

# Starter: Length, Gradients & Mid-Points

$A(-2,9)$  and  $B(3,-3)$

Mid-Point?

Gradient?

Length AB?

Perpendicular gradient?

Finding the gradient of a line

To find the gradient,  $m$ , of the line joining the points  $(x_1, y_1)$  and  $(x_2, y_2)$  use ...

$$\text{Gradient, } m = \frac{y_2 - y_1}{x_2 - x_1}$$

Finding the length of a line

To find the length of the line joining the points  $(x_1, y_1)$  and  $(x_2, y_2)$  use ...

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

Finding the midpoint of a line

To find the midpoint of the line joining the points  $(x_1, y_1)$  and  $(x_2, y_2)$  use ...

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

Finding the perpendicular gradient to a line

To find the perpendicular gradient,  $m_1$  to the line joining the points  $(x_1, y_1)$  and  $(x_2, y_2)$  you need to find the gradient of the line itself,  $m$ . Then use the fact that:

$$m \cdot m_1 = -1$$

*(i.e. find the negative reciprocal)*

Do . . .

The coordinates  $A(-3,-3)$ ,  $B(-1,2)$ ,  $C(4,4)$  and  $D(2,-1)$  are plotted on a graph.

Prove that they form a rhombus.

Think . . .

How have you shown the quadrilateral is definitely a rhombus and not a square?

Do . . .

Find the area of the rhombus formed by joining the points  $A$ ,  $B$ ,  $C$  and  $D$ .

Think . . .

How could drawing the diagonals on a sketch help you?

Do . . .

Prove that the diagonals of the rhombus are perpendicular bisectors of each other.

Think . . .

What is the product of two perpendicular gradients?

Justify . . .

Is it possible to draw one circle which passes through all four coordinates? Explain your answer

Think . . .

What is the least you would need to do in order to prove four coordinates formed a trapezium?

# Task: Equations of Lines

- Pick three coordinates
- Find the equations of the perpendicular bisectors for each pair of coordinates
- Find where these three lines intersect
- What do you notice?