



Lines, shapes and coordinates

- Classifying quadrilaterals by their geometric properties
- Calculating the midpoint of a line segment
- Knowing the parts of a circle

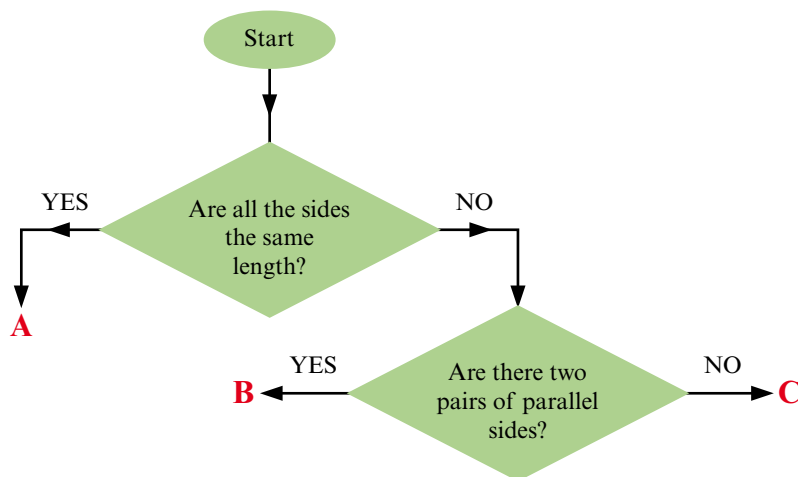
Keywords

You should know

explanation 1

1 Look at this flow chart. It shows a possible way to classify quadrilaterals.

- a** Which category contains arrowheads?
- b** Name the two shapes that belong to **A**.
- c** Do either of the shapes in **A** have just one pair of parallel sides?
- d** Are there any shapes in **B** that have all sides the same length?
- e** Are there any rectangles in **A**? Explain your answer.
- f** Are there any rectangles in **C**? Explain your answer.
- g** Are there any squares in **B**? Explain your answer.
- h** Name the two shapes that belong to **B**.



2 Which quadrilaterals always have each property?

- a** All sides are the same length.
- b** All angles are the same size.
- c** Opposite sides are equal.
- d** Opposite angles are equal.
- e** There are two pairs of parallel sides.
- f** There is only one pair of parallel sides.
- g** Diagonals are of the same length.
- h** The diagonals intersect at right angles.
- i** There is only one line of reflection symmetry.
- j** There are two lines of reflection symmetry.
- k** There are four lines of reflection symmetry.
- l** It has rotational symmetry of order 2.



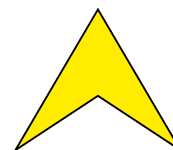
square



rectangle



kite



arrowhead



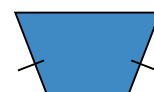
rhombus



parallelogram



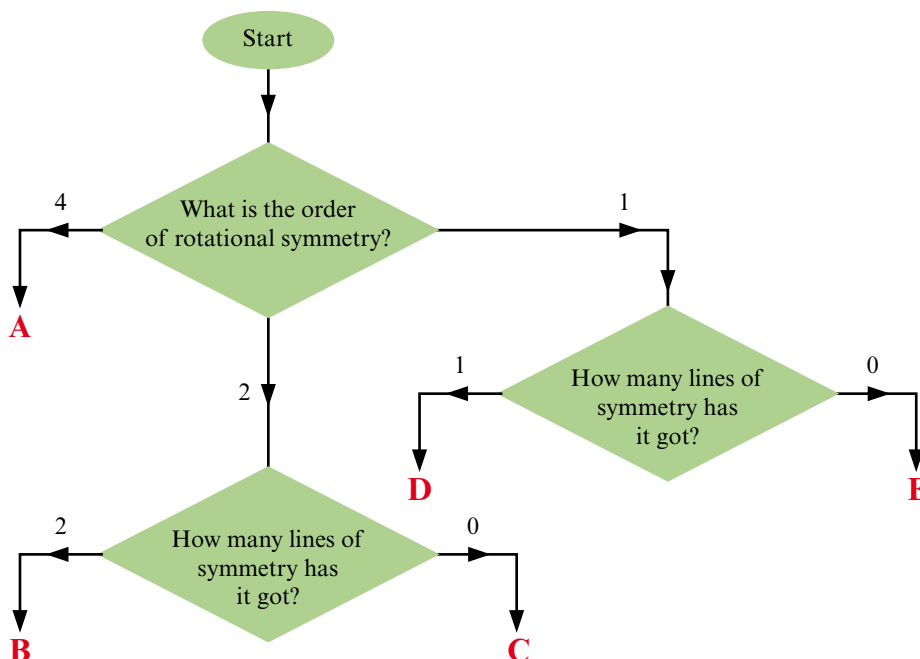
trapezium



isosceles trapezium

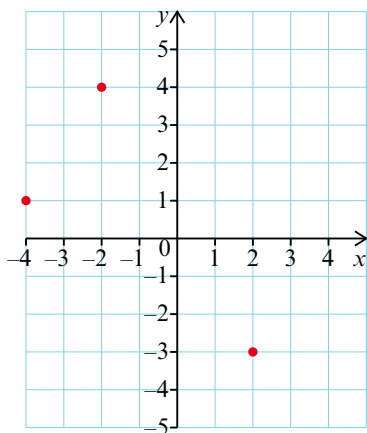
3 Look at this flow chart. It shows a possible way to classify the quadrilaterals according to their symmetry properties.

Write a shape that could be in each tray. Use your answers to question **2**, and other properties of quadrilaterals, to help you.

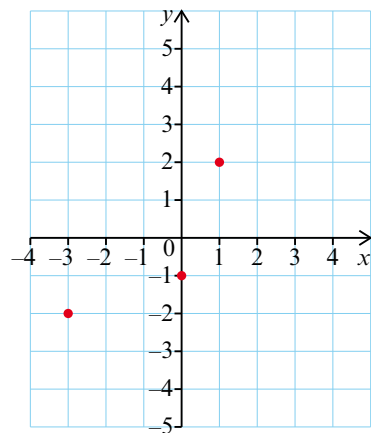


- 4** In each grid, three vertices of a quadrilateral are plotted.
Write down all the possible coordinates of the fourth vertex.

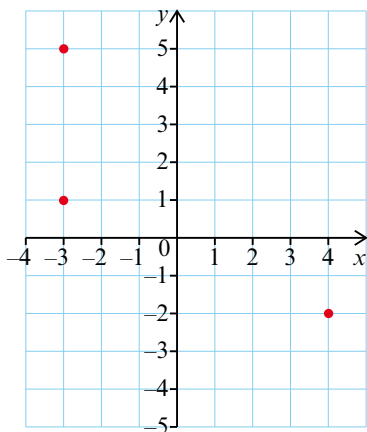
a A rectangle



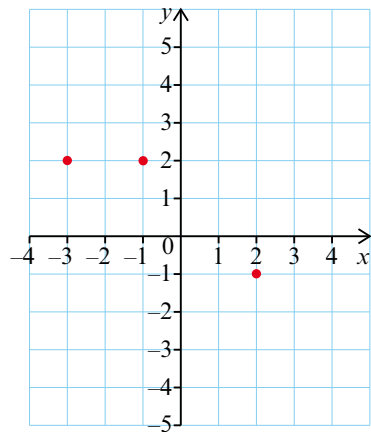
b A rhombus



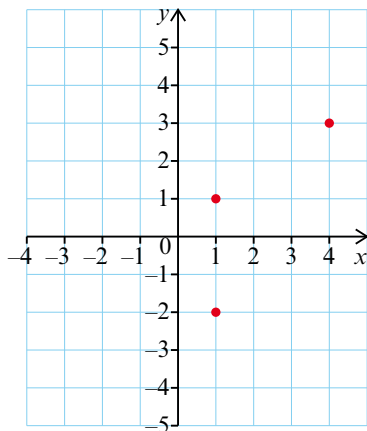
c A kite



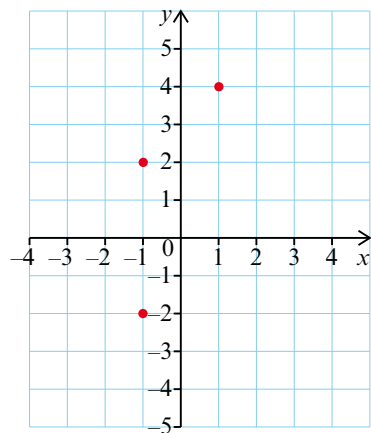
d An arrowhead



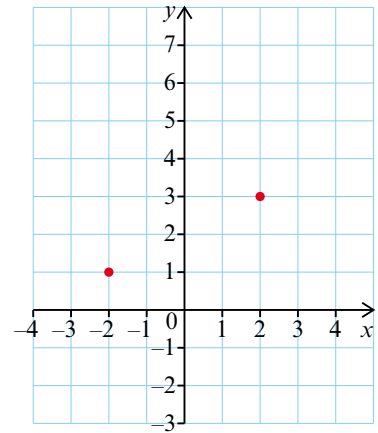
e A parallelogram



f An isosceles trapezium that contains the origin $(0, 0)$



- 5** The diagram shows two vertices of a square. Find all the possible positions of the other two vertices. Write their coordinates.



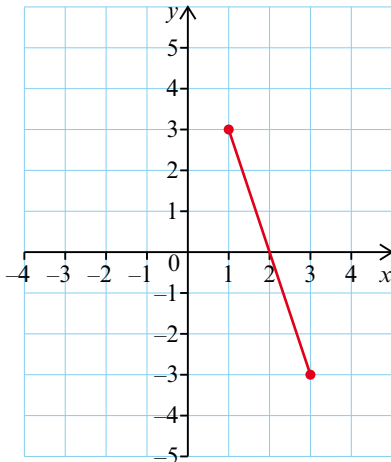
explanation 2a

explanation 2b

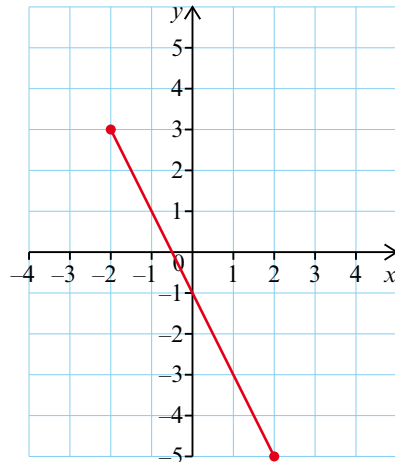
explanation 2c

- 6** Write the coordinates of the midpoint of each line segment.

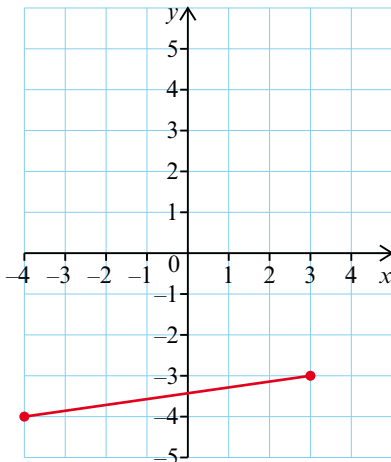
a



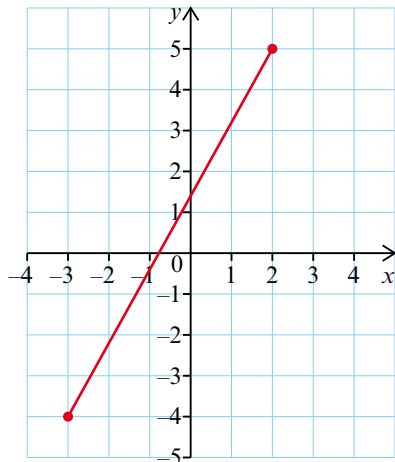
b



c



d



- 7** These are the coordinates of the end points of line segments.
Calculate the coordinates of the midpoint of each line segment.
- a** (2, 4) and (4, 8) **b** (0, 2) and (6, 2) **c** (2, -3) and (-1, 6)
- 8** Point M is the midpoint of line segment AB. The coordinates of points A and M are given. In each case, calculate the coordinates of point B.
- a** A(1, 2), M(5, 3) **b** A(-2, 1), M(4, -1) **c** A(3, -8), M(1, -4)

explanation 3a

explanation 3b

- 9** Draw a circle with radius 5 cm.
Mark two points P and Q on the circumference so that $PQ = 10$ cm.
- a** What is line PQ called?
- b** Mark another point R on the circumference of the circle.
Draw the lines PR and QR. Measure the angle PRQ.
- c** Repeat part **b** for some other positions of point R on the circumference.
What do you notice about the angle PRQ each time?
- 10** Draw a circle with radius 5 cm. Mark a point A on the circumference.
Mark another point B on the circumference so that $AB = 5$ cm.
- a** What is the line AB called?
- b** Mark a point C on the major arc of the circle and draw lines AC and BC.
Measure angle ACB. Is it acute or obtuse?
- c** Repeat part **b** for some other positions of the point C on the major arc.
What do you notice about the size of angle ACB?
- d** Mark a point D on the minor arc of the circle and draw lines AD and BD.
Measure the angle ADB. Is it acute or obtuse?
- e** Repeat part **d** for some other positions of point D on the minor arc.
What do you notice about the size of angle ADB?
- f** What do you notice about the sum of angles ACB and ADB?
Does it depend on where points C and D are?
- g** Jacqui draws a quadrilateral by joining up any four points on the circumference of a circle.
What do you expect the sum of opposite angles to be?
Explain your answer. Check your answer by drawing and measuring.