

Properties of 2D Shapes

Solutions

For AQA GCSE Mathematics (8300) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (1 mark)

A polygon has 8 sides.

What is the name of the polygon?

Circle your answer.

Options: Pentagon, Hexagon, Octagon, Decagon

Pentagon: 5 sides

Hexagon: 6 sides

Octagon: 8 sides

Decagon: 10 sides

Answer: Octagon

2 (3 marks)

Tick one box for each statement.

	True	False
A rhombus has four equal sides	✓	
A trapezium always has two pairs of parallel sides		✓
A kite always has at least one line of symmetry	✓	
Every square is a rectangle	✓	
The diagonals of a rectangle always cross at right angles		✓

A rhombus has four equal sides: true.

A trapezium has only **one** pair of parallel sides: false.

A kite always has a line of symmetry along one of its diagonals: true.

A square has four right angles and opposite sides equal, so it is a special rectangle: true.

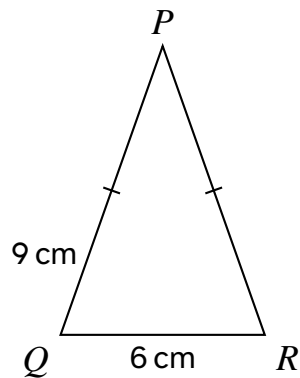
The diagonals of a rectangle are equal, but they only cross at right angles if it is a square: false.

Answer: True, False, True, True, False

Marks: 3 marks for all five correct. 2 marks for four correct. 1 mark for three correct.

3 (3 marks)

The diagram shows an isosceles triangle PQR .



Not drawn accurately

The triangle and a regular pentagon have the same perimeter.
Work out the length of one side of the pentagon.

The marks show that $PQ = PR$, so $PR = 9$ cm.

Perimeter of the triangle = $9 + 9 + 6 = 24$ cm

A regular pentagon has 5 equal sides.

One side of the pentagon = $24 \div 5 = 4.8$ cm

Answer: 4.8 cm

Tip: The dashes on PQ and PR mean these sides are equal. A common mistake is to add only the two lengths shown ($9 + 6 = 15$).

Marks: 1 mark for $PR = 9$ or $9 + 9 + 6$. 1 mark for $24 \div 5$. 1 mark for 4.8.

4 (1 mark)

A regular hexagon has a perimeter of 42 cm.
Work out the length of one side.

A regular hexagon has 6 equal sides.

$$42 \div 6 = 7 \text{ cm}$$

Answer: 7 cm

5 (2 marks)

- (a) Write down the name of a quadrilateral with exactly one pair of parallel sides.

A trapezium has exactly one pair of parallel sides.

Answer: Trapezium

- (b) Write down the name of a triangle with no equal sides.

A scalene triangle has no equal sides (and no equal angles).

Answer: Scalene

6 (1 mark)

Circle the order of rotational symmetry of a regular hexagon.

Options: 1, 2, 3, 6

Turn the hexagon through one full turn.

It looks exactly the same 6 times (once every 60°).

So the order of rotational symmetry is 6.

Answer: 6

7 (2 marks)

Write down the number of lines of symmetry of

- (a) a rectangle

A rectangle has one vertical and one horizontal line of symmetry through its centre.

The diagonals are **not** lines of symmetry.

Answer: 2

Tip: Fold a rectangle of paper along a diagonal: the two halves do not match. So the answer is not 4.

(b) an equilateral triangle

There is one line from each corner to the middle of the opposite side.

That makes 3 lines of symmetry.

Answer: 3

8 (1 mark)

Ella says,

‘A square is not a rhombus, because a rhombus has slanted sides.’

Is Ella correct? Tick a box.

Give a reason for your answer.

A rhombus is any quadrilateral with four equal sides.

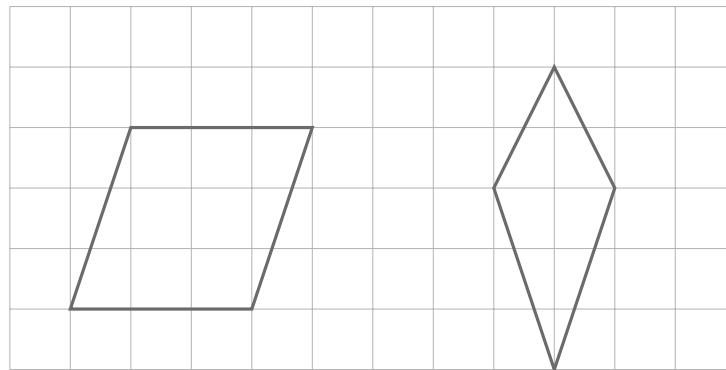
It does not have to have slanted sides.

A square has four equal sides, so a square is a special type of rhombus.

Answer: No, a square has four equal sides so it is a rhombus

9 (2 marks)

Here is a grid. Example answers:



- (a) On the grid, draw a parallelogram that is not a rectangle.

A parallelogram has two pairs of parallel sides.

So that it is not a rectangle, make sure the angles are not 90° .

See the shape on the left of the grid.

Answer: Any correct parallelogram

- (b) On the same grid, draw a kite.

A kite has two pairs of equal sides that are next to each other.

One diagonal is a line of symmetry.

See the shape on the right of the grid.

Answer: Any correct kite

Tip: Use a ruler and count squares carefully so that the equal sides really are equal.

10 (3 marks)

Tick one box for each shape to show how many pairs of parallel sides it has.

	0	1	2	3
Isosceles triangle	✓			
Trapezium		✓		
Rhombus			✓	
Regular hexagon				✓
Parallelogram			✓	

Isosceles triangle: no two sides are parallel, so 0.

Trapezium: exactly one pair of parallel sides, so 1.

Rhombus: opposite sides are parallel, so 2 pairs.

Regular hexagon: each side is parallel to the side opposite it, so 3 pairs.

Parallelogram: opposite sides are parallel, so 2 pairs.

Answer: 0, 1, 2, 3, 2

Tip: A pair of parallel sides is two sides, so a shape with 4 parallel sides has 2 **pairs**. Sketch the regular hexagon to see its 3 pairs.

Marks: 3 marks for all five correct. 2 marks for four correct. 1 mark for three correct.

11 (2 marks)

Here are some statements about a parallelogram.

Which **two** statements are always true?

Tick two boxes.

In a parallelogram, opposite sides are parallel and equal in length ✓

Opposite angles are equal ✓

The diagonals are only the same length if it is a rectangle.

A parallelogram has no lines of symmetry (unless it is a rectangle or a rhombus).

The angles are only all 90° if it is a rectangle.

Answer: Opposite angles are equal. Opposite sides are equal in length.

Tip: Sketch a slanted parallelogram to test each statement. A statement that is only true for a rectangle is not **always** true.

Marks: 2 marks for both correct and no others. 1 mark for one correct.

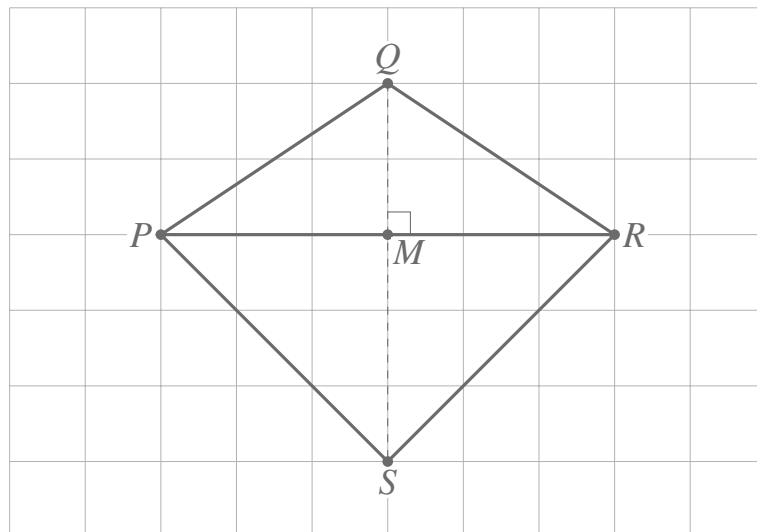
12 (4 marks)

$PQRS$ is a quadrilateral.

Its diagonals PR and QS cross at the point M .

- M is the midpoint of PR
- QS is perpendicular to PR
- Q is above PR and $QM = 2$ cm
- $MS = 3$ cm

(a) Draw $PQRS$ on the centimetre grid.



M is the midpoint of PR . PR is 6 cm, so M is 3 squares from P .

QS is perpendicular to PR , so QS is a vertical line through M .

$QM = 2$ cm, so Q is 2 squares above M .

$MS = 3$ cm, so S is 3 squares below M .

Join P to Q , Q to R , R to S and S to P .

Answer: See diagram

Tip: The diagonals are PR and QS , so go round the shape in order P, Q, R, S . Do not join P to R as a side.

Marks: 1 mark for M at the midpoint of PR with QS perpendicular to PR . 1 mark for Q and S at the correct distances from M . 1 mark for a fully correct quadrilateral.

(b) Write down the mathematical name of quadrilateral $PQRS$.

$PQ = QR$ and $PS = SR$ (two pairs of equal sides next to each other).

QS is a line of symmetry.

So it is a kite.

Answer: Kite