Chapter Eight

Graphs And The Straight Line

Linear graphs:

These are straight line graphs and there are two types, which are:

i. Graphs of the form $y = mx$.
ii. Graphs of the form $y = mx + c$.

Graphs of the form $y = mx$:

i. Examples of these graphs are : (a) $y = 3x$ (b) $y = -4x$ (c) $y = 5x$ (d) $y = -7x$
ii. All these graphs pass through the origin or the point (0, 0).
iii. In $y = mx$, m = the slope or the gradient i.e. the number attached to the x is the slope.

Q1. Determine the gradients of the following graphs, with the following equations:

a) $y = 3x$.

Soln.

The slope = 3.

b) $y = -4x$

Soln.

The slope = - 4

c) $y = 4x$

Soln.

The slope = 4

d) $y = -\frac{1}{3}x$

Soln

The slope = $= -\frac{1}{3}$.

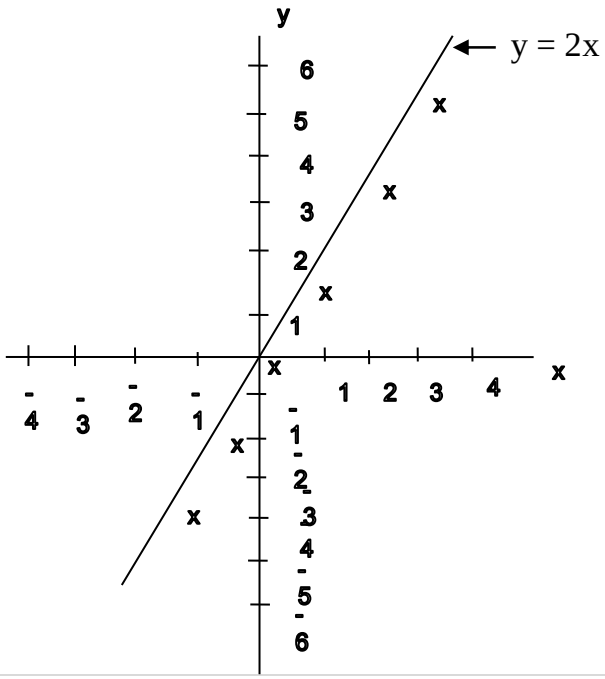
Q2. Using values of *x* from -2 to 3, plot the graph of y = 2*x*.

Soln.

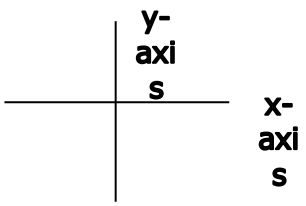
y = 2*x*

X	-2	-1	0	1	2	3
Y	-4	-2	0	2	4	6

1. $If\ x = -2 => y = 2x, => y = 2(-2) => y = -4.$
2. $If\ x = -1 \Longrightarrow y = 2x, => y = 2(-1) \Longrightarrow y = -2.$
3. $If\ x = 0 \Longrightarrow y = 2x, => y = 2(0) \Longrightarrow y = 0.$
4. $If\ x = 1 \Longrightarrow y = 2x, => y = 2(1) \Longrightarrow y = 2.$
5. $If\ x = 2 \Longrightarrow y = 2x, => y = 2(2) \Longrightarrow y = 4.$
6. $If\ x = 3 \Longrightarrow y = 2x, => y = 2(3) \Longrightarrow y = 6.$



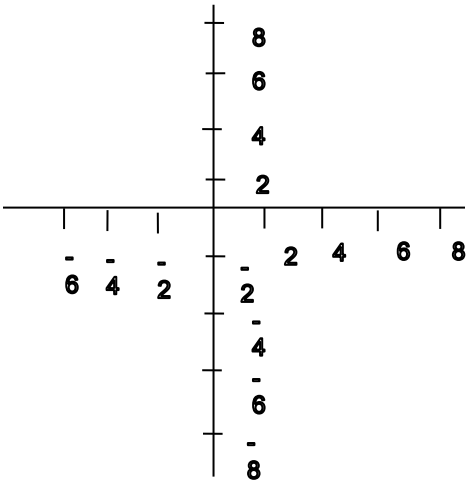
N/B: A graph has two axes and these are the y-axis and the *x*-axis.



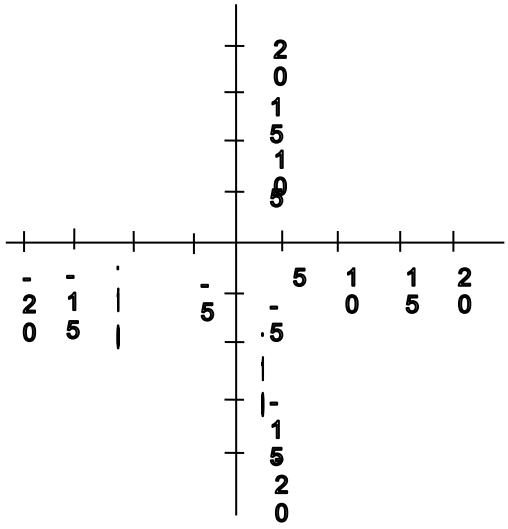
For one particular axis, the intervals used (ie the difference between the numbers written on that axis) must be equal.

We can choose to use the same scale or interval on each of these two axes.

Example (1)

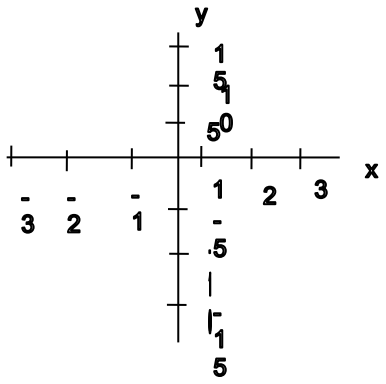


Example (2)

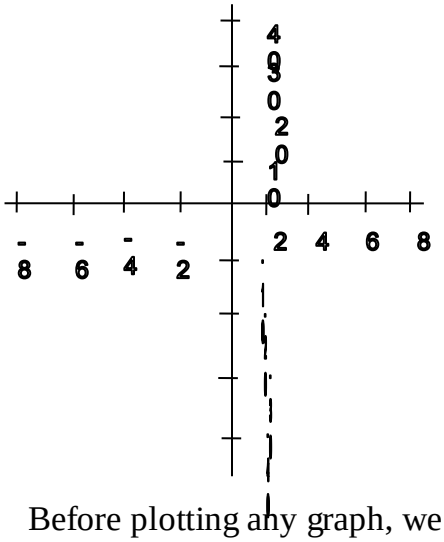


On the other hand, a particular interval or scale can be used on one particular axis, while a different one is used on the other axis.

Example (1)



Example (2)



Before plotting any graph, we must ensure that y is or is made the subject of the equation. This means that y must stand alone on either the right hand side or the left hand side of the equal to sign (i.e =)

Q3.(a) Plot the graph of the equation $y - 5x = 0, for -3 \leq x \leq 2$.

b) Using your graph, find the value of

i) y when x = 2.5. ii) x when y = -10.

Soln.

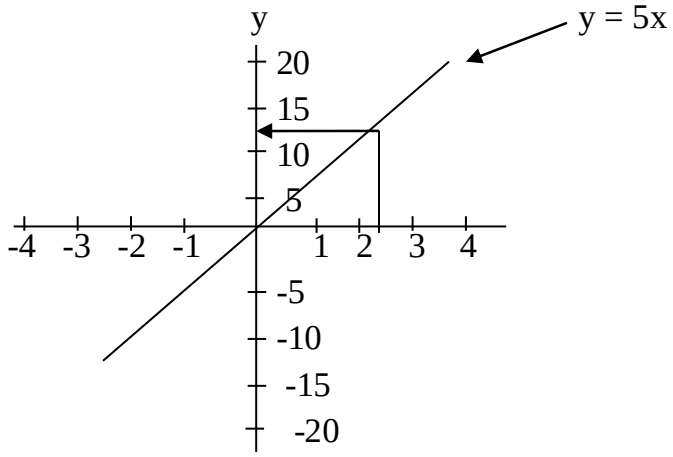
a) $From\ y - 5x = 0 => y = 0 + 5x, => y = 5x.$

Also $-3 \leq x \leq 2 \Rightarrow$ we are to use values of x from -3 to 2.

y = 5*x*.

x	-3	-2	-1	0	1	2
y	-15	-10	-5	0	5	10

1. $If\ x = -3 \Longrightarrow y = 5x, \Longrightarrow y = 5(-3) \Longrightarrow y = -15.$
2.
3. $If\ x = -2 \Longrightarrow y = 5x, \Longrightarrow y = 5(-2) \Longrightarrow y = -10.$
4. $If\ x = -1 \Longrightarrow y = 5x, \Longrightarrow y = 5(-1) \Longrightarrow y = -5.$
5. $If\ x = 0 \Longrightarrow y = 5x, \Longrightarrow y = 5(0) \Longrightarrow y = 0.$
6. $If\ x = 1 \Longrightarrow y = 5x, \Longrightarrow y = 5(1) \Longrightarrow y = 5.$
7. $If\ x = 2 \Longrightarrow y = 5x, \Longrightarrow y = 5(2) \Longrightarrow y = 10.$



b) i. To determine the value of y when x = 2.5, we draw a line from the point x = 2.5 to meet our graph. At the point where it meets the graph, another line is drawn from this point to meet the y-axis and the y value determined. From the graph when x = 2.5, then y = 12.

ii. To determine the value of x when y = -10, we draw a line from the point y = -10 to meet the graph. From the point where it meets the graph, another line is drawn to meet the x-axis as shown in the graph, and the corresponding x value determined, => when y = -10, x = 2.

Q4. The equation of a graph is given as y = -3x.

a) Determine the gradient of this graph.
b) Using values of x from -2 to 2, construct a table for the given relation.
c) Plot the graph for the given relation.
d) From your graph, determine the value of y when x = -1.5.

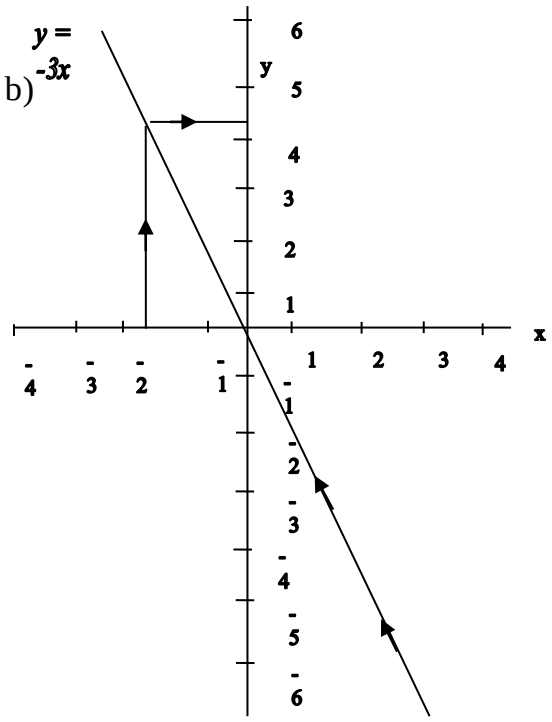
Soln.

a) From y = -3x, the slope = -3.
(b) y = -3x.

X	-2	-1	0	1	2
Y	6	3	0	-3	- 6

1. $If\ x = -2 \Longrightarrow y = -3x, \Longrightarrow y = -3(-2) \Longrightarrow y = 6.$
2. $If\ x = -1 \Longrightarrow y = -3x, \Longrightarrow y = -3(-1) \Longrightarrow y = 3.$
3. $If\ x = 0 => y = -3(0) => y = 0.$
4. $If\ x = 1 => y = -3x, => y = -3(1) \Longrightarrow y = -3.$
5. If $x = 2 \Longrightarrow y = -3x, \Longrightarrow y = -3(2) \Longrightarrow y = -6.$

b)



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(d) From the point x = - 1.5, draw a line to meet the graph, and from this point draw another line to meet the y- axis, as shown in the diagram (graph).

$$=> When\ x = -1.5. then\ y = 4.5$$