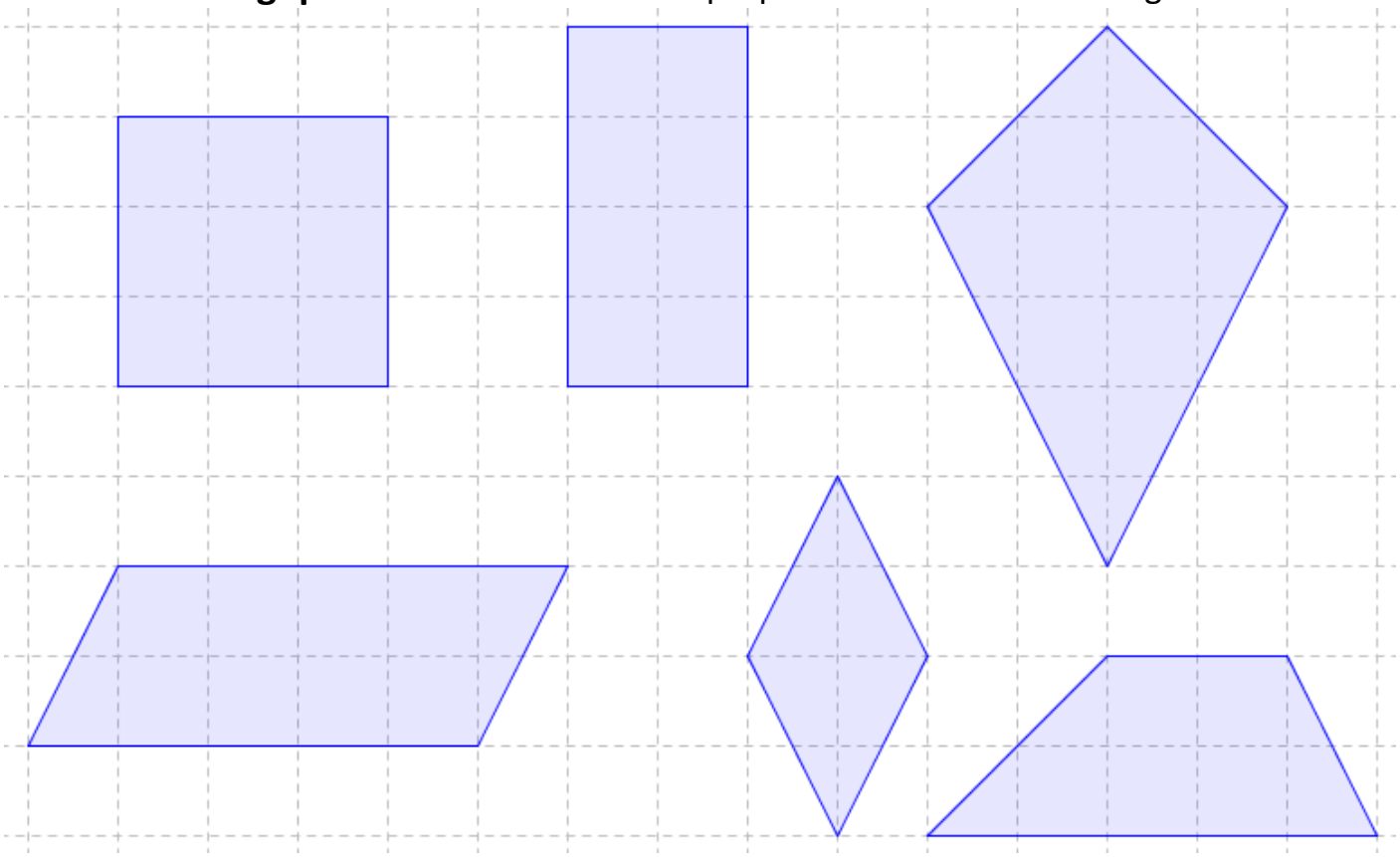
Quadrilaterals

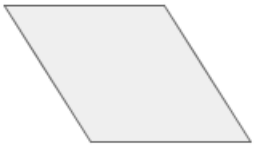
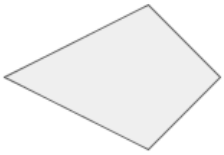
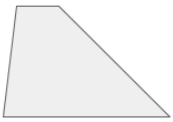
Three-sided shapes are all triangles (equilateral, isosceles or scalene).
Four-sided shapes are all quadrilaterals, and many have special names.

Task A: Naming quadrilaterals: Write the proper name beside each diagram below.



Choose from: Arrowhead, Circle, Cube, Delta, Diamond, Hexagon, Kite, Oblong, Oval, Parallelogram, Polygon, Prism, Pyramid, Rectangle, Rhombus, Square, Triangle, Trapezium.
Extension: Can you find the area of all the shapes above? Are there any useful rules?

Task B: Describing quadrilaterals: We want to know about **sides**, **angles** & **symmetry**.
For each shape below, see how much you can say about it. One has been done for you.

	 **Rhombus** • All sides equal • Two pairs of parallel sides • Opposite angles equal • Two lines of symmetry	
		

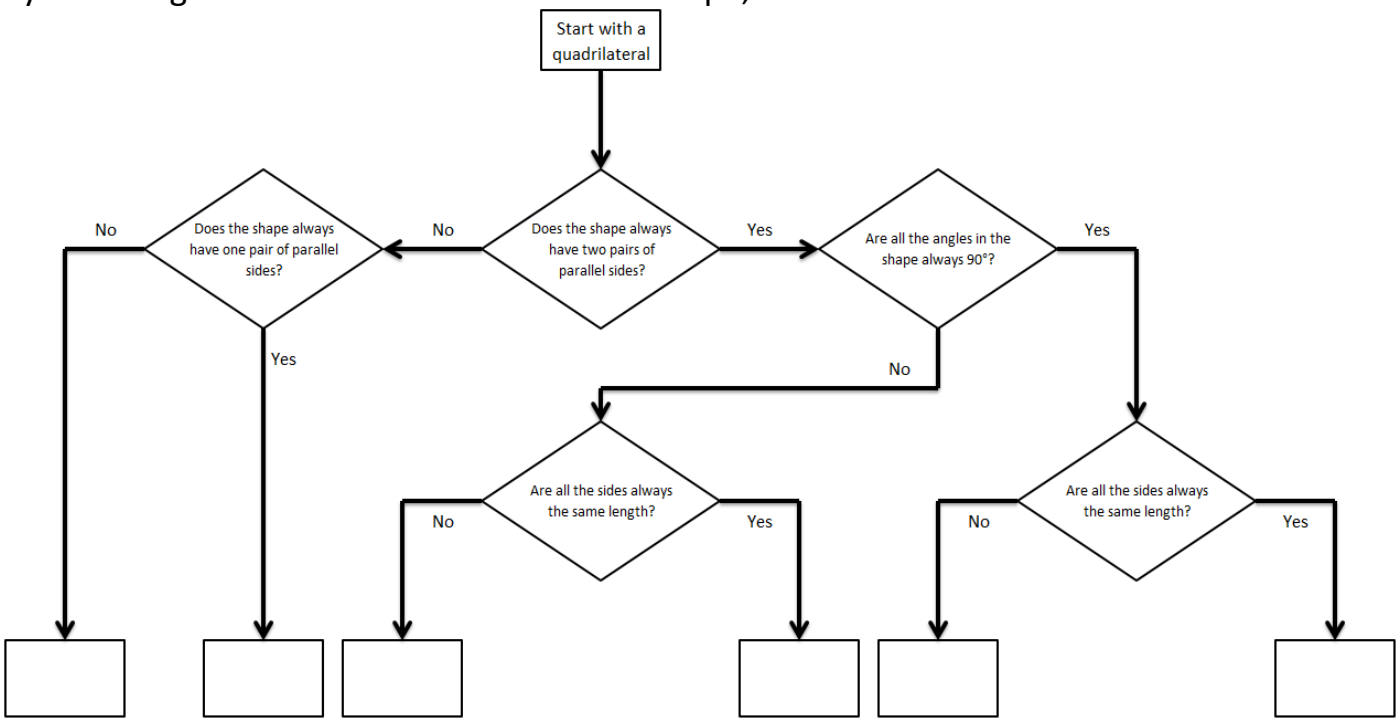
Your descriptions should be true for all *shapes with this name, not just the example drawn.*
Extension: Do any of these shapes have* rotational *symmetry? If so, what order?

Task C: Classifying quadrilaterals

The six most common types of quadrilateral are:

Square, Rectangle, Rhombus, Parallelogram, Kite, Trapezium

By following the flow chart below for each shape, fill in the boxes with the correct name.



Extension: Make your own flow chart, using different questions or in a different order.

Task D: Is a square a rectangle?

Are your angles $90°$?
You're a rectangle!

Are all your sides the same length?
You're a rhombus!

Got a pair of parallel sides?
You're a trapezium!

You wouldn't normally call the shape above a rectangle, but it fits all the requirements:

- Opposite sides equal and parallel
- All angles $90°$

Anything which is true for a rectangle is also true for a square (eg area is $length \times width$)

Think of the definitions as *qualifications* for different shapes. It's harder to qualify to be called a square than a rectangle (because as well as all the requirements above, you need *all* sides equal). All you need to be called a trapezium is a pair of parallel sides. If you want to graduate to being called a parallelogram you'll need the other two parallel as well.

Which of these statements do you think are true?

• "A square is always a rhombus"	• "A trapezium is always a rhombus"
• "A rhombus is always a square"	• "A rhombus is always a trapezium"

Extension: True or false: "If a shape is a kite and a trapezium, it must be a rhombus"

Quadrilaterals SOLUTIONS

Three-sided shapes are all triangles (equilateral, isosceles or scalene).
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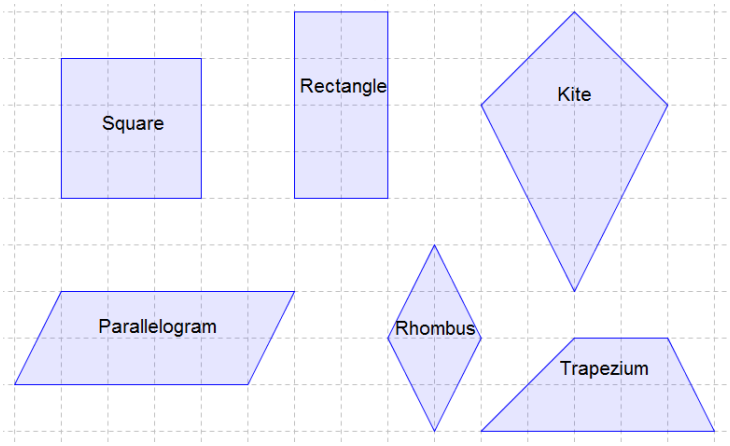
Task A: Naming quadrilaterals: Write the proper name beside each diagram below.



Arrowhead / Delta: *a quadrilateral with a reflex angle*
Circle: *a curved 2D shape*
Cube: *the 3D equivalent of a square*
Diamond: *non-mathematical word (a rhombus, but only a certain way round usually)*
Hexagon: *six-sided polygon*
Oblong: *sometimes means a rectangle that cannot be a square, sometimes means oval*
Oval: *vague term referring to a curved shape (like an ellipse) or a rounded rectangle*
Polygon: *a many-sided shape (a general term for any 2D shape with straight sides)*
Prism: *3D shape with a constant cross-section (eg Toblerone)*
Pyramid: *3D shape with a 2D shaped base going to a point*

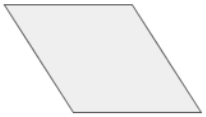
Extension: Can you find the area of all the shapes above? Are there any useful rules?

Square	Rectangle	Parallelogram	Rhombus	Kite	Trapezium
$9cm^2$	$8cm^2$	$10cm^2$	$4cm^2$	$12cm^2$	$7cm^2$
$length^2$	$length \times width$	$base \times height$	$base \times height$ or $\frac{diagonal_1 \times diagonal_2}{2}$	$\frac{diagonal_1 \times diagonal_2}{2}$	$\frac{(a+b)}{2}h$

Task B: Describing quadrilaterals: We want to know about **sides**, **angles** & **symmetry**.
For each shape below, see how much you can say about it. One has been done for you.

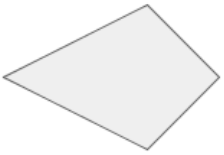
Square

- All sides equal
- Two pairs of parallel sides
- All angles equal to 90°
- Four lines of symmetry



Rhombus

- All sides equal
- Two pairs of parallel sides
- Opposite angles equal
- Two lines of symmetry



Kite

- Two pairs of adjacent sides equal
- One pair of opposite angles equal

Rectangle

- Two pairs of equal opposite sides
- Two pairs of parallel sides
- All angles equal to 90°
- Two lines of symmetry

Parallelogram

- Two pairs of equal opposite sides
- Two pairs of parallel sides
- Opposite angles equal
- No lines of symmetry

Trapezium

- One pair of parallel sides

Your descriptions should be true for all *shapes with this name, not just the example drawn.*

Extension: Do any of these shapes have* rotational *symmetry? If so, what order?

Task C: Classifying quadrilaterals

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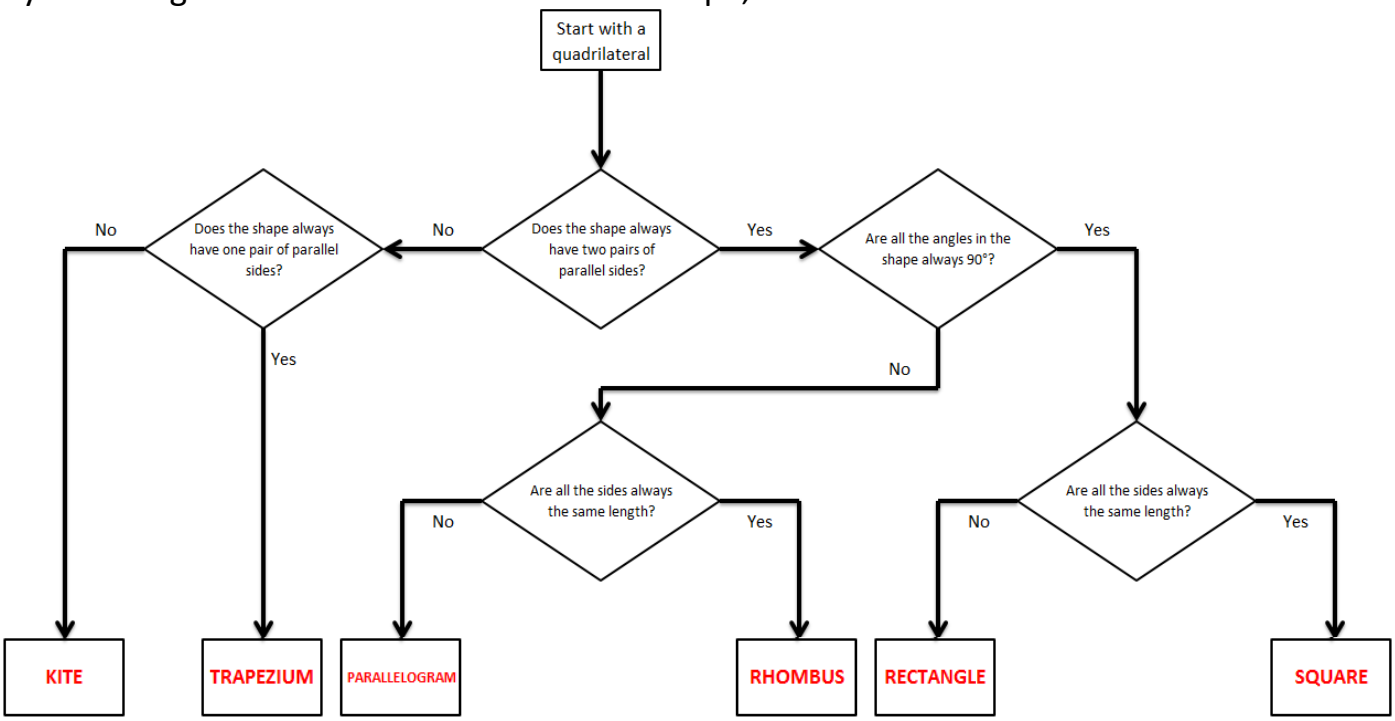

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Which of these statements do you think are true?

• "A square is always a rhombus" **True: it has all sides equal**	• "A trapezium is always a rhombus" **False: it may not have all sides equal**
• "A rhombus is always a square" **False: it may not have all angles $90°$**	• "A rhombus is always a trapezium" **True: it has a pair of parallel sides**

Extension: True or false: "If a shape is a kite and a trapezium, it must be a rhombus"

For a kite to have parallel sides, they would all have to be equal, so it *would* be a rhombus.