Chapter 9: Straight line graphs

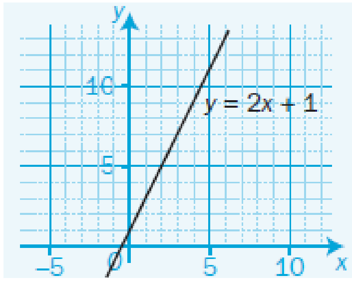
Linear functions can be written in the form $y = mx + c$, where m and c are constants.
A linear function is represented graphically by a straight line, m is the gradients and c is the y-intercept of the graph.

Example 1: Draw the graph of $y = 2x + 1$

Solution:
Step 1: Make a table of values

x	0	2	4
y	1	5	9

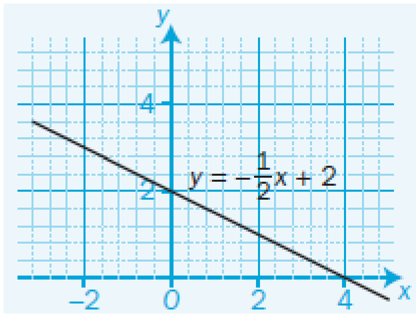
Step 2: Use your table to draw the straight line graph



Example 2: Plot the straight line using the gradient and y intercept

Solution:

Step 1: Mark on the y axis the y-intercept = 2



Step 2: The gradient= $-\dfrac{1}{2}$ so start from the y– intercept for every 1unit across to the right go down by half a unit and mark a second point there.

Step 3: Join the y intercept with the new point with a line and extend form both sides.

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Here are some examples of linear functions not all of them in the form $y = mx + c$. You need to be confident into rearranging the functions making y the subject in order to identify the gradient and y-intercept.

$y = \mathbf{2}x + \mathbf{3}$

gradient= 2

y-intercept= 3

$3x - 2y + 1 = 0$

so $y = \dfrac{3}{2}x + \dfrac{1}{2}$

gradient= $\dfrac{3}{2}$

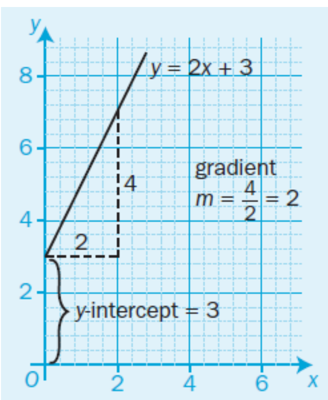
y-intercept= $\dfrac{1}{2}$

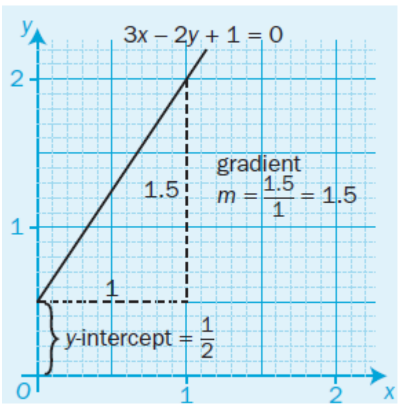
$4y - x = 3$

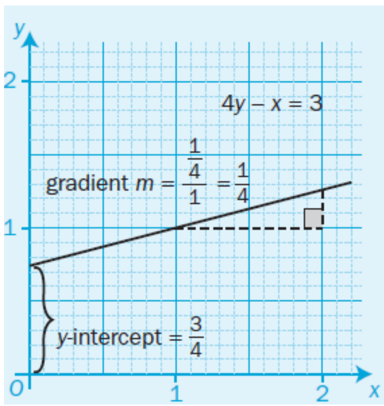
so $y = \dfrac{1}{4}x + \dfrac{3}{4}$

gradient= $\dfrac{1}{4}$

y-intercept= $\dfrac{3}{4}$







To find the y-axis crossing, substitute $x = 0$ into the linear equation and solve for y.
To find the x-axis crossing, substitute $y = 0$ into the linear equation and solve for x.

Example 3: Rewrite the equation $3y - 2x = 5$ into the form $y = mx + c$, find the gradient and the y-intercept
Solution:

Step 1: Add $2x$ to both sides (so that the x term is positive): $3y = 5 + 2x$

Step 2: Divide by 3 both sides: $y = \frac{2}{3}x + \frac{5}{3}$

Step 3: Identify the gradient and y-intercept gradient= $\frac{2}{3}$ y-intercept= $\frac{5}{3}$

Example 4: Find the gradient of the line which passes through the points A (1, 4) and B (-3, 2)

Solution:

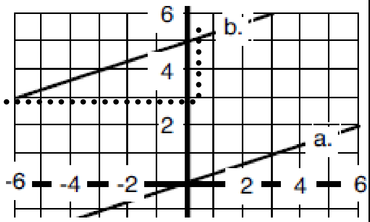
Step 1: Use the x and y values of A (x_1, y_1) and B (x_2, y_2) $m = \frac{2-4}{-3-1} = \frac{-2}{-4} = \frac{1}{2}$

Step 2: find the gradient $m = \frac{y_2 - y_1}{x_2 - x_1}$

Finally you need to be able to find the equation of a line from a graph.

Example 5: Find the equation of the straight line which passes through the point (1, 3) and has gradient 2

Solution:
Step 1: Find where the line crosses the y axis.
This is the y intercept, c.



Line crosses y axis at 5,
so y-intercept c=5

Step 2: Draw a triangle below the line from the intercept to a point you know
And work out the gradient between the two points $m = \frac{y_2 - y_1}{x_2 - x_1}$

Gradient triangle from (-6,3) to (0,5) so $m = \frac{5-3}{0--6} = \frac{2}{6} = \frac{1}{3}$

Step 3: Write in the form $y = mx + c$ $y = \frac{1}{3}x + 5$

Exercise A: Plot the graph of each function taking the given values

a) $y = x - 3$ (x = -2 to 4)

b) $y = -x + 4$ (x = -2 to 5)

c) $y = 2x - 3$ (x = -1 to 5)

d) $y = -3x + 5$ (x = -2 to 3)

Exercise B:
Rewrite the equations below into the form $y = mx + c$, find the gradient and the y-intercept

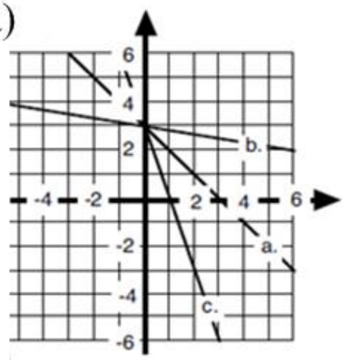
a) $3x - 2y - 2 = 0$ b) $x + 2y - 8 = 0$ c) $5 = 4x - 2y$

Then plot the graph of each equation

Exercise C:
Work out the gradient between the sets of coordinates

a) A (0, 2) and B(3, 6)
b) A (1, 0) and B(3, -2)
c) A (1, -3) and B(2, -4)
d) A (-4, 2) and B(3, 5)
e) A (1, 0.5) and B(5, -2)
f) A (-7, -3) and B(-2, -6)

Exercise D:
Find the equation of these lines in the form

a)


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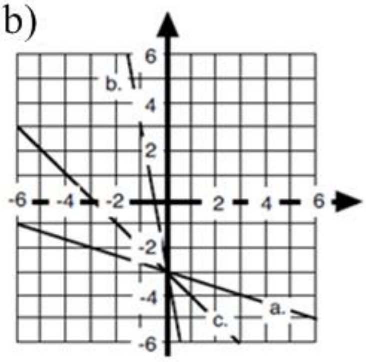
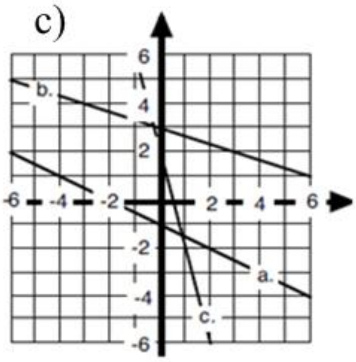


c)


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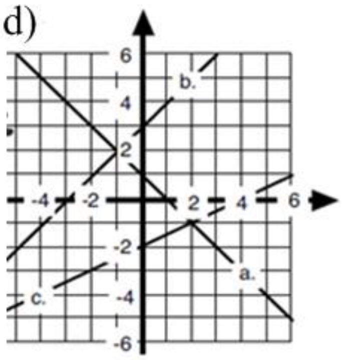

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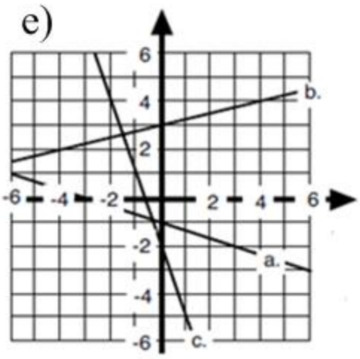

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