1. The cost of a notebook is twice the cost of a pen. Write a linear equation in two variables to represent this statement.
(Take the cost of a notebook to be Rs. x and that of a pen to be Rs. y).

Sol. Let the pen cost y and the notebook cost x.

A/q (according to question):

Notebook price $= 2(\text{pen price})$

$\therefore\ 2y = x$

$\Rightarrow x - 2y = 0$.

2. 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 solution

Sol. **(iii)** Infinitely many solution
Because a line has infinite many points and each point is a solution of the linear equation.

3. Write four solutions for each of the following equations:
(i) $2x + y = 7$ (ii) $\pi x + y = 9$ (iii) $x = 4y$

Sol. **(i)** $2x + y = 7 \Rightarrow y = 7 - 2x$
Putting $x = 0$, we have, $y = 7 - 2\times 0 = 7$, therefore, (0, 7) is a solution of the equation.
Putting $x = 1$, we have, $y = 7 - 2\times 1 = 5$, therefore, (1,5) is a solution of the equation.
Putting $x = 2$, we have, $y = 7 - 2\times 2 = 3$, therefore. (2,3) is a solution of the equation.
Putting $x = 3$, we have, $y = 7 - 2\times 3 = 1$, therefore, (3,1) is a solution of the equation.
Hence, (0,7), (1, 5), (2,3) and (3,1) are the four solutions of the equation $2x + y = 7$.

(ii) $\pi x + y = 9 \Rightarrow y = 9 - \pi x$
Putting $x = 0$, we have, $y = 9 - \pi\times 0 = 9$, therefore, $(0, 9)$ is a solution of the equation.
Putting $x = 2$, we have, $y = 9 - \pi\times 1 = 9 - \pi$, therefore, $(1, 9 - \pi)$ is a solution of the equation.
Putting $x = 2$, we have, $y = 9 - \pi\times 2 = 9 - 2\pi$, therefore, $(2, 9 - 2\pi)$ is a solution of the equation.
Putting $x = 3$, we have, $y = 9 - \pi\times 3 = 9 - 3\pi$ therefore, $(3, 9 - 3\pi)$ is a solution of the equation.
Hence, $(0, 9), (1, 9 - \pi), (2, 9 - 2\pi)$ and $(3, 9 - 3\pi)$ are the four solutions of the equation $\pi x + y = 9$.

(iii) $x = 4y$

Putting $y = 0$ we have, $x = 4 \times 0 = 0$, therefore, (0,0) is a solution of the equation.
Putting y = 1, we have, $x = 4 \times 1 = 4$, therefore, (4,1) is a solution of the equation.
Putting y = 2, we have, $x = 4 \times 2 = 8$, therefore, (8, 2) is a solution of the equation.
Putting y = 3, we have, $x = 4 \times 3 = 12$, therefore, (12,3) is a solution of the equation.
Hence, (0, 0), (4, 1), (8, 2) and (12, 3) are the four solutions of the equation $x = 4y$.

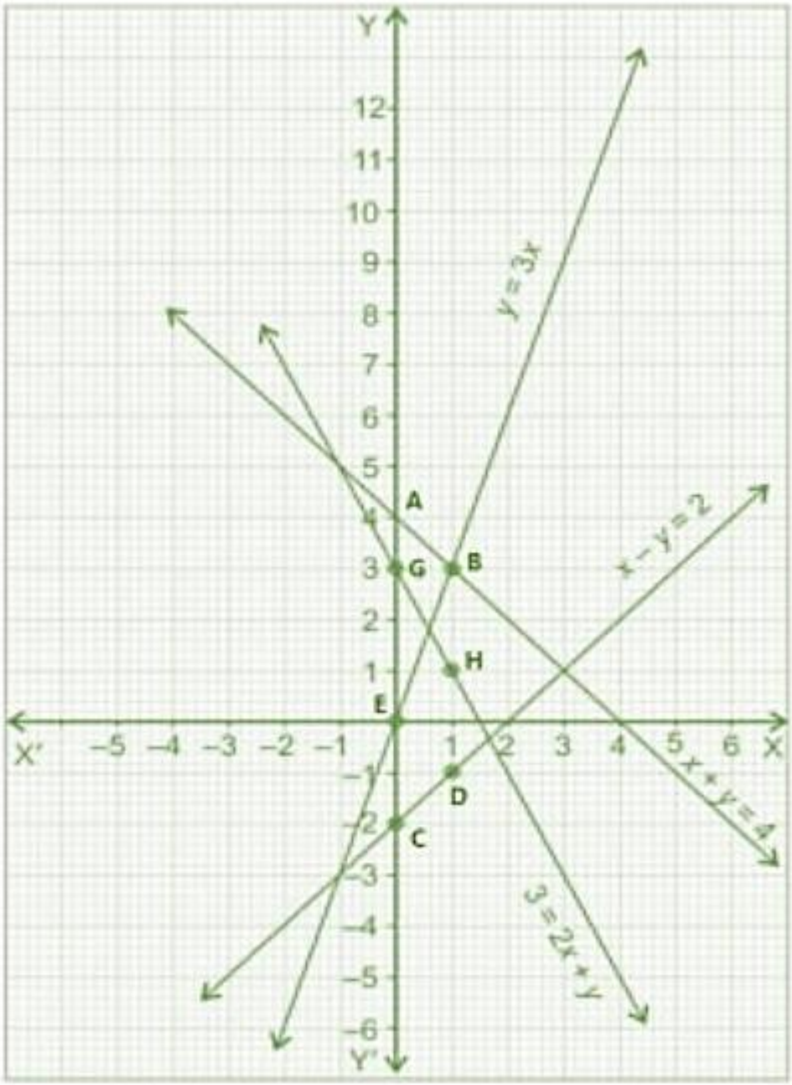
4. Draw the graph of each of the following linear equations in two variables:
(i) $x + y = 4$ (ii) $x - y = 2$ (iii) $y = 3x$
(iv) $3 = 2x + y$

Sol. **(i)** $x + y = 4$
$\Rightarrow y = 4 - x$
Putting $x = 0$, we have, $y = 4 - 0 = 4$
Putting $x = 1$, we have $y = 4 - 1 = 3$
Hence, A(0, 4) and B(1, 3) are the solutions of the equation.

(ii) $x - y = 2$
$\Rightarrow y = x - 2$
Putting $x = 0$, we have $y = 0 - 2 = -2$
Hence, $C(0, -2)$ and $D(1, -1)$ are the solutions of the equation.

(iii) $y = 3x$
Putting $x = 0$, we have, $y = 3 \times 0 = 0$
Putting $x = 1$, we have, $y = 3 \times 1 = 3$
Hence, E(0, 0) and B(1, 3) are the solutions of the equation.

(iv) $3 = 2x + y$
$\Rightarrow y = 3 - 2x$
Putting $x = 0$, we have $y = 3 - 2 \times 0 = 3$
Putting $x = 1$, we have $y = 3 - 2 \times 1 = 1$
Hence, G(0, 3) and H(1, 1) are the solutions of the equation.



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

Sol. Equation of two lines passing through (2, 14) are given by: $x+y=16$ and $8x-y=2$.

There are infinite number of lines that can pass through (2, 4) as infinite number of lines passes through a point.

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

Sol. Given equation of line: $3y=ax+7$.

Putting $x=3$ and $y=4$, we have $3\times 4=a\times 3+7$

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

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

7. 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 that: Distance travelled $= x\ km$ and total fare = Rs. y

Total fare = Fare for first km + Fare for remaining distance

Therefore, the equation: $y = 8 + 5 \times (x - 1) \Rightarrow y = 5x + 3$

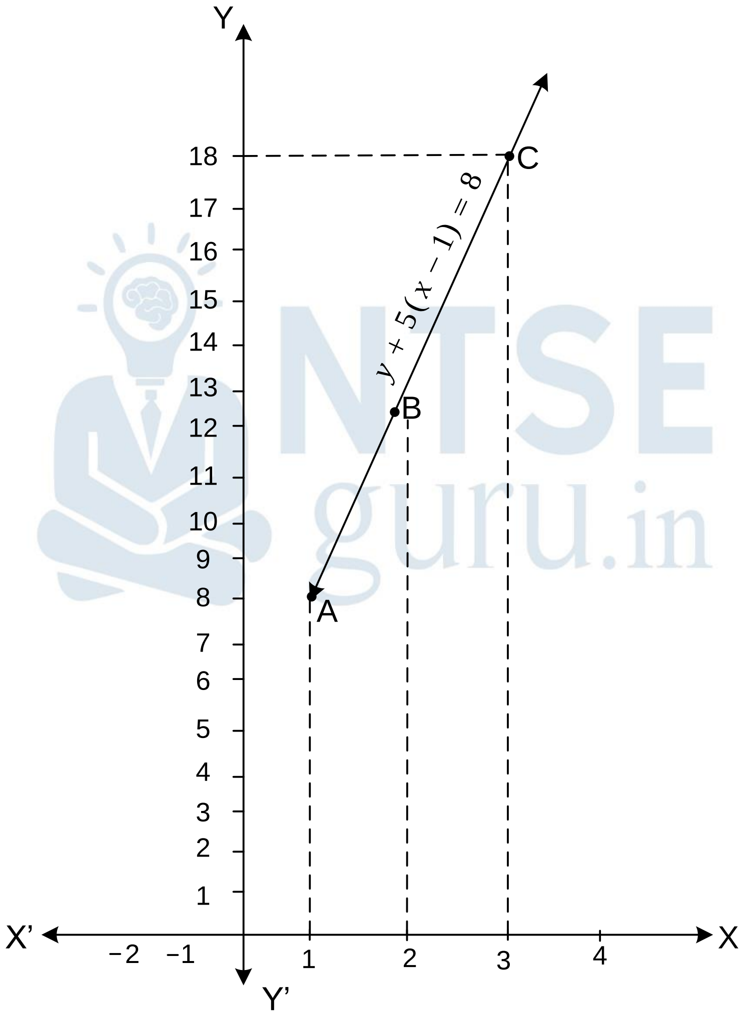
For the graph

Putting $x = 1$, we have $y = 5 \times 1 + 3 = 8$

Putting $x = 2$, we have $y = 5 \times 2 + 3 = 13$

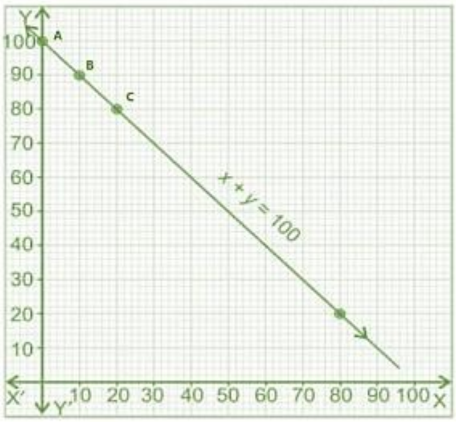
Putting $x = 3$, we have $y = 5 \times 3 + 3 = 18$

Hence, A(1, 8), B(2, 13) and C(3, 18) are solutions of the equation.



8. 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.



Let the contribution by Yamini = Rs. x [Taken on X-axis]

Let the contribution by Fatima = $Rs.\,y$ [Taken on Y-axis]

According to question, $x + y = 100$

$\Rightarrow y = 100 - x$ For the graph:

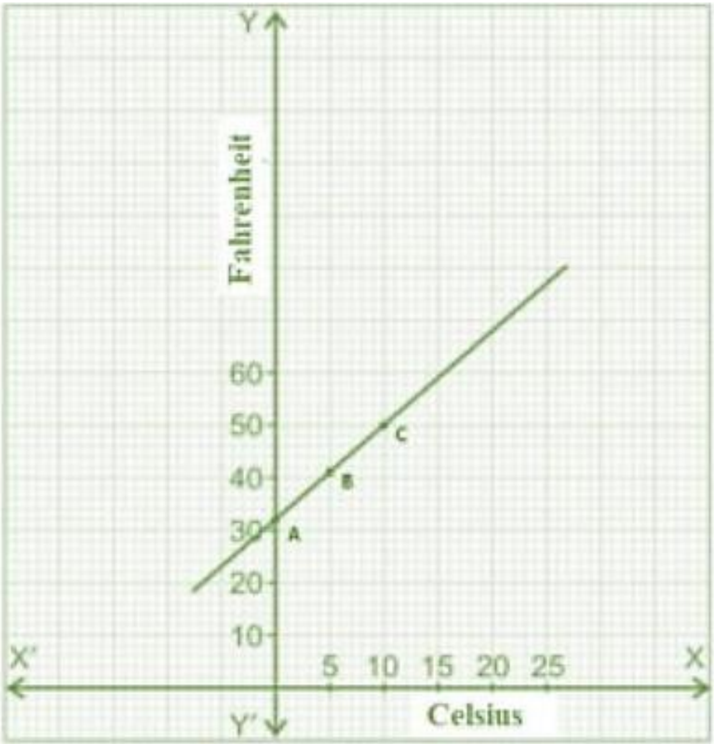
Putting $x = 0$, we have, $y = 100 - 0 = 100$
Putting $x = 10$, we have, $y = 100 - 10 = 90$
Putting $x = 20$, we have, $y = 100 - 20 = 80$
Hence, A(0,100), B(10,90) and C(20,80) are the solutions of equation.

9. 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.

Sol.



(i) Taking Celsius on x-axis and Fahrenheit on y-axis, the linear equation is given by:

$$y=\left(\frac{9}{5}\right)x+32$$

For plotting the graph:

Putting $x=0,$ we have, $y=\left(\frac{9}{5}\right)\times 0+32=32$

Putting $x=5,$ we have, $y=\left(\frac{9}{5}\right)\times 5+32=41$

Putting $x=10,$ we have, $y=\left(\frac{9}{5}\right)\times 10+32=50$

Hence, A(0, 100), B(5, 41) and C(10, 50) are the solutions of the equation.

(ii) If the temperature is $30^{\circ}\mathrm{C}$, then

$$\mathrm{F}=\left(\frac{9}{5}\right)\times 30+32=54+32=86$$

Hence, if the temperature is $30^{\circ}\mathrm{C},$ the temperature in Fahrenheit is $86^{\circ}\mathrm{F}$.

(iii) If the temperature is 95^{o}F, then

$$95=\left(\frac{9}{5}\right)\text{C}+32$$

$$\Rightarrow 95-32=\left(\frac{9}{5}\right)C$$

$$\Rightarrow 63\times\frac{5}{9}=C$$

$$\Rightarrow C=35^{o}$$

If the temperature is 95^{o}F, the temperature in Celsius is 35^{o}C.

(iv) If temperature is 0^{o}C, then

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

If the temperature is 0^{o}F, then

$$0=\left(\frac{9}{5}\right)\text{C}+32$$

$$\Rightarrow -32=\left(\frac{9}{5}\right)\text{C}$$

$$\Rightarrow -32\times\frac{5}{9}=\text{C}$$

$$\Rightarrow -\frac{160}{9}=\text{C}$$

$$\Rightarrow \text{C}=-17.8^{o}$$

If the temperature is 0^{o}C, the temperature in Fahrenheit is 32^{o}F and if the temperature is 0^{o}F, the temperature in Celsius is -17.8^{o}C.

(v) Let x^{o} be the temperature which is numerically the same in both Fahrenheit and Celsius, then

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

$$\Rightarrow x-32=\left(\frac{9}{5}\right)x$$

$$\Rightarrow (x-32)\times 5=9x$$

$$\Rightarrow 5x-160=9x$$

$$\Rightarrow 4x=-160$$

$$\Rightarrow x=-40$$

Hence, -40^{o} is the temperature which is numerically the same in both Fahrenheit and Celsius.

10. Give the geometric representations of $y=3$ as an equation

(i) in one variable

(ii) in two variables

Sol. **(i)** Equation y = 3 can be represented in one variable on number line.

(ii) For two variables representation of $y=3$, we will use Cartesian plane. Now the equation:

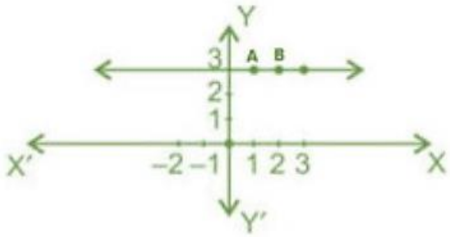
$0.x+y=3$

$\Rightarrow y=3-0.x$

Putting $x=1$, we have, $y=3-0.1=3$

Putting $x=2$, we have $y=3-0.2=3$

Hence, A(1, 3) and B(2, 3) are the two solutions of the given equation.



11. Give the geometric representations of $2x+9=0$ as an equation

(i) in one variable

(ii) in two variables

Sol. **(i)** To represent the equation $2x+9=0$ in one variable, we will use number line.

$2x+9=0$

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

(ii) To represent the equation $2x+9=0$ in two variable, we will use Cartesian plane. Now the equation: $2x+0.\,y=-9$

$\Rightarrow x=\frac{-9-0.y}{2}$

Putting $y=1$, we have $x=\dfrac{-9-0\times1}{2}=-\dfrac{9}{2}$

Putting $y=2$, we have $x=\dfrac{-9-0\times2}{2}=-\dfrac{9}{2}$

Hence, $A\left(-\dfrac{9}{2},1\right)$ and $B\left(-\dfrac{9}{2},2\right)$ are the two solutions of the given equation.