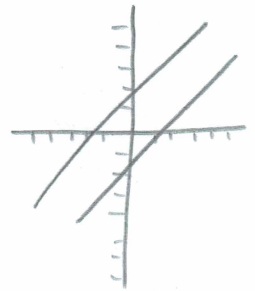


Parallel lines

Parallel lines have the same slope (m) and never intersect (cross)

If you are asked to prove two lines are parallel you need to find the slope of both lines and show they are the same.



For example:

Question - Prove that the line b and line d are parallel

line b has the points $(2,3)$ and $(5,8)$

line d has the points $(5,6)$ and $(8,11)$

$$\text{line } b \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\begin{array}{cc} x_1, y_1 & x_2, y_2 \\ (2, 3) & (5, 8) \end{array}$$

$$\frac{8-3}{5-2}$$

$$m = \frac{5}{3}$$

$$\text{line } d \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$\begin{array}{cc} x_1, y_1 & x_2, y_2 \\ (5, 6) & (8, 11) \end{array}$$

$$\frac{11-6}{8-5}$$

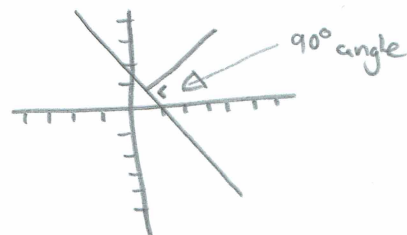
$$m = \frac{5}{3}$$

$$m \text{ of line } b = m \text{ of line } d$$

(therefore) $\therefore$ line b and d are parallel.

Perpendicular lines

Two lines are perpendicular when they intersect at a 90° angle.



In an exam you might be asked two types of questions

* **TYPE 1** * - Find the slope of a line perpendicular to line d which has the co-ordinates (2,3) (5,8)

STEP 1 Find the slope of line d:

$$\begin{matrix} x_1, y_1 & x_2, y_2 \\ (2, 3) & (5, 8) \end{matrix}$$

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

$$\frac{8-3}{5-2} = \frac{5}{3}$$

STEP 2 Flip the slope and change the sign

$$\frac{5}{3} \rightarrow \frac{3}{5} \text{ (and change the sign)} \quad -\frac{3}{5} \quad \boxed{\text{Ans } -\frac{3}{5}}$$

* **TYPE 2** *

Prove that the lines X and Y are perpendicular

line X has points (-1,2) (3,4)

line Y has points (4,-2) (3,0)

STEP 1 Find the slopes of both lines

$$\begin{matrix} \text{line X} \\ \frac{4-2}{3-(-1)} = \frac{2}{4} = \frac{1}{2} \end{matrix}$$

$$\begin{matrix} \text{line Y} \\ \frac{0-(-2)}{3-4} = \frac{+2}{-1} = -\frac{2}{1} \end{matrix}$$

STEP 2 MULTIPLY the two slopes and if they equal -1, the two lines are perpendicular ($\perp$)

$$\frac{1}{2} \times -\frac{2}{1} = \frac{-2}{2} = -1$$

$\therefore$ lines X & Y are perpendicular.