y$

(v) $2x = -5y$ (vi) $3x + 2 = 0$

(vii) $y - 2 = 0$ (viii) $5 = 2x$

Sol. (i) $2x + 3y - 9.3\overline{5} = 0$

Here, $a = 2, b = 3, c = -9.3\overline{5}$

(ii) $x - y/5 - 10 = 0$

i.e., $1x + (-\frac{1}{5})y + (-10) = 0$

Here, $a = 1, b = -\frac{1}{5}, c = -10$

(iii) $-2x + 3y = 6$

i.e., $2x - 3y + 6 = 0$,

i.e., $2x + (-3)y + 6 = 0$

Here, $a = 2, b = -3, c = 6$

(iv) $x = 3y$, i.e., $1x + (-3)y + 0 = 0$

Here, $a = 1, b = -3, c = 0$

(v) $2x = -5y$, i.e., $2x + 5y + 0 = 0$

Here, $a = 2, b = 5, c = 0$

(vi) $3x + 2 = 0$

i.e. $(3)x + (0)y + (2) = 0$

Here, $a = 3, b = 0$ and $c = 2$.

(vii) $y - 2 = 0$

i.e. $(0)x + (1)y + (-2) = 0$

Here, $a = 0, b = 1$ and $c = -2$.

(viii) $5 = 2x$

$\Rightarrow 5 - 2x = 0 \Rightarrow -2x + 0y + 5 = 0$

$\Rightarrow (-2)x + (0)y + (5) = 0$

Here, $a = -2, b = 0$ and $c = 5$.

EXERCISE : 4.2

1. Which one of the following options is true, and why?

$y = 3x + 5$ has

(i) a unique solution

(ii) Only two solutions

(iii) Infinitely many solutions.

Sol. Option (iii) is true because a linear equation has infinitely many solutions. Moreover when represented graphically a linear equation in two variable is a straight line which has infinite points and hence, it has infinite solutions.

2. Write four solutions for each of the following equations :

(i) $2x + y = 7$ (ii) $\pi x + y = 9$

(iii) $x = 4y$

Sol. (i) $2x + y = 7$

For $x = -1$, we get $-2 + y = 7$, i.e., $y = 9$

$\therefore$ $(-1, 9)$ is a solution.

For $x = 0$, we get $y = 7$

$\therefore$ $(0, 7)$ is a solution.

For $x = 1$, we get $2 + y = 7$, i.e., $y = 5$

$\therefore$ $(1, 5)$ is a solution.

For $x = 2$, we get $4 + y = 7$, i.e., $y = 3$

$\therefore$ $(2, 3)$ is a solution.

Hence, we have four solutions $(-1, 9)$, $(0, 7)$, $(1, 5)$ and $(2, 3)$

(ii) Proceed as in (i) and we can have four solutions as (0, 9), (1, 9 – π), (2, 9 – 2π) and (3, 9 – 3π).

(iii) Proceed as in (i) and we can have four solutions as (0, 0), (4, 1), (8, 2) and (12, 3)

3. Check which of the following are solutions of the equation x – 2y = 4 and which are not

(i) (0, 2) (ii) (2, 0)

(iii) (4, 0) (iv) $(\sqrt{2}, 4\sqrt{2})$

(v) (1, 1)

Sol. (i) Substituting x = 0, y = 2 in the equation x – 2y = 4,

we get 0 – 2 (2) = 4, i.e., – 4 = 4 but – 4 ≠ 4

∴ (0, 2) is not a solution

(ii) 2 – 2 (0) ≠ 4

∴ (2, 0) is not a solution.

(iii) Substituting x = 4 and y = 0 in the equation x – 2y = 4, we get

L.H.S. = 4 – 2(0) = 4 – 0 = 4 = R.H.S.

∴ L.H.S. = R.H.S.

∴ (4, 0) is a solution.

(iv) $\sqrt{2} - 2(4\sqrt{2}) = 4$, i.e., $\sqrt{2} - 8\sqrt{2} = 4$,

i.e., $-7\sqrt{2} = 4$ but $-7\sqrt{2} \neq 4$

∴ $(\sqrt{2}, 4\sqrt{2})$ is not a solution

(v) 1 – 2 (1) ≠ 4

∴ (1, 1) is not a solution.

4. Find the value of k if x = 2, y = 1 is a solution of the equation 2x + 3y = k.

Sol. (2)(2) + (3)(1) = k, i.e., 4 + 3 = k, i.e., k = 7.

EXERCISE : 4.3

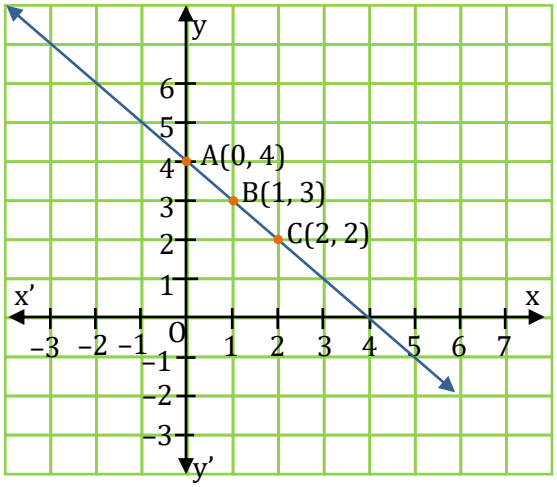
1. Draw the graph of each of the following linear equations in two variables :

(i) x + y = 4 (ii) x – y = 2

(iii) y = 3x (iv) 3 = 2 x + y

Sol. (i) x + y = 4 or y = 4 – x.

x	0	1	2
y	4	3	2



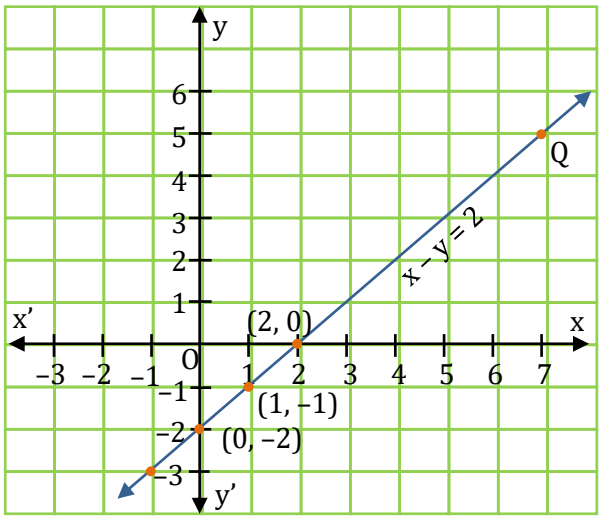
(ii) x – y = 2 ⇒ y = x – 2

If we have x = 0, then y = 0 – 2 = –2

x = 1, then y = 1 – 2 = –1

x = 2, then y = 2 – 2 = 0

x	0	1	2
y	–2	–1	0



Thus, the line PQ is required graph of x – y = 2

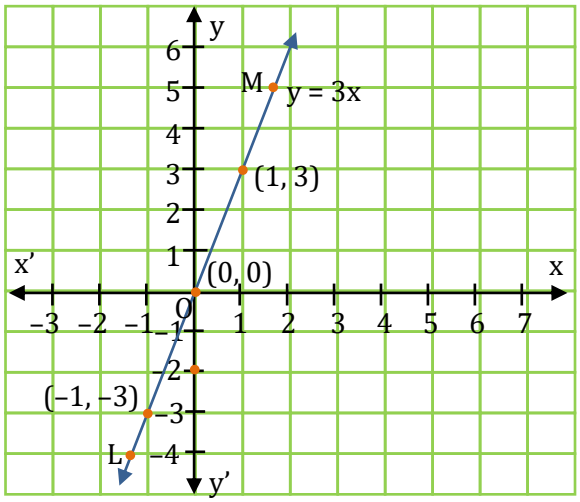
(iii) $y = 3x$

If we have $x = 0$, then $y = 3(0) \Rightarrow y = 0$

$x = 1$, then $y = 3(1) \Rightarrow y = 3$

$x = -1$, then $y = 3(-1) \Rightarrow y = -3$

x	0	1	−1
y	0	3	−3



Thus, LM is the required graph of $y = 3x$.

(iv) $3 = 2x + y$

$\Rightarrow y = 3 - 2x$

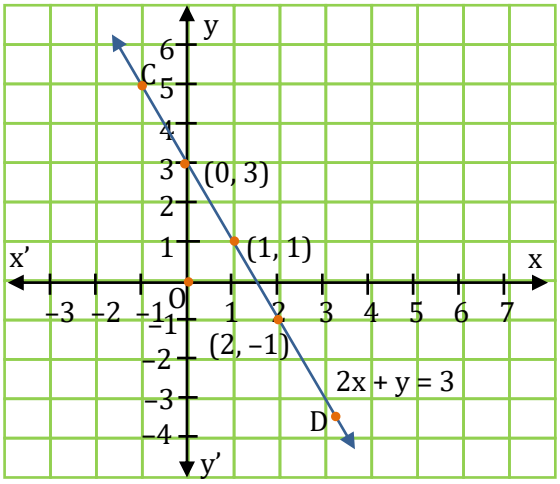
If we put $x = 0$, then $y = 3 - 2(0) \Rightarrow y = 3$

$x = 1$, then $y = 3 - 2(1) \Rightarrow y = 1$

$x = 2$, then $y = 3 - 2(2) = 3 - 4 = -1$

$\Rightarrow y = -1$

x	0	1	2
y	3	1	−1



Thus, the line CD is the required graph of $3 = 2x + y$.

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

Sol. $x + y = 16$,

$4x - y + 6 = 0$

Both the above equations will be satisfied by $x = 2$, $y = 14$. Hence, these are the equations of two lines passing through (2, 14). We can write infinitely many such lines because infinitely many lines can be made to pass through a point.

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

Sol. The equation of the given line is $3y = ax + 7$

$\because$ (3, 4) lies on the given line

$\therefore$ it must satisfy the equation $3y = ax + 7$

We have $(3, 4) \Rightarrow x = 3$ and $y = 4$, putting these values in equation, we get

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

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

Thus, the required value of a is $\frac{5}{3}$.

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. Here, total distance covered = x km and total taxi fare = Rs. y

Fare for the 1st km = Rs. 8

Remaining distance = (x − 1) km

$\therefore$ Fare for (x − 1) km = Rs. 5 × (x − 1)

Total taxi fare = Rs. 8 + Rs. 5(x − 1)

According to the condition,

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

$\Rightarrow y = 5x + 3$

which is the required linear equation representing the given information.

Graph : We have $y = 5x + 3$

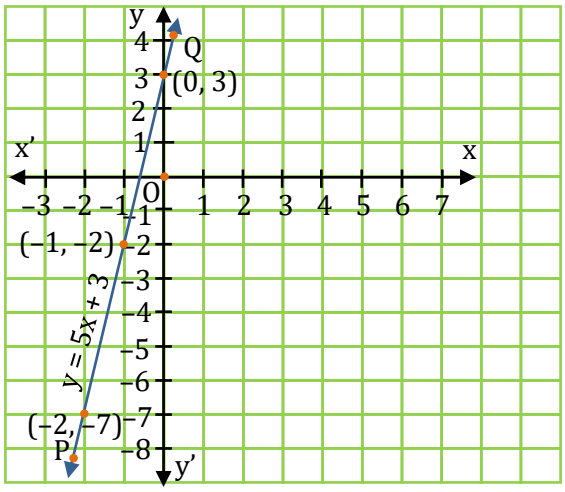
$\therefore$ When $x = 0$, then $y = 5(0) + 3 \Rightarrow y = 3$

$x = -1$, then $y = 5(-1) + 3 \Rightarrow y = -2$

$x = -2$, then $y = 5(-2) + 3 \Rightarrow y = -7$

$\therefore$ We get the following table :

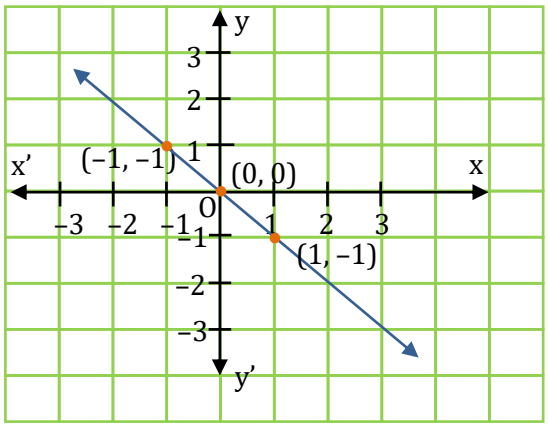
x	0	–1	–2
y	3	–2	–7



Thus, PQ is the required graph of the linear equation $y = 5x + 3$

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

1.



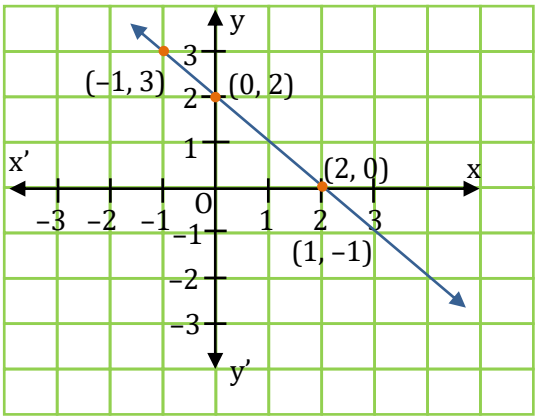
(i) $y = x$

(ii) $x + y = 0$

(iii) $y = 2x$

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

2.



(i) $y = x + 2$

(ii) $y = x - 2$

(iii) $y = -x + 2$

(iv) $x + 2y = 6$

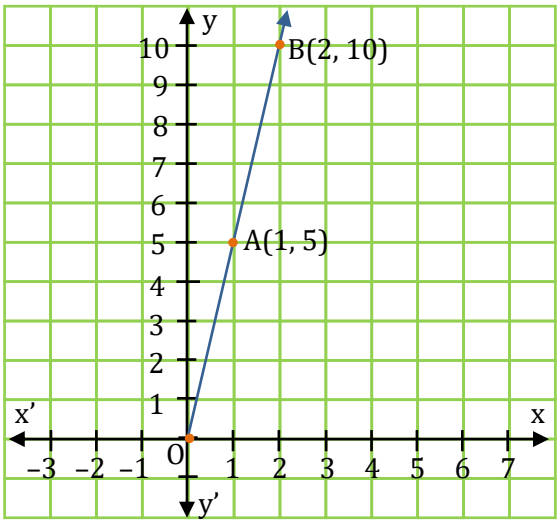
Sol. From fig.1, the equation of the graph is $x + y = 0$ because (–1,1), (0,0) and (1, –1) satisfy the equation.

From fig.2, the equation of the graph is $y = -x + 2$ because (–1,3), (0,2) and (2,0) satisfy the equation.

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.



Let us take that, the work done = y units when the distance travelled = x units.

Constant force = 5 units.

we have y = 5 × x [∵ Work done = force × distance]

Hence, the required equation is y = 5x

x	0	1	2
y	0	5	10

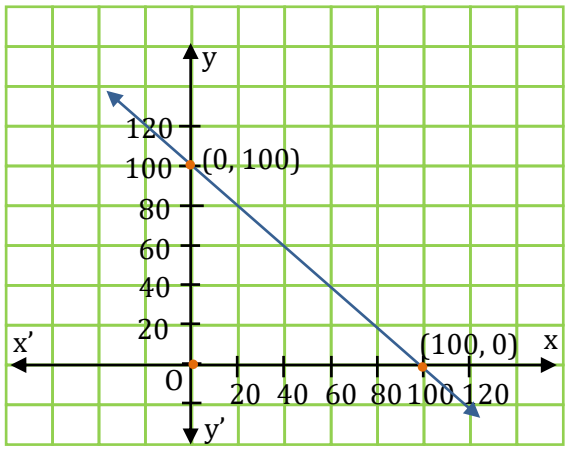
(i) From the graph when x = 2,

we have y = 10, i.e., work = 10 units.

(ii) When x = 0, we have y = 0, i.e., work done = 0

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.



Contribution of Yamini = Rs. x (say)

and contribution of Fatima = Rs. y (say)

Then, x + y = 100

is the required equation.

Graph of the given equations is shown on the next page.

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 = (9/5) 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.

Sol. (i) We have $F = \left(\frac{9}{5}\right)C + 32$

When C = 0, $F = \left(\frac{9}{5}\right) \times 0 + 32 = 32$

When C = –15, $F = \left(\frac{9}{5}\right)(-15) + 32$

$= -27 + 32 = 5$

When C = –10, $F = \left(\frac{9}{5}\right)(-10) + 32 = 14$

We have the following table :

C	0	–15	–10
F	32	5	14

(ii) From the graph, we have 86°F corresponds to 30° C

(iii) From the graph, we have 95°F = 35°C

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

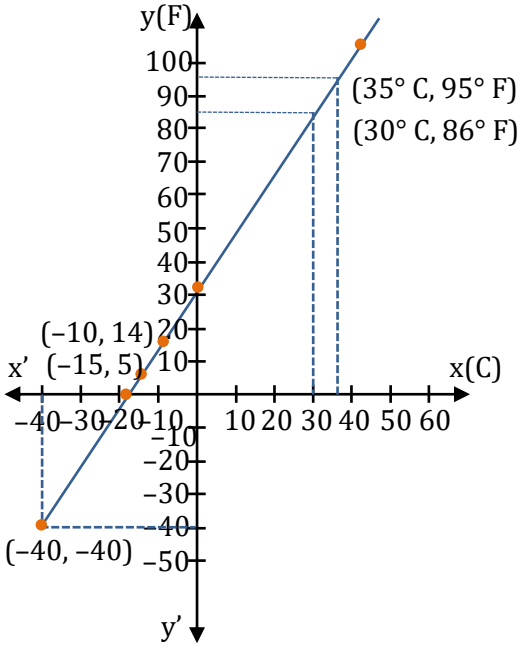
(v) When F = C (numerically)

From given equation, we get

$F = \frac{9}{5}F + 32 \Rightarrow F - \frac{9}{5}F = 32$

$\Rightarrow -\frac{4}{5}F = 32 \Rightarrow F = -40$

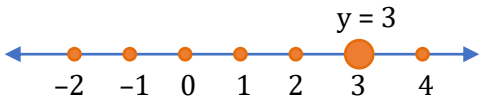
Temperature is –40° both in F and C.



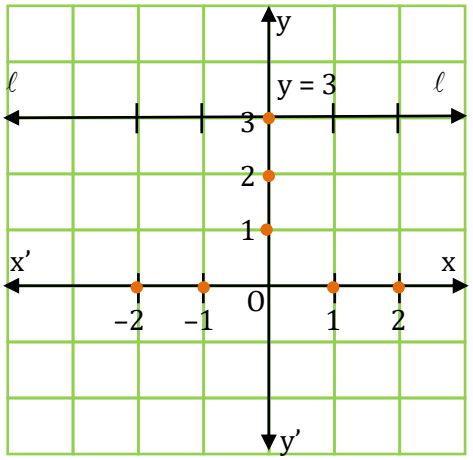
EXERCISE : 4.4

1. Give the geometric representation of y = 3 as an equation (i) in one variable (ii) in two variables.

Sol. (i)



(ii)

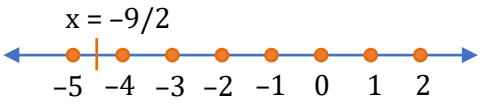


2. Give the geometric representation of 2x + 9 = 0 as an equation.

(i) in one variable

(ii) in two variables.

Sol. (i)



(ii)