

Exercise walk-through

Coordinates ■ E3.1

eXercise

You must be able to

- plot and read coordinates (x, y)
- find the length of a segment using Pythagoras
- find the midpoint of a segment

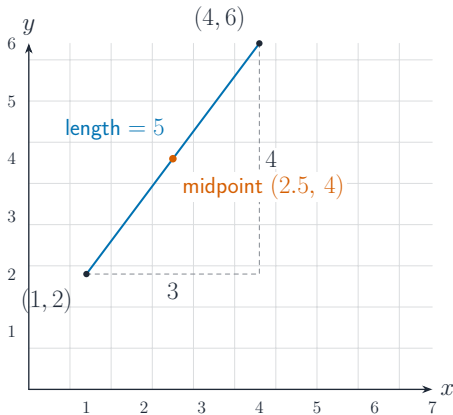
Method — Length and midpoint

$$\text{length} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \quad \text{midpoint} = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

■ **Worked** (1, 2) to (4, 6): length = $\sqrt{3^2 + 4^2} = 5$; midpoint = (2.5, 4).

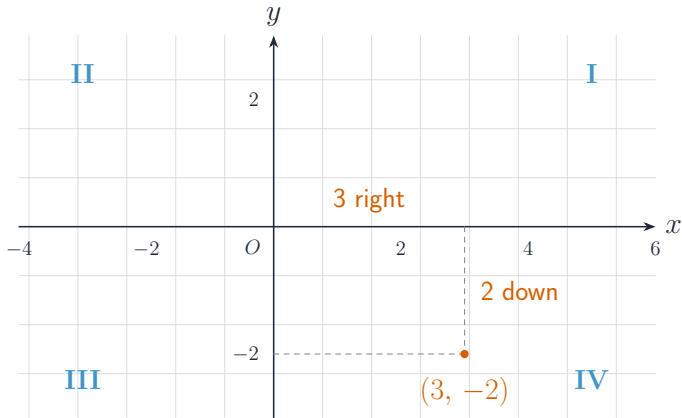
Answer shapes: **M1** a correct method, **A1** the correct answer.

Method — Length and midpoint



A right triangle gives the length; the midpoint is the average of the coordinates

Method — Length and midpoint



Points are plotted on the coordinate plane

Practice 2.1 ■ 2 marks

Find the midpoint of the segment joining $(2, 3)$ and $(6, 9)$.

Solution 2.1

Worked steps

$$\left(\frac{2+6}{2}, \frac{3+9}{2}\right) = (4, 6) \quad \text{M1 A1 for the midpoint method; for } (4, 6).$$

Practice 2.2 ■ 2 marks

Find the length of the segment from $(0, 0)$ to $(3, 4)$.

Solution 2.2

Worked steps

$$\sqrt{3^2 + 4^2} = \sqrt{25} = 5 \quad \text{M1 A1 for } \sqrt{9 + 16}; \text{ for } 5.$$

Practice 2.3 ■ 1 mark

Write down the coordinates of the point 3 left and 2 up from the origin.

Solution 2.3

Method: Length and midpoint

Worked steps

$(-3, 2)$ **B1**.

Exam-style 3.1 ■ 2 marks

$A = (1, 1)$ and $B = (7, 9)$.

- (a) Find the midpoint of AB .
- (b) Find the length of AB .

Solution 3.1

Method: Length and midpoint

Worked steps

$$\begin{aligned} \text{(a)} \quad \left(\frac{1+7}{2}, \frac{1+9}{2}\right) &= (4, 5) \quad \text{M1 A1}. & \text{(b)} \quad \sqrt{(7-1)^2 + (9-1)^2} &= \sqrt{36 + 64} = \\ \sqrt{100} &= 10 \quad \text{M1 A1} \text{ for } 10. \end{aligned}$$

Exam-style 3.2 ■ 2 marks

$M(3, 5)$ is the midpoint of PQ . Given $P = (1, 2)$, find the coordinates of Q .

Solution 3.2

Method: Length and midpoint

Worked steps

if M is the midpoint, $Q = (2 \times 3 - 1, 2 \times 5 - 2) = (5, 8)$ **M1** **A1** *for using the midpoint relationship; for $(5, 8)$.*