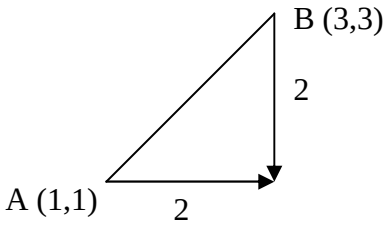
# Finding the Midpoint of a Line

To work out the midpoint of line
we need to find the halfway point

Midpoint of AB = (2,2)




The formula for the midpoint is:-

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

*Where* $(x_1, y_1)$ and $(x_2, y_2)$ are 2 given points on the line

*Example* 1. If A(3,7) and B(11, − 3) Find the midpoint of AB

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

$$= \left( \frac{3 + 11}{2}, \frac{7 + -3}{2} \right)$$

$$= \left( \frac{14}{2}, \frac{4}{2} \right)$$

$$= (7,2)$$

Diameter of circles are often used in this topic because the midpoint will always be the centre of the circle.

*Example 2.* *If A(2,3) and B is(5,9) and the centre of the circle. If AC is the diameter of the circle find the coordinates of C*

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

$$(5, 9) = \left( \frac{2 + x}{2}, \frac{3 + y}{2} \right)$$

$$\therefore\ 5 = \frac{2 + x}{2} \qquad \text{and} \qquad 9 = \frac{3 + y}{2}$$

$$10 = 2 + x \qquad 18 = 3 + y$$

$$8 = x \qquad 15 = y$$

$$\therefore\ C = (5,15)$$

$$\text{if } x = \frac{10}{4} \qquad \text{then} \qquad y = -x - 1$$

$$y = -\frac{10}{4} - 1$$

$$y = -3{\cdot}5$$

$\therefore$ The Centre of the circle is $(2.5, -3.5)$