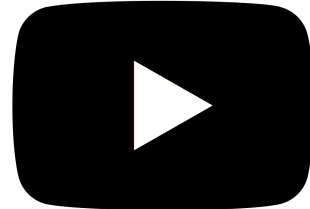# Worksheets

ABC Secondary School
S4 Mathematics
Topic: Equations of Straight Lines

Name: _____ Class: _____ (   )   Date: _____
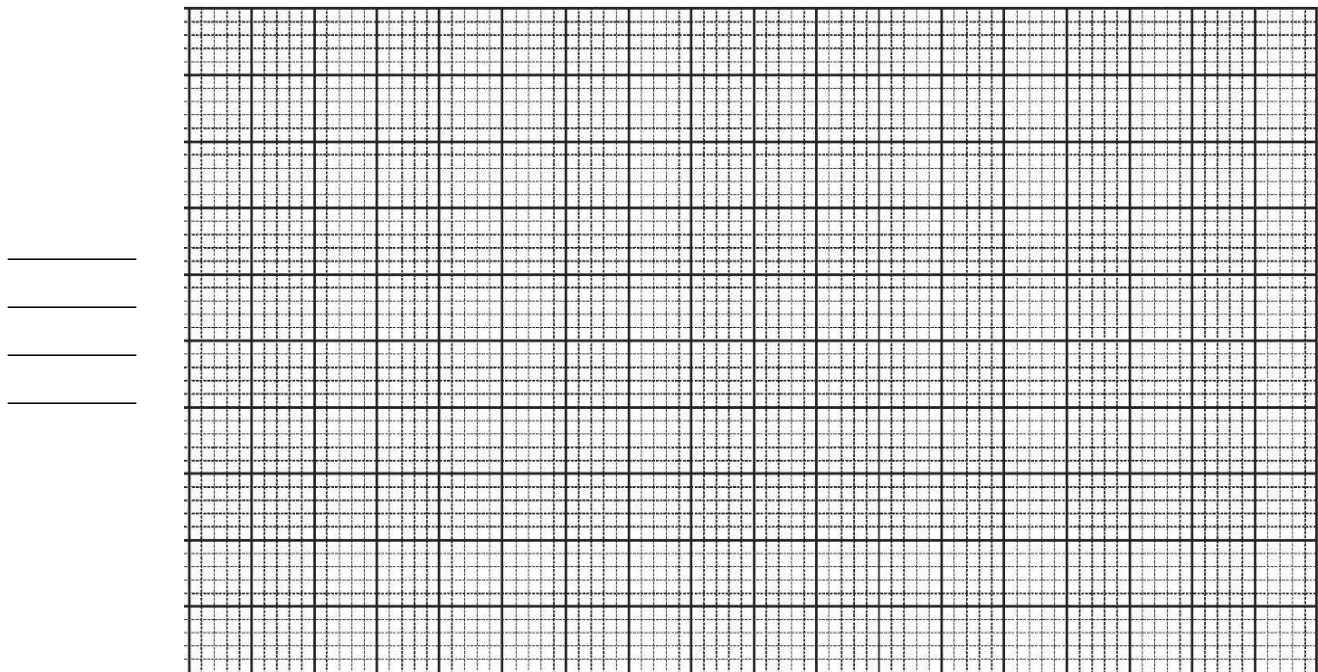
Question 1:

(a) You are planning on starting a YouTube channel. At this moment, you will begin with 0 subscribers, you are keen on becoming the best YouTuber and expect to gain 20 subscribers every 20 days. How many subscribers would you have in the coming 60 days?

(Represent the table below in coordinates below.)

No. of days passed				
No. of subscribers				

_____

_____

(b) Try to plot a line by connecting all the coordinates on the graph above.

(c) By referring to the line you plotted in (b), assuming your channel would continue to grow at the **same rate**, how many subscribers would you expect your YouTube channel to have after 100 days?

(d) Carl said "I will have at least 150 subscribers after 200 days!" Do you agree with his statement? Show your working.

(e) Now use the QR code on the right to access the GeoGebra file, GeoGebra will allow you to plot your graph digitally for the next two tasks.

Question 2:

(a) You currently have $120 in your Octopus Card, each day you have to spend $20 commuting from school to your home. You want to tabulate your expenses for the coming 5 days.

No. of days passed (d)				
Remaining balance (P)	$___	$___	$___	$___

Let d and P be the number of days passed and your Octopus balance respectively.
Set an equation outlining the relationship between d and P.

(b) Chris is an active YouTuber who constantly uploads new videos daily, he has a healthy sum of 20,000 subscribers. For every video he uploads, he gains 5,000 new subscribers. Complete the table below with the information provided above.

No. of new videos uploaded				
No. of subscribers				

Try to illustrate this table in coordinates using GeoGebra!

i) Chris would like to obtain the Silver Play Button, an award given to a YouTuber who reaches 100,000 subscribers. How many videos would Chris need to upload to obtain the Silver Play Button?
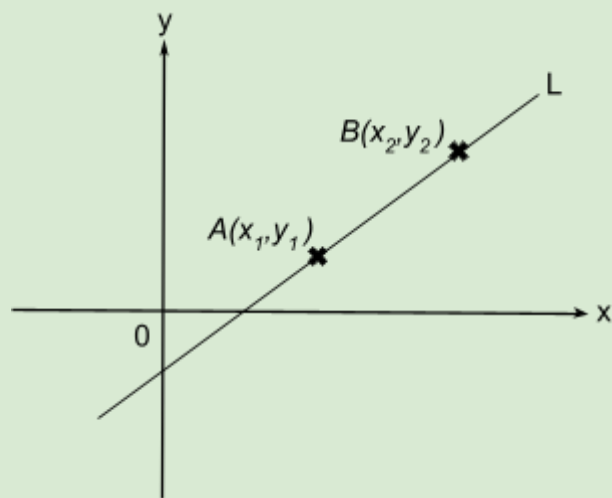
ii) Set an equation outlining the relationship between the number of subscribers of Chris' channel and the number of new videos he uploads **after being awarded the Silver Play Button**.

Slopes of Straight Lines:

The slope of the straight line (L) can be illustrated as follows.

(a) The slope (m) of line L can be found by;

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

iii) If you were to plot a graph based on your equation in (ii) onto the GeoGebra graphing calculator, what would be the value of the slope (rate of change)?
(Recall: Slope $= Vertical\ Distance \div Horizontal\ Distance$)

Hint: You can use any two points on the straight line and calculate its slope.

The rate of change (slope) is _____.

An Equation of a Straight Line:

The equation of a straight line looks like this:
$y = mx + c$

We can also form something *similar* using this equation.

$$m = \frac{y - y_1}{x - x_1}$$

$$(y - y_1) = m(x - x_1)$$

You can use **any** one of the two points on the **same straight line** to form the equation.

1. Find the equation of the straight line passing through Point A (–3, 6) and Point B (1, –8).

Step 1:
Calculate the slope of the two points using the formula below.

Step 2:
Derive the Equation of the straight line using the same formula.

$$m = \frac{y - y_1}{x - x_1}$$

(where m is the slope)

2. Find the equation of the straight line passing through origin and Point C (8, -4).

Multiple Choice Questions (MCQs)

1. A straight line is parallel to the x-axis, which of the following is representative of the equation of its straight line?
   A. $10y = 10x + 10$
   B. $y = -x$
   C. $2y = -2$
   D. $y = -2x - 9$

2. A straight line has a slope of -3. Which of the following equations is **CORRECT** to represent its equation?
   A. $y = 5x + 3$
   B. $y = -6x - 3$
   C. $y = -3x$
   D. $2y = -8x - 3$

Point-Slope Form vs. Slope-Intercept Form

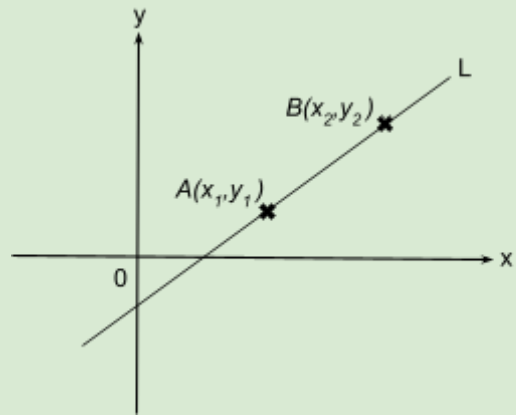We know that we can find the equation of a straight line using the slope formula:

By converting the formula to find slope, we can

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

turn it into something like this:

$$m = \frac{y - y_1}{x - x_1}$$

$$(y - y_1) = m(x - x_1)$$

Look back at question 2(b), we have found an equation of a straight line as stated in 2b(ii).
Now use GeoGebra to look at the equation, you need to zoom out to see the values, click on the line to check the x and y intercepts

What can we notice on GeoGebra? List it out in the following table!

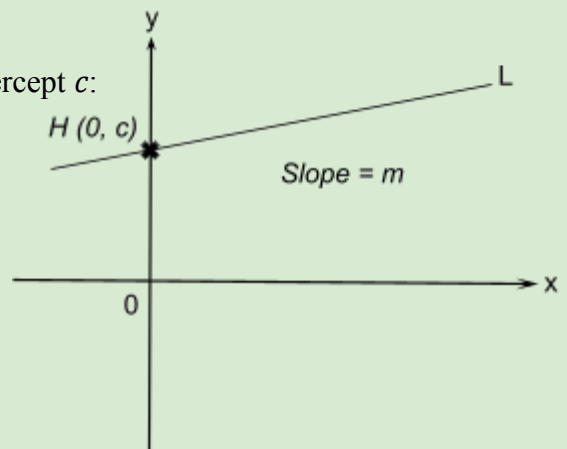| The x-intercept: (Root)	_____
The y-intercept:	_____

Slope-Intercept Form

The equation of a straight line is given by slope (m) and y-intercept c:
$$y = mx + c$$

Using the figure on the right as an example.
We can say that the equation of line (L) can be written as;

$$y = mx + c$$

Let's Try

1. Find the equation of the straight line passing through Point A (−3, 6) and Point B (1, −8).

	Hints
	Step 1: Use the formula $y = mx + c$ where m is the slope and c is the y-intercept.

A general form of the equation of a straight line is expressed in the form below.

$$Ax + By + C = 0$$

A, B and C are all constants and A and B are both non-zero. This is the **general form** of the equation of a straight line.

Let's Try

1. Convert the following equations of straight lines into the general form.

(a) $y = 3x - 2$	(b) $2y = -8x - 3$	(c) $y = \frac{3}{5}x - 15$

2. Can you list out the following items just by looking at the original equation?

Slope: _____	Slope: _____	Slope: _____
y-intercept: _____	y-intercept: _____	y-intercept: _____

Multiple Choice Questions (MCQs)

1. Which one of these is the equation of the straight line passing through A(2 , 3), B(0 , 4)?
   A. $x - y + 4 = 0$
   B. $y = -x + 3$
   C. $x - y + 2 = 0$
   D. $x + 2y - 4 = 0$

2. A(−4 , 1) and B(3 , 5) are points on a straight line L. Find the slope of L.
   A. $-\dfrac{7}{2}$
   B. $\dfrac{2}{7}$
   C. $\dfrac{7}{2}$
   D. $-\dfrac{2}{7}$

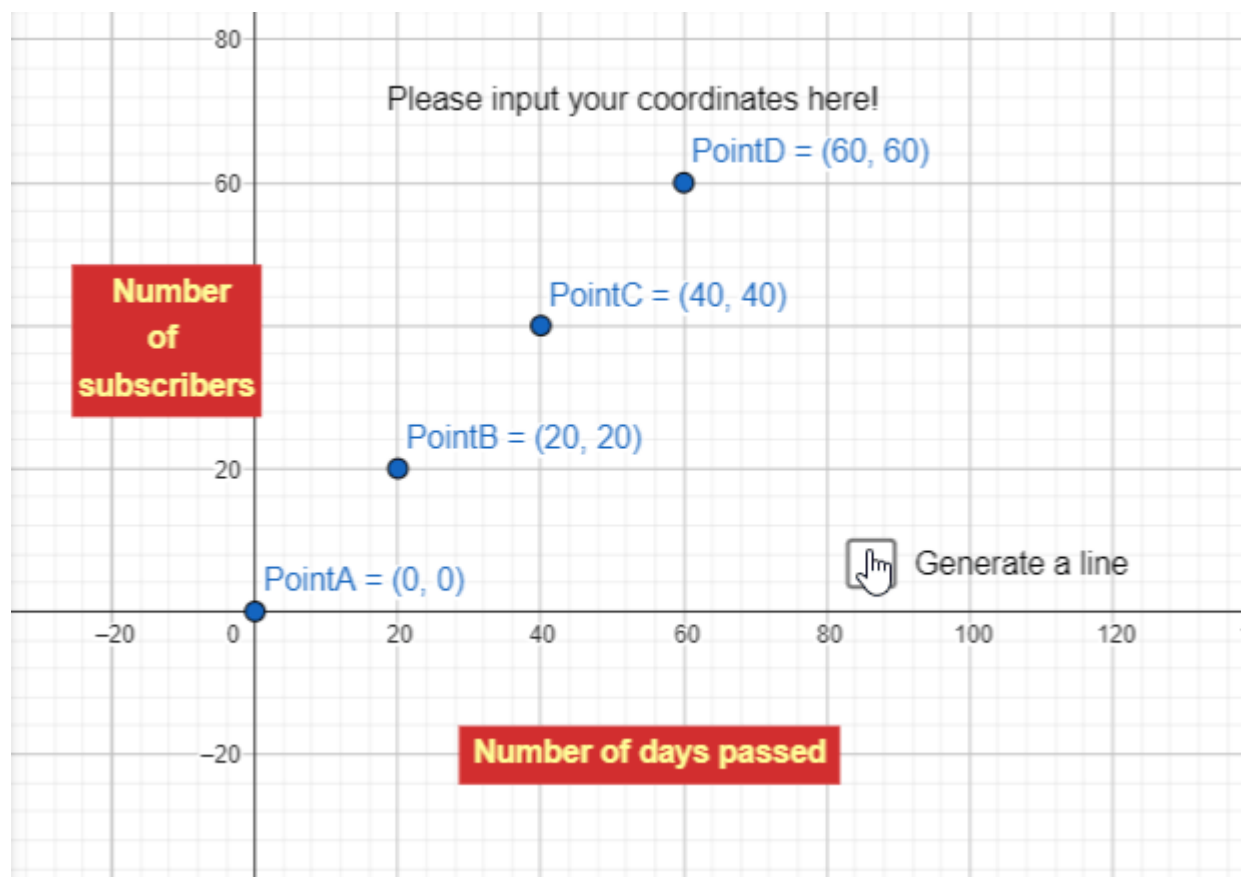**THE END**

How to use GeoGebra Template

Students are able to edit the Points A-D using coordinates.	After inputting the coordinates, the coordinates would be plotted onto the GeoGebra graphing calculator like this;
Number of subscribers Number of days passed Please input your coordinates here! PointA = (0, 0) PointB = (20, 20) PointC = (40, 40) PointD = (60, 60)	Please input your coordinates here! PointD = (60, 60) PointC = (40, 40) PointB = (20, 20) Generate a PointA = (0, 0) **Number of days passed**
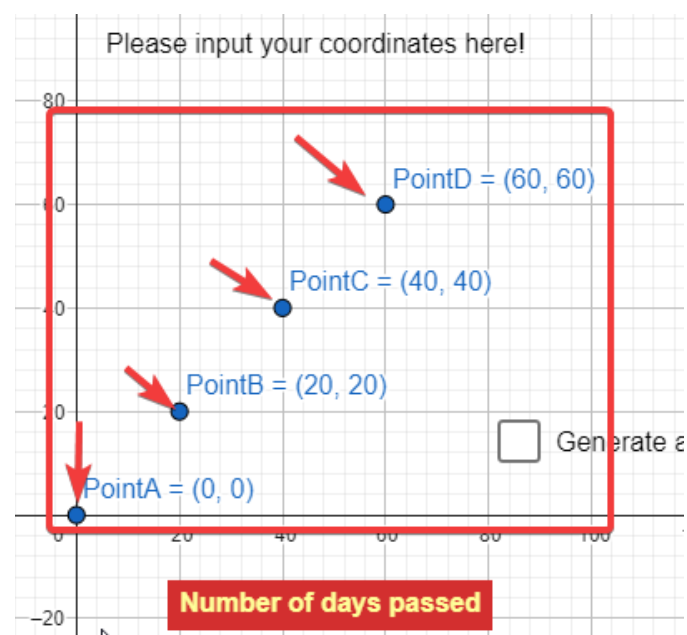
A GIF (Graphics Interchange Format .gif) file has been prepared, please click on the image below to see the "Generate a line" button function built into the GeoGebra template.

Please input your coordinates here!

PointD = (60, 60)

Number of subscribers

PointC = (40, 40)

PointB = (20, 20)

Generate a line

PointA = (0, 0)

Number of days passed

(Alternate Access: *https://img.karndeep.me/84pGcZRuGE.gif*)