LINEAR EQUATION IN TWO VARIABLES

APPLICATIONS OF LINEAR EQUATIONS IN TWO VARIABLES

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Many practical problems involve relations among unknown and known numbers which can be expressed in the form of mathematical expressions. These problems are often stated in words and it is for this reasons, we often refer to these problems as word problems.

Ex.1 The cost of a 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 notebook = Rs. x

and the cost of a pen = Rs. y

Since the cost of a notebook = Twice the cost of a pen

$x = 2 \times y$

$x - 2y = 0$ is the required equation

Ex.2 The distance covered by a body is directly proportional to time taken if the body is moving with a constant speed. Represent the situation algebraically and graphically when speed of the body is 2 km/hr.

Sol. Here, the variables involved are distance and time.

Let the distance covered be x km and time taken be y hrs.

$x \propto y$

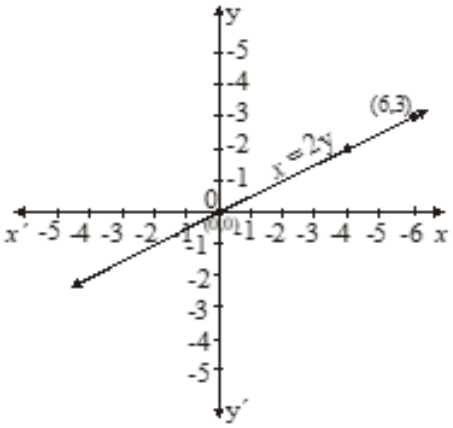
$x = ky$ ...(i)

k is constant (k is speed of the body)

when speed is 2 km/h, equation (i) reduces to $x = 2y$

Now, we draw the line representing $x = 2y$

For this we find its solutions,



From the graph, we see that the distance covered is 6 km when time taken is 3 hours, distance covered is 0 km when time taken is 0 hour.

Ex.3 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 of Yamini and Fatima be Rs x and Rs y respectively.

Then according to the question,

$x + y = 100$

This is the linear equation which the given data satisfies.

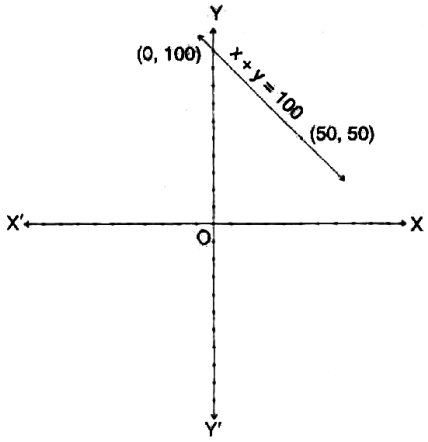
Now, $x + y = 100$

$\Rightarrow y = 100 - x$

Table of solutions

x	0	50
y	100	50

We plot the points (0,100) and (50,50) on the graph paper and join the same by a ruler to get the line which is the graph of the equation $x + y = 100$



Ex.4 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 30º C, what is the temperature of Fahrenheit ?

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

(iv) If the temperature is 0º C, what is the temperature in Fahrenheit and if the Temperature is 0ºF, what is the temperature in Celsius ?

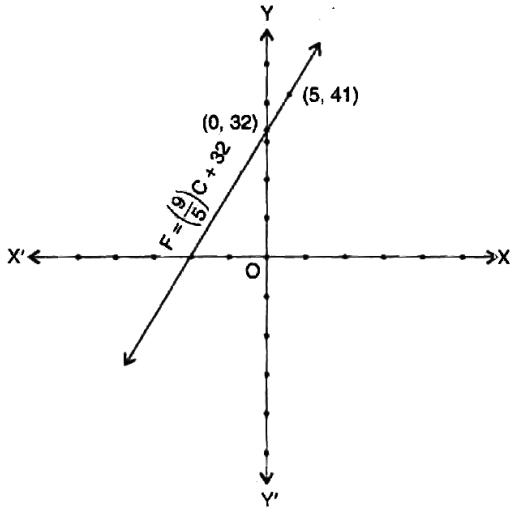
(v) Is there a temperature which is numerically the same in both Fahrenheit and Celsius? If yes, find it ?

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

Table of solutions.

C	0	5
F	32	41

We plot the points (0,32) and (5,41) on the graph paper and join the same by a ruler to get the line which is the graph of the equation $F = \left(\frac{9}{5}\right) C + 32$



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

When C = 30, then $F = \left(\frac{9}{5}\right) + 32 = 54 + 32 = 86$

∴ Required temperature = 86ºF

(iii) When F = 95, then

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

$\Rightarrow \left(\frac{9}{5}\right)C = 63 \quad \Rightarrow C = \frac{63\times5}{9} \quad \Rightarrow C = 35$

Required temperature = 35ºC

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

Required temperature = 32ºF

When F = 0, then

$F = \left(\frac{9}{5}\right)C + 32 \quad \Rightarrow 0 = \left(\frac{9}{5}\right)C + 32 \quad \Rightarrow \left(\frac{9}{5}\right)C = -32$

$\Rightarrow c = -\frac{32\times5}{9} = -\frac{160}{9}$

Required temperature = $-\frac{160}{9}$ º C

(v) Let the temperature be x numerically. Then,

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

$\Rightarrow \left(\frac{4}{5}\right)x = -32 \quad \Rightarrow x = -\frac{32\times5}{4} \quad \Rightarrow x = -40$

Numerical value of required temperature = – 40