

# Year 9 Autumn 2

## KEYWORDS:

- Gradient** A measure of how steep the straight line is (also known as slope). The bigger the gradient, the steeper the line.
- Y Intercept** Where a line crosses the y-axis of a graph
- Parallel lines** Two lines that are always the same distance apart and never meet
- Perpendicular line** Two lines which meet at a right angle (90 degrees)

- Horizontal Line** A straight line that goes from left to right across the graph
- Vertical Line** A straight line that goes from top to bottom of the graph
- Midpoint** The middle point on a straight line which is equidistant (the same distance) from each end point
- Equation of a line**  $Y = mx + c$

## Equation of a line

$$y = mx + c$$

$m$  is the **gradient** of the line.

$c$  is the **y-intercept**

For example, the line  $y = 3x + 4$  has a gradient of **3** and crosses the y-axis at the point  $(0, 4)$ .

The line  $y - 5x = 7$  is not in the form  $y = mx + c$ , so needs to be rearranged first to  $y = 5x + 7$  then you can see this line has a gradient of **5** and crosses the y-axis at the point  $(0, 7)$ .

Videos 207-213

## Gradient of a line

$$\text{Gradient} = \frac{\text{change in } y}{\text{change in } x}$$

Positive gradient

Negative gradient

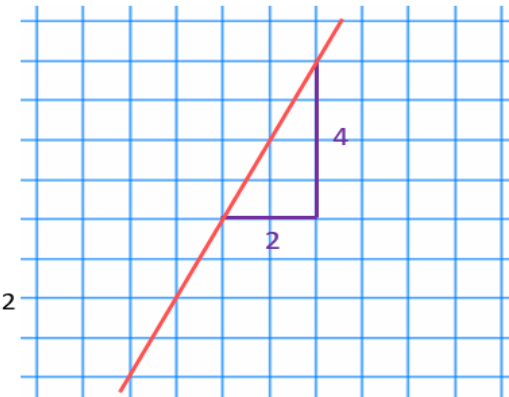
What is the gradient of this line?

Step 1: draw a triangle using the grid lines

Step 2: use the formula

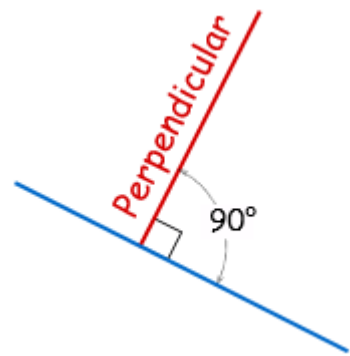
$$\text{Gradient} = \frac{\text{squares up}}{\text{squares across}}$$

Gradient of the red line =  $4 \div 2 = 2$

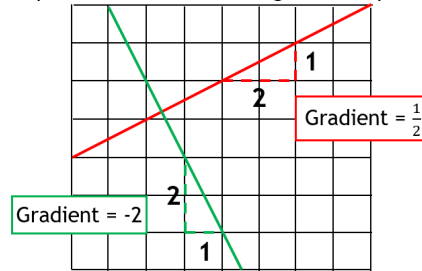


Videos 201-204

## Parallel & Perpendicular Lines



Perpendicular Gradient - Negative Reciprocal



Find the equation of the line that is parallel to the line  $y = 4x - 22$  that passes through the point  $(3, 14)$

$$\begin{aligned} m &= 4 & y &= mx + c \\ x &= 3 & 14 &= 4 \times 3 + c \\ y &= 14 & 14 &= 12 + c \\ & & 14 - 12 &= c \\ & & 2 &= c \end{aligned}$$

$$y = 4x + 2$$

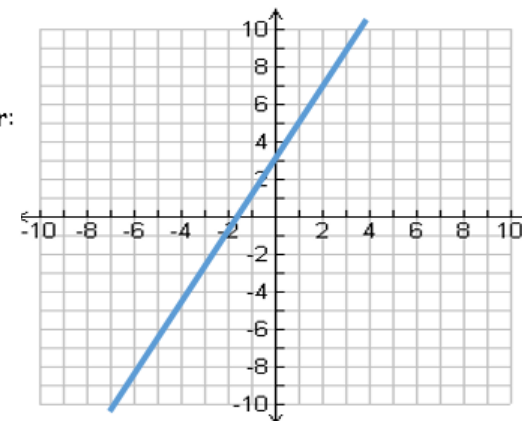
Parallel lines have **gradients** that are **equal**

Videos 214-216

## Table of Values

Suppose we want to plot points for:

$$y = 2x + 3$$



We can use a table as follows:

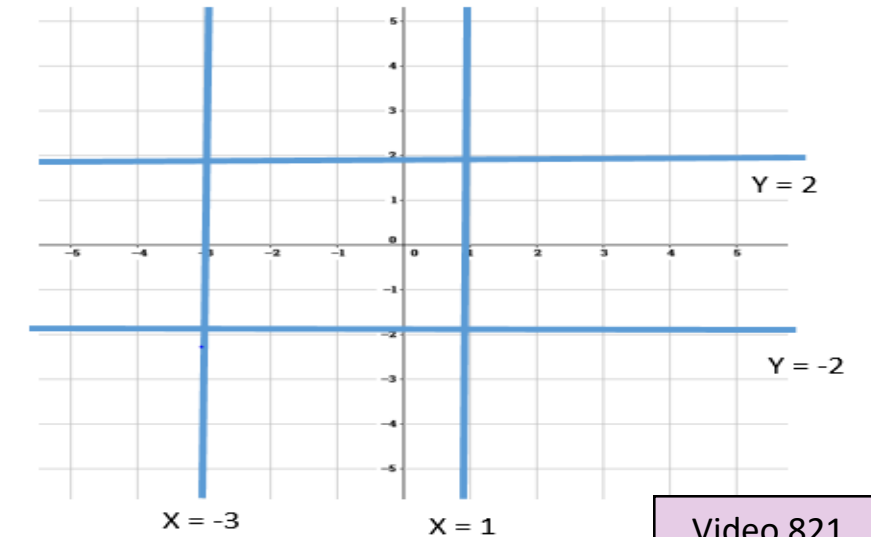
x	-3	-2	-1	0	1	2	3
2x	-6	-4	-2	0	2	4	6
$Y = 2x + 3$	-3	-1	1	3	5	7	9

$\downarrow$   $(-3, -3)$     $\downarrow$   $(-2, -1)$     $\downarrow$   $(-1, 1)$     $\downarrow$   $(0, 3)$     $\downarrow$   $(1, 5)$     $\downarrow$   $(2, 7)$     $\downarrow$   $(3, 9)$

Video 206

## Horizontal and Vertical Lines

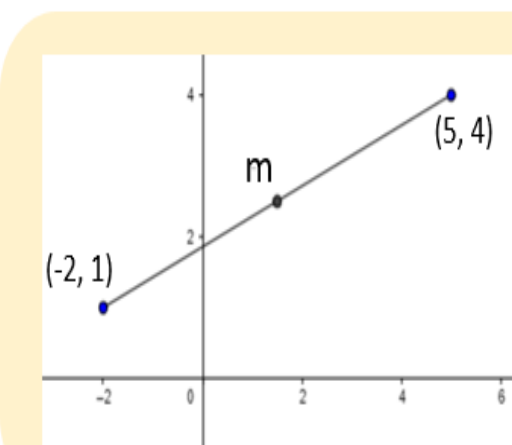
- Horizontal Lines (lines that go across) – always have the equation  $y = ?$
- Vertical Lines (lines that go down) – always have the equation  $x = ?$



Video 821

## Midpoint of a Line

$$\text{Midpoint} = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$



$$\begin{aligned} m &= \left( \frac{-2 + 5}{2}, \frac{1 + 4}{2} \right) \\ &= \left( \frac{3}{2}, \frac{5}{2} \right) \\ &= (1.5, 2.5) \end{aligned}$$

Video 200

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