

4.4.4 Coordinate Geometry

Name: _____ Class: _____ Date: _____

KEY WORDS midpoint

<!-- Session 2 native-skill companion -->

Objective

Practise coordinate geometry within the labelled native lessons. Public original tasks; locally authored answer guidance.

1 Key knowledge and worked examples

■ Geometric reasoning on coordinate axes · Foundation

Find horizontal or vertical length by subtracting coordinates; use Pythagoras for a diagonal. Midpoint coordinates are averages of the endpoints. Equal coordinate changes identify translations. To prove a quadrilateral property, justify side directions and lengths, rather than naming a shape from its appearance.

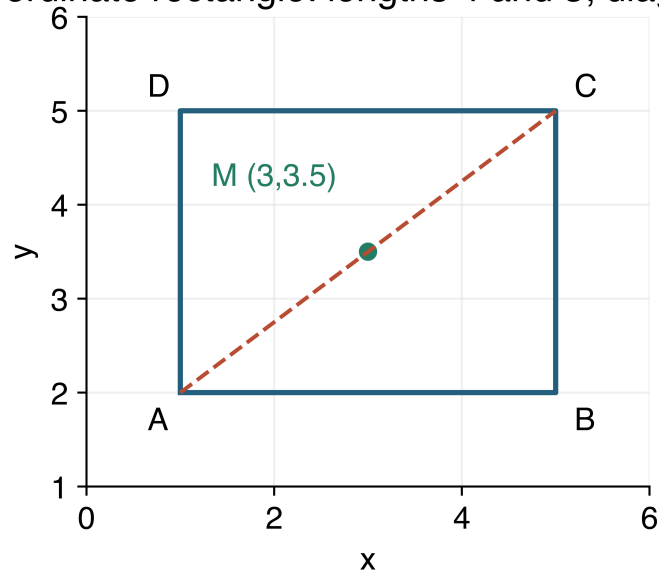
$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$$

For A=(1,2), B=(5,2), C=(5,5), D=(1,5), AB=4 and BC=3. AB is horizontal, BC vertical, so they are perpendicular; opposite sides have matching directions and lengths, establishing a rectangle. Diagonal AC has length $\sqrt{(4^2+3^2)}=5$. Its midpoint is $((1+5)/2, (2+5)/2)=(3,3.5)$. Diagonal BD has the same midpoint, confirming that the diagonals bisect each other. A translation by (2,-1) sends A to (3,1) and C to (7,4), preserving the diagonal length. A square would additionally need adjacent side lengths equal; these lengths 4 and 3 exclude it.

A coordinate difference can be negative even though a length is nonnegative. The diagonal is not the sum of the two edge lengths. One pair of equal sides alone does not establish a rectangle.

AQA G11 solves geometric problems on axes. Keep point labels, coordinate arithmetic and geometric reasons linked in the written argument; use the diagram to choose a method, then verify it numerically.

Coordinate rectangle: lengths 4 and 3; diagonal 5



Original native-lesson illustration; labels belong to its worked example.

2 Practice

2.1 (Foundation) Find AB for $A=(1,2)$, $B=(5,2)$.

2.2 (Foundation) Find AC for $A=(1,2)$, $C=(5,5)$.

2.3 (Foundation) Find the x-coordinate of the midpoint of AC.

3 Exam-style questions

3.1 Decide whether this claim is true. Justify with a concrete calculation or counterexample: Every quadrilateral with two equal diagonals is a square.

Solutions

2.1 Same y: horizontal distance $|5-1|=4$.

2.2 Pythagoras gives $\sqrt{4^2+3^2}=5$.

2.3 Average the x-coordinates: $(1+5)/2=3$.

3.1 False. A 3 by 4 rectangle has two diagonals of length 5 but unequal adjacent sides, so it is not a square.

Local review guidance: show the chosen method; give the checked result; explain the condition or failed shortcut. This is authored classroom guidance.