

Straight Lines

LET Mathematics & Statistics

This workshop focuses on gradients and the equation of a straight line

1 Gradient

Gradient is the measure of how steep something is. For a straight-line, the gradient is the same throughout, straight-lines do not get steeper or shallower.

The **gradient of a straight-line** is a numerical value that tells you how far up (if a positive value) or down (if a negative value) when you move one unit horizontally to the right. It can be calculated as:

$$\text{Gradient} = \frac{\Delta y}{\Delta x}$$

Δ represents the amount of change.

If the points with coordinates (x_1, y_1) and (x_2, y_2) lie on a straight-line, the gradient will be calculated as:

$$\text{Gradient} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

1. Find the gradient of the straight-line that passes through the points $(1, 1)$ and $(5, 13)$
2. Find the gradient of the straight-line that passes through the points $(2, -1)$ and $(10, 3)$
3. Find the gradient of the straight-line that passes through the points $(5, 18)$ and $(7, 8)$

2 Equation of a Straight Line

The general equation of a straight line is:

$$y = mx + c$$

Here, m is the **gradient of the straight-line** and c is the **y -intercept**, which is the value of y when $x = 0$ and the point on the y -axis where the line crosses it.

Any function that is written in this form, *or can be rearranged to be in this form*, are straight-lines.

4. What is the gradient and y -intercept of the straight-line $y = 5x + 1$
5. What is the gradient and y -intercept of the straight-line $y = 15 - 2x$
6. What is the gradient and y -intercept of the straight-line $4y = 4x + 12$
7. What is the gradient and y -intercept of the straight-line
 $4x - 2y - 9 = 0$
8. What is the gradient and y -intercept of the straight-line $2x + 3y = -7$

3 Finding the Equation of a Straight-Line

If you have two points on a straight-line, you can find its equation by:

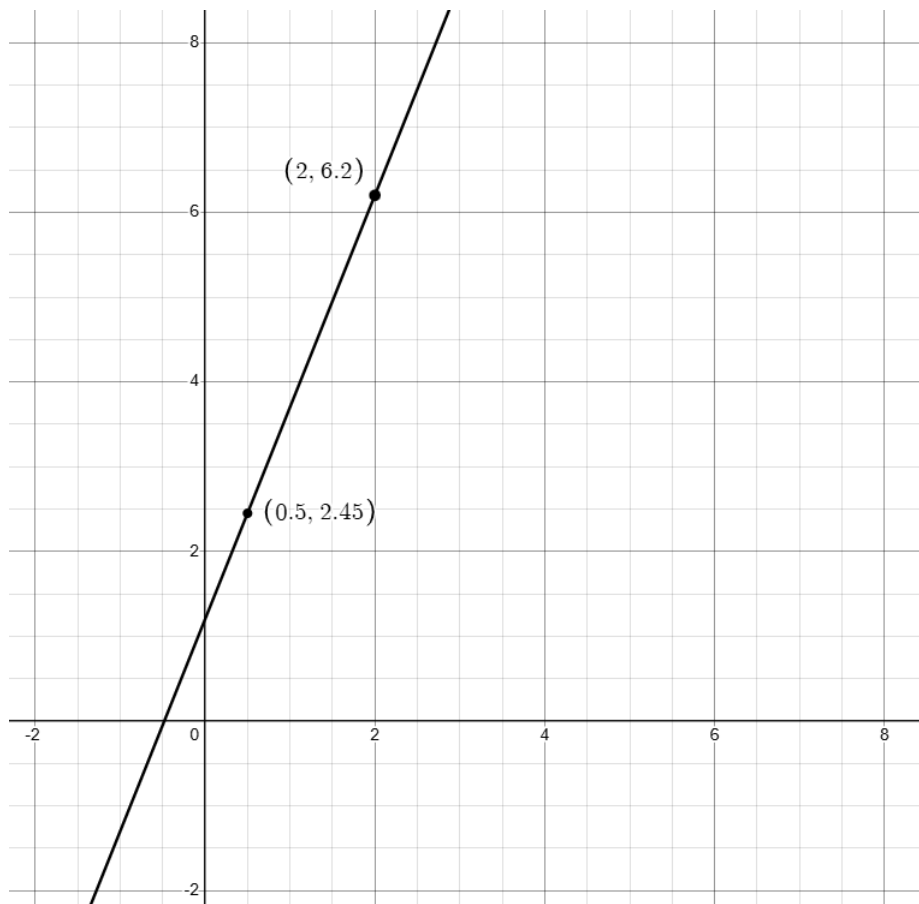
Step 1: Find the gradient between the two points

Step 2: Writing the partial answer $y = mx + c$, using your value of the gradient for m

Step 3: Substitute either of the coordinates in for x and y into $y = mx + c$ and solve for c

9. Find the equation of the straight-line that passes through the points (1,6) and (3,10)
10. Find the equation of the straight-line that passes through the points (5,12) and (12,-9)

11. Find the equation of the straight-line shown in the image below



12. Use your answer from question 11 to write the equation of this line in the form

$$ax + by + c = 0$$

Where a , b , and c are all integers (whole numbers).