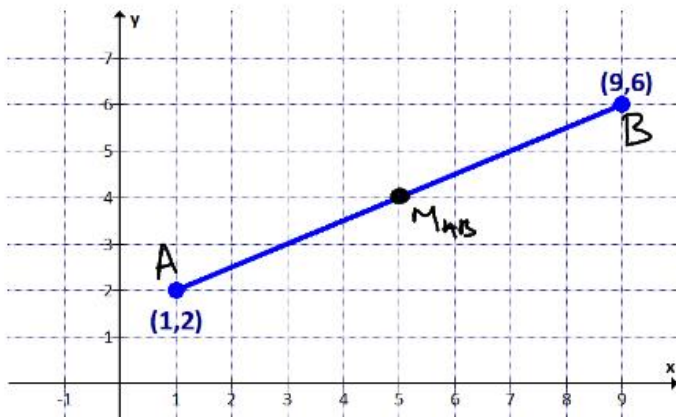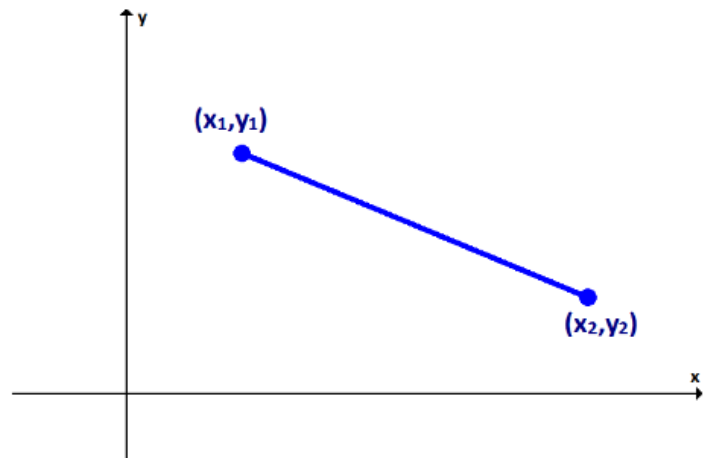**Midpoint of a Line Segment**

What are the coordinates of the midpoint of segment AB?

How can you determine the midpoint algebraically given the coordinates of the endpoint?

The coordinates of the midpoint of a line segment are found by taking averages:

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

$$M_{AB} = \left(\frac{1+9}{2}, \frac{2+6}{2} \right)$$

$$= (5, 4)$$

Ex. 1 Find the midpoint of the line segment AB where A(2,-4) and B(-3,5).

$$M_{AB} = \left(\frac{-3+2}{2}, \frac{5+(-4)}{2} \right)$$

$$= \left(-\frac{1}{2}, \frac{1}{2} \right)$$

Ex. 2 C(4, -3) is the midpoint of a line segment with endpoints A(7, 5) and B. Determine the coordinates of B.

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

$$x_m = \frac{x_1 + x_2}{2}$$

$$4 = \frac{7 + x_2}{2}$$

$$8 = 7 + x_2$$

$$1 = x_2$$

$$y_m = \frac{y_1 + y_2}{2}$$

$$-3 = \frac{5 + y_2}{2}$$

$$-6 = 5 + y_2$$

$$y_2 = -11$$

$$\therefore B(1, -11)$$

Ex.3 The ⟨diameter⟩ of a circle has endpoints A(4, -3) and B (-3, 5).
Find the centre of the circle.

$$M_{AB} = \left(\frac{4+(-3)}{2}, \frac{-3+5}{2} \right)$$

$$= \left(\frac{1}{2}, 1 \right)$$

∴ Centre of the circle is $\left(\frac{1}{2}, 1 \right)$