# GCSE MATHEMATICS

# Properties of Quadrilaterals
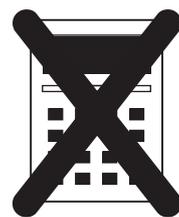
**AQA** These questions have been taken or modified from previous AQA GCSE Mathematics Papers.

## Instructions
- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Answer **all** questions.
- You must answer the questions in the spaces provided.
- If your calculator does not have a π button, take the value of π to be 3.14 unless another value is given in the question.

## Information
- The marks for questions are shown in brackets.
- The quality of your written communication is specifically assessed in questions that are indicated with an asterisk (*).

## Advice
- Read each question carefully before you start to answer it.
- In all calculations, show clearly how you work out your answer.
- Use the number of marks for the question as a guide to the amount of time you need to spend.
- Look at previous parts of the question, e.g. a), b), c) i) as there may be information there you need to answer later parts.
- Check your answer is realistic and appropriate.
- For calculator decimal numbers always write your full calculator display in the working out area and then, if you need to, round the answer on the answer line.

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**1** Tick (✓) or cross (×) the properties of the quadrilaterals shown.
The square has been done as an example.

**[4 marks]**

|  | Property | | | | |
|---|---|---|---|---|---|
|  | **Diagonals cross at right angles** | **One pair of equal opposite angles** | **All sides equal** | **Exactly one line of symmetry** | **Rotational symmetry of order 2** |
| **Square** | ✓ | × | ✓ | × | × |
| **Rhombus** |  |  |  |  |  |
| **Kite** |  |  |  |  |  |
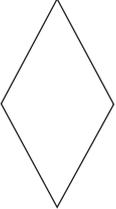
**2 (a)** How many lines of symmetry does a square have?

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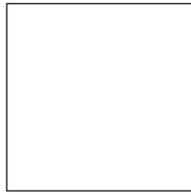
Answer ...................................................................... *(1 mark)*

**2 (b)** Here are three quadrilaterals.
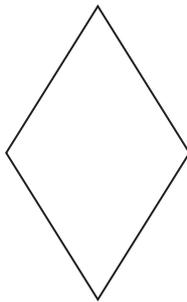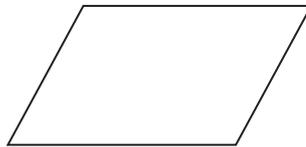
rhombus           parallelogram           kite
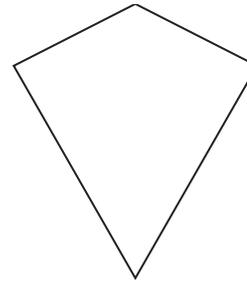
Give a reason why each of the quadrilaterals could be the odd one out.

**2 (b) (i)** The rhombus could be the odd one out because ...........................................................

...................................................................................................................................
*(1 mark)*

**2 (b) (ii)** The parallelogram could be the odd one out because .....................................................

...................................................................................................................................
*(1 mark)*

**2 (b) (iii)** The kite could be the odd one out because ....................................................................

...................................................................................................................................
*(1 mark)*

**3** Here are six quadrilaterals.

Square

Rectangle

Parallelogram

Kite

Rhombus

Trapezium
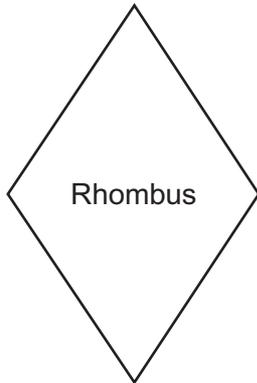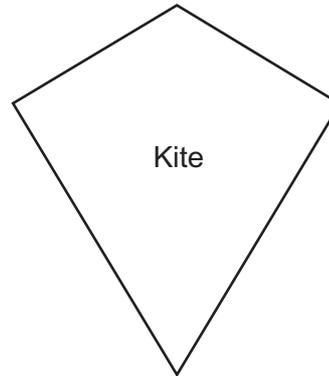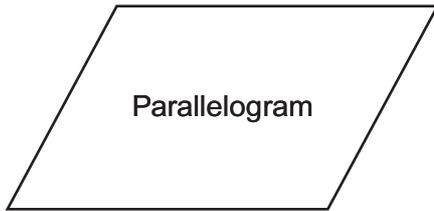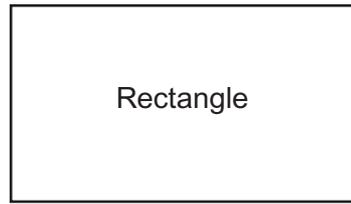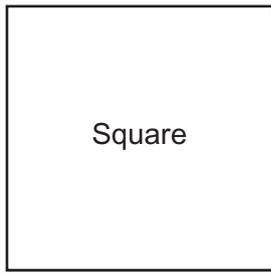
**3 (a)** Write down the names of the **three** quadrilaterals that have diagonals crossing at right-angles.

**[2 marks]**

Answer ........................................................................

and ........................................................................

and ........................................................................

**3 (b)** Write down the names of the **two** quadrilaterals that have

rotational symmetry of order 2

**and**

diagonals of different lengths.

**[2 marks]**

Answer ................................................. and .................................................

**3 (c)**    Three quadrilaterals are

Square          Rectangle          Parallelogram

The parallelogram could be the odd one out. Give a reason why.          **[1 mark]**

.................................................................................................................................

.................................................................................................................................

.................................................................................................................................

**3 (d)**    Three of the quadrilaterals are

Kite          Rectangle          Parallelogram

The kite could be the odd one out. Give a reason why.          **[1 mark]**

.................................................................................................................................

.................................................................................................................................

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**3 (e)**    Three quadrilaterals are

Rectangle          Parallelogram          Rhombus

Tick the **one** property that these three quadrilaterals have in common.          **[1 mark]**

All four sides the same length          ☐          Diagonals bisect each other          ☐

All four angles equal          ☐          Two lines of symmetry          ☐

**3 (f)**    Tick the **one** property that these three quadrilaterals have in common.

Rectangle          Square          Rhombus          **[1 mark]**

All four sides the same length          ☐          Diagonals bisect each other          ☐

All four angles 90º          ☐          No lines of symmetry          ☐

**4 (a)** The diagram below is used to sort some quadrilaterals.
A trapezium has already been sorted.

Use the diagram to sort

a parallelogram, a rectangle, a rhombus and a square.

**[2 marks]**

```
┌──────────────┐
│  Choose a    │
│ quadrilateral│
└──────────────┘
        │
        ▼
   ╱────────╲                      ╱────────╲              ┌──────────────┐
  ╱ All sides ╲   ┌─────┐         ╱ All angles╲   ┌─────┐   │ Quadrilateral is │
 ╱  the same   ╲→ │ YES │ →      ╱    90°      ╲→ │ YES │ → │        a         │
  ╲  length    ╱  └─────┘         ╲            ╱  └─────┘   └──────────────┘
   ╲────────╱                      ╲────────╱
        │                              │
     ┌─────┐                        ┌─────┐              ┌──────────────┐
     │ NO  │                        │ NO  │ →            │ Quadrilateral is │
     └─────┘                        └─────┘              │        a         │
        │                                                └──────────────┘
        ▼
   ╱──────────╲                     ╱────────╲              ┌──────────────┐
  ╱ Both pairs ╲   ┌─────┐         ╱ All angles╲   ┌─────┐   │ Quadrilateral is │
 ╱ of opposite ╲→ │ YES │ →      ╱    90°      ╲→ │ YES │ → │        a         │
  ╲sides parallel╱ └─────┘         ╲            ╱  └─────┘   └──────────────┘
   ╲──────────╱                     ╲────────╱
        │                              │
     ┌─────┐                        ┌─────┐              ┌──────────────┐
     │ NO  │                        │ NO  │ →            │ Quadrilateral is │
     └─────┘                        └─────┘              │        a         │
        │                                                └──────────────┘
        │              ╱────────╲
        └────────→    ╱          ╲   ┌─────┐   ┌──────────────┐
                     ╱            ╲→ │ YES │ → │ Quadrilateral is │
                      ╲          ╱   └─────┘   │        a         │
                       ╲────────╱              │    TRAPEZIUM     │
                           │                   └──────────────┘
                        ┌─────┐
                        │ NO  │
                        └─────┘
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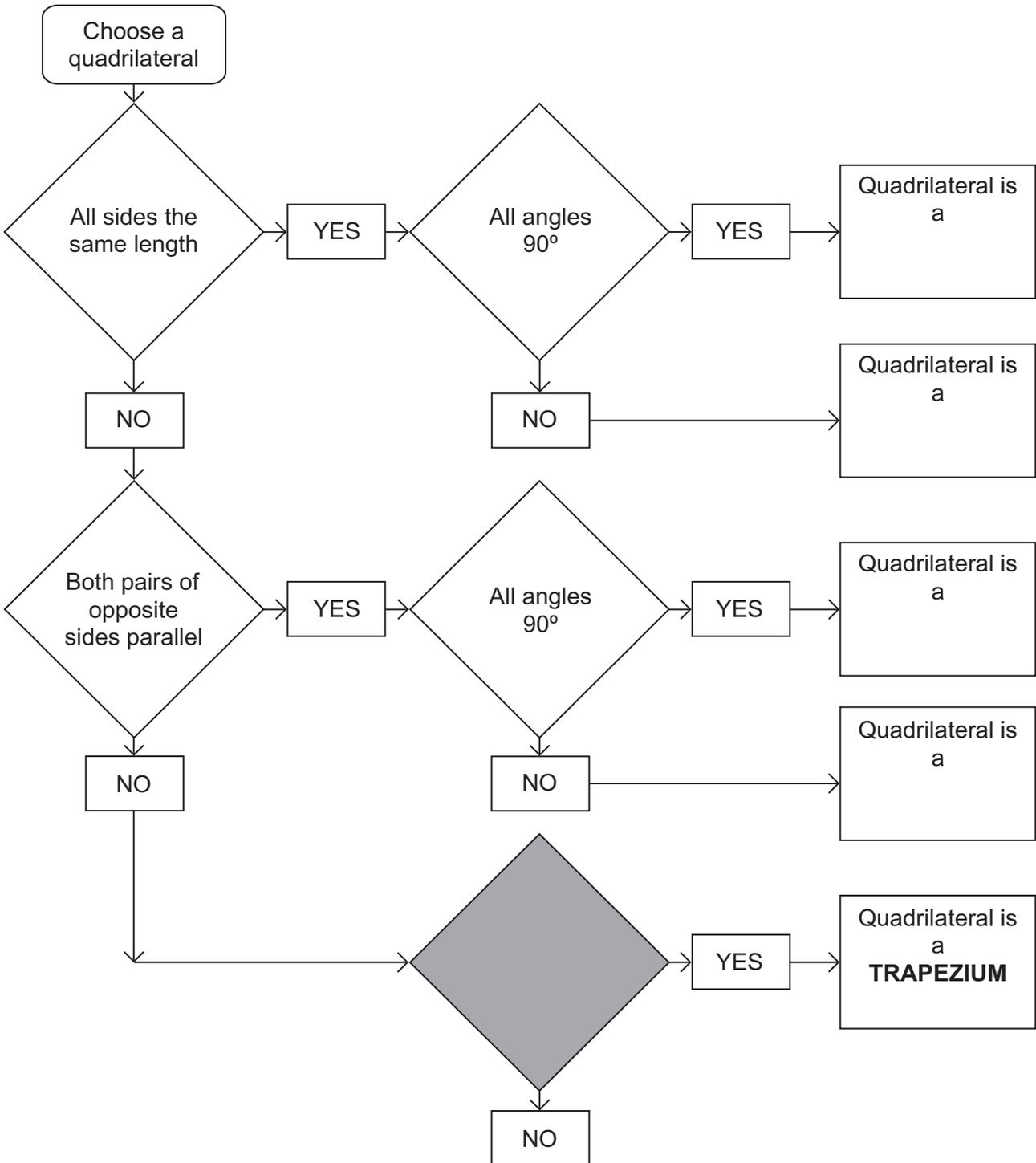
**4 (b)** A trapezium has been sorted in the diagram on the opposite page.

Write a statement, using the properties of quadrilaterals, that could go into the shaded box.

**[1 mark]**

.......................................................................................................................................

.......................................................................................................................................

.......................................................................................................................................

**5** Match the name of each shape to a correct property.

**[2 marks]**

Kite ●                              ● All sides equal

Parallelogram ●                  ● One line of symmetry

Rectangle ●                       ● All angles equal

Rhombus ●                        ● No lines of symmetry