## Distance Formula

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

This equation is used to find the distance between two points $(x_1, y_1$ and $x_2, y_2)$ on a graph that uses the Cartesian system of co-ordinates.
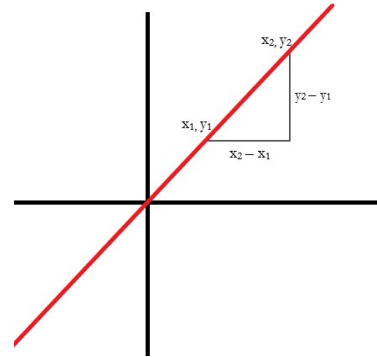
For example, if we wanted to find the distance between $(9,3)$ and $(5,6)$, we would need to use the distance formula.

We can say that $x_1 = 9$, $x_2 = 5$, $y_1 = 3$ and $y_2 = 6$

$$d = \sqrt{(5-9)^2 + (6-3)^2}$$

$$d = \sqrt{(-4)^2 + (3)^2}$$

$$d = \sqrt{25} = 5$$

### Proof

Using Pythagoras' Theorem

$$hypotenuse^2 = opposite^2 + adjacent^2$$

Distance, d, is the hypotenuse

$$d^2 = opposite^2 + adjacent^2$$

Length of opposite is $x_1 - x_2$, length of adjacent is $y_1 - y_2$

$$d^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$$

Squaring both sides gives

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

### See also
- Pythagoras' Theorem

### References
Attwood, G. et al. (2017). *Edexcel AS and A level Mathematics - Pure - Year 1*. London: Pearson Education. p.100.