

Maths Revision & Practice Booklet

Name: _____



Properties of Shapes

Revise

Compare and Classify 2D Shapes Based on Their Properties

2D shapes have two dimensions – length and width.

A polygon is a 2D shape with straight sides. Polygons are compared and classified according to the properties of their sides and angles.

Key Vocabulary

Regular: A polygon that has all sides and angles equal.

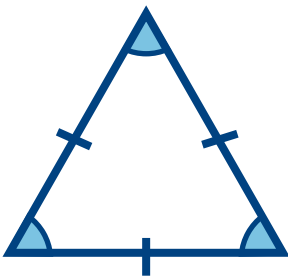
Parallel: Lines that always stay the same distance apart and never meet.

Adjacent: Angles or sides that are next to each other.

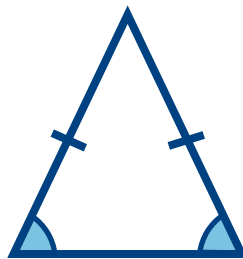


Triangles

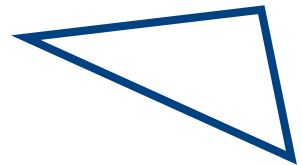
Triangles have three sides and three vertices. The total of the angles in a triangle is 180° .



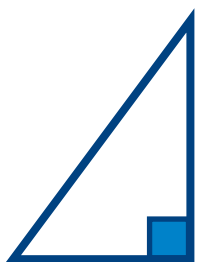
An equilateral triangle is a regular polygon. It has sides of equal length and each angle is 60° .



An isosceles triangle has two sides of equal length and two angles of equal size.

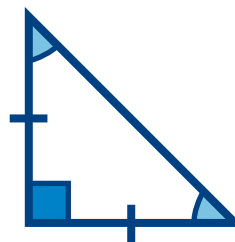


A scalene triangle has no equal sides or angles.



This is a right-angled triangle as one of its angles is 90° .

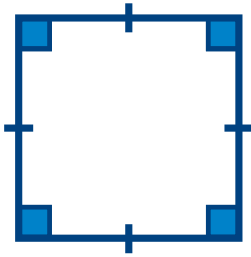
It is also scalene.



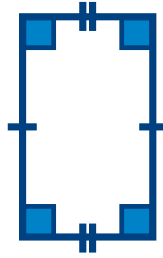
This is a right-angled triangle as one of its angles is 90° . It is also isosceles.

Quadrilaterals

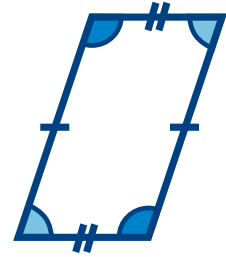
A quadrilateral is a polygon with four sides.



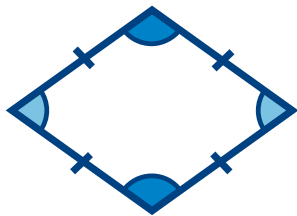
A square has four sides of equal length and four right angles (90°). A square is also a rectangle, a rhombus and a parallelogram!



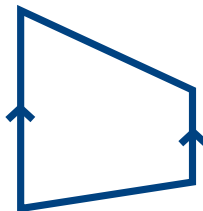
A rectangle has two pairs of parallel, equal sides and four right angles. A rectangle is also a parallelogram!



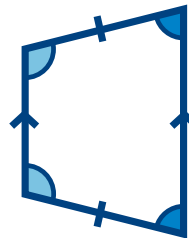
A parallelogram has two pairs of parallel, equal sides and opposite equal angles.



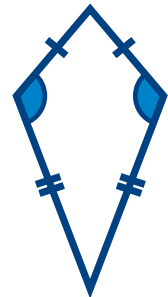
A rhombus has four sides of equal length and opposite equal angles. A rhombus is also a parallelogram!



A trapezium only has one pair of opposite parallel sides.

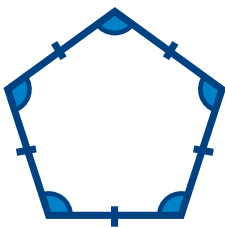


This is an isosceles trapezium as it has two sides of equal length and two pairs of equal angles.

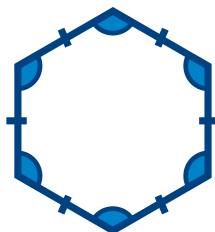


A kite has two pairs of adjacent equal sides and one pair of opposite equal angles.

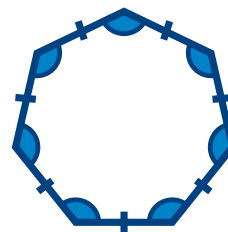
Regular Polygons



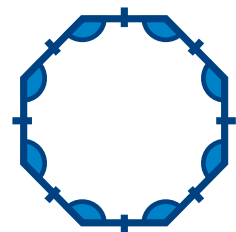
A regular pentagon has five equal sides and five equal angles of 108° . In regular and irregular pentagons, the interior angles will total 540° .



A regular hexagon has six equal sides and six equal angles of 120° . In regular and irregular hexagons, the interior angles will total 720° .



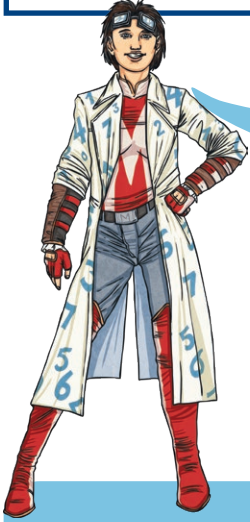
A regular heptagon has seven equal sides and seven equal angles. In regular and irregular heptagons, the interior angles will total 900° .



A regular octagon has eight equal sides and eight equal angles of 135° . In regular and irregular octagons, the interior angles will total $1,080^\circ$.

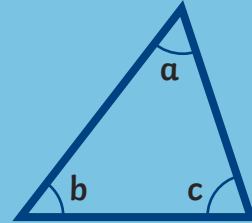
Draw 2D Shapes Using Given Dimensions and Find Unknown Angles in 2D Shapes

We can use the link between geometry and algebra to help us to draw 2D shapes and find unknown angles.



The interior angles of a triangle add up to 180° .

We can use the properties of specific triangles to work out missing angles.

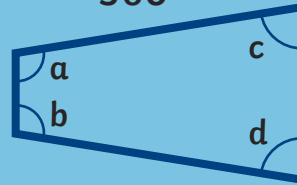


$$a + b + c = 180^\circ$$

The interior angles of a quadrilateral add up to 360° .

We can use the properties of specific quadrilaterals to work out missing angles.

$$a + b + c + d = 360^\circ$$



As the number of sides of a polygon increases by one, we add another 180° to the total of the interior angles.

When n = number of sides, we can use this formula to find the size of each angle in a regular polygon:

$$\text{Sum of Interior Angles} = (n - 2 \times 180^\circ)$$

$$\text{Each Angle} = \frac{(n - 2 \times 180^\circ)}{n}$$

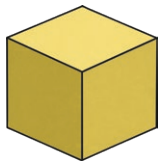
Shape	Sides	Total of Interior Angles	Shape	Sides	Total of Interior Angles
Triangle	3	180°	Square	4	360°
Pentagon	5	540°	Hexagon	6	720°

Compare and Classify 3D Shapes and Their Nets

3D shapes have three dimensions – length, width and depth. 3D shapes can be compared and classified according to the properties of their faces, edges and vertices.

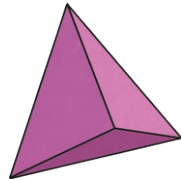
A polyhedron is a 3D shape with flat faces.

Spheres, cylinders and cones are not polyhedra as they have curved surfaces.



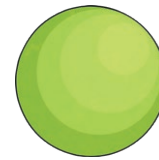
Cube

6 square faces
12 edges
8 vertices



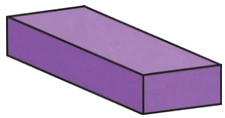
Tetrahedron

4 triangular faces
6 edges
4 vertices



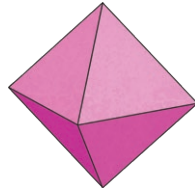
Sphere

1 curved surface
0 edges
0 vertices



Cuboid

6 faces
12 edges
8 vertices



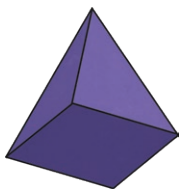
Octahedron

8 faces
12 edges
6 vertices



Cone

1 circular face
1 curved surface
1 curved edge
0 vertices (1 apex)



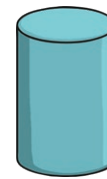
Square-based pyramid

5 faces
8 edges
5 vertices



Triangular prism

5 faces
9 edges
6 vertices

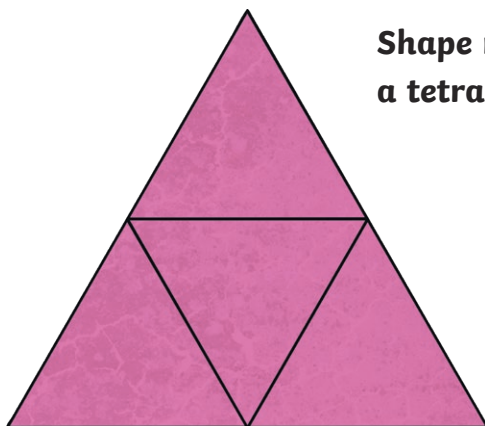


Cylinder

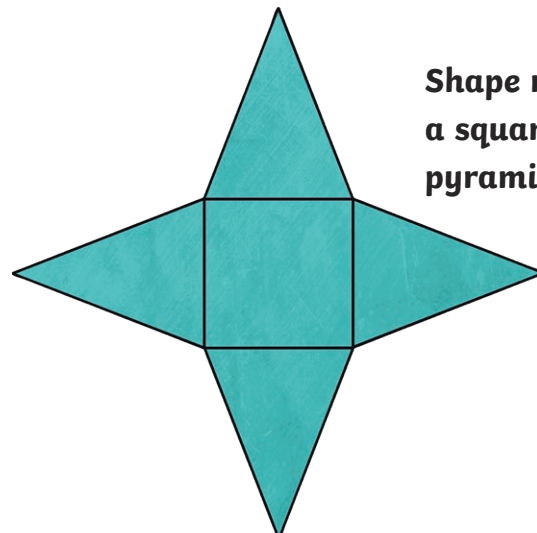
2 circular faces
1 curved surface
2 curved edges
0 vertices

A shape net shows which 2D shapes can be folded and joined to make a 3D shape.

When you are drawing a net, or solving a problem involving a shape net, think carefully about where the edges of the faces meet.



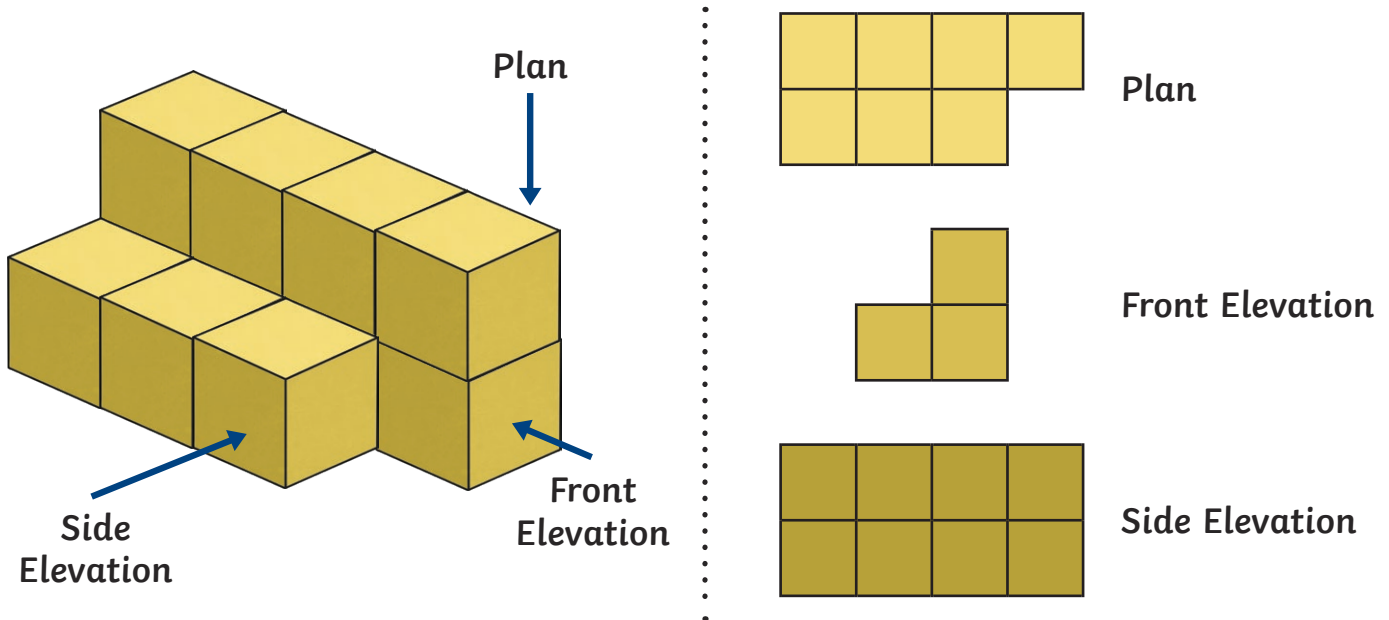
Shape net of a tetrahedron



Shape net of a square-based pyramid

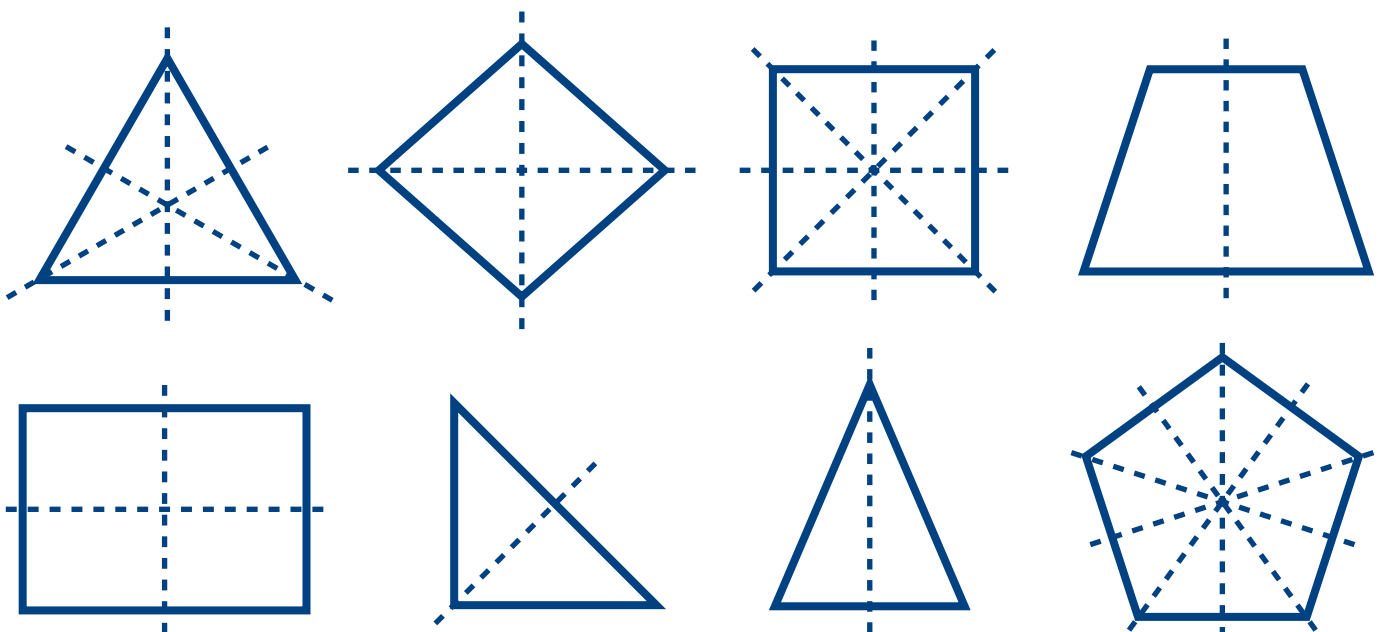
Identify Cubes and Cuboids from 2D Representations

Sometimes, we will need to identify cube models from different viewpoints. This is like when architects design buildings and create 2D drawings to show what the building will look like from each side. These drawings are called plans and elevations.



Identify Lines of Symmetry in 2D Shapes and Complete a Simple Symmetric Figure

Reflection symmetry is where one half of a shape or pattern is the exact reflection of the other half. You could fold the image and have both halves match exactly. The line showing the reflection is called the line of symmetry or the mirror line.



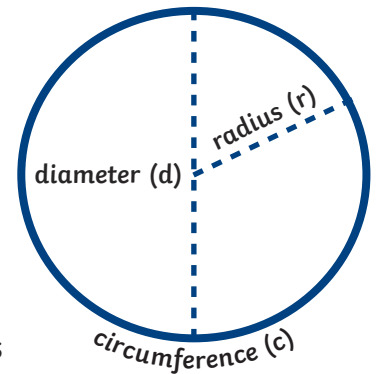
Illustrate and Name Parts of Circles

A circle is a 2D shape.

The perimeter of a circle is called the **circumference (c)**.

The distance across the circle, passing through the centre, is called the **diameter (d)**.

The distance from the centre of the circle to the circumference is called the **radius (r)**.



The diameter of a circle is always twice the length of the radius:

$$r \times 2 = d$$

The radius of a circle is always half the length of the diameter:

$$\frac{d}{2} = r$$

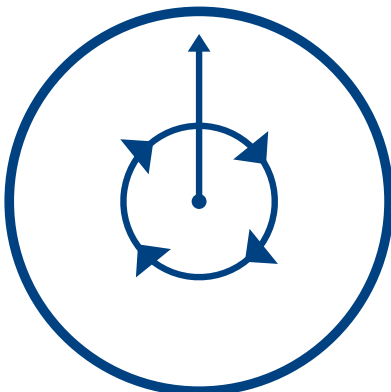
The circumference of a circle is always approximately three times the length of the diameter:

$$d \times 3.142 = c$$

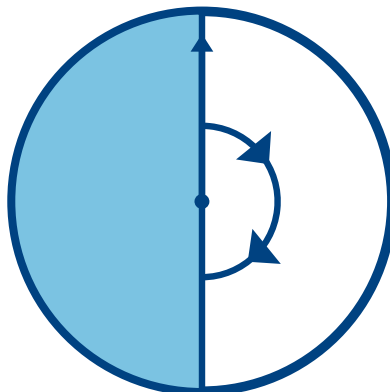
Recognise Angles as a Description of a Turn

One whole turn clockwise or anti-clockwise is a complete rotation of 360° . Therefore, a half turn is 180° and a quarter turn is 90° .

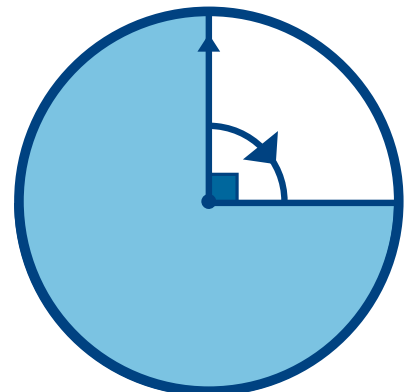
360°



180°



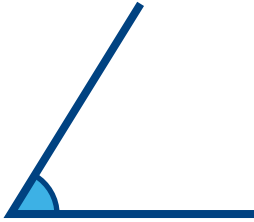
90°



Identify and Find Missing Angles at a Point or on a Straight Line

Angles measure the distance between lines.

Acute Angles



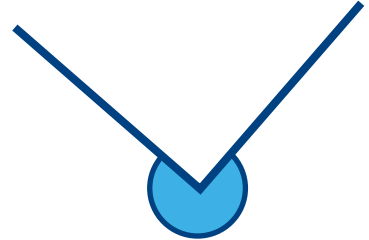
Any angle **less than 90°** is called an acute angle.

Obtuse Angles



Any angle **greater than 90°** and **less than 180°** is called an obtuse angle.

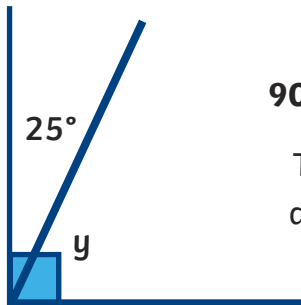
Reflex Angles



Any angle **greater than 180°** is called a reflex angle.

To find missing angles, remember these key facts:

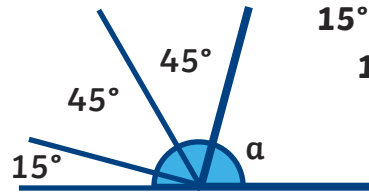
Angles on a right angle total 90°.



$$90^\circ - 25^\circ = 65^\circ$$

The missing angle is 65°.

Angles on a straight line total 180°.

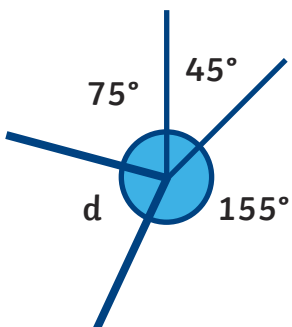


$$15^\circ + 45^\circ + 45^\circ = 105^\circ$$

$$180^\circ - 105^\circ = 75^\circ$$

The missing angle is 75°.

Angles around a point total 360°.

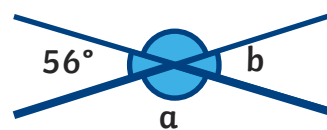


$$45^\circ + 75^\circ + 155^\circ = 275^\circ$$

$$360^\circ - 275^\circ = 85^\circ$$

The missing angle is 85°.

Opposite angles are equal on intersecting lines.



$$56^\circ + 56^\circ = 112^\circ$$

$$360^\circ - 112^\circ = 248^\circ$$

$$248^\circ \div 2^\circ = 124^\circ$$

Angle a is 124°.

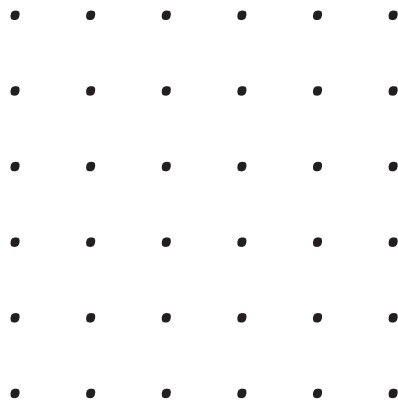


Practise

Supercharge your powers by answering these questions.



1. Use the dots to draw quadrilateral with one right angle.



1 mark



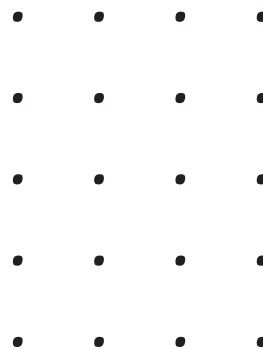
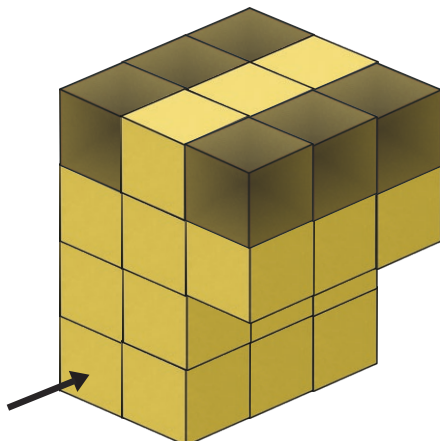
2. A bicycle wheel has a radius of 0.64m. What is the diameter of the bicycle wheel?

metres

1 mark



3. I make this cube model. I take the black cubes away. Draw the front elevation of the new model on the grid.

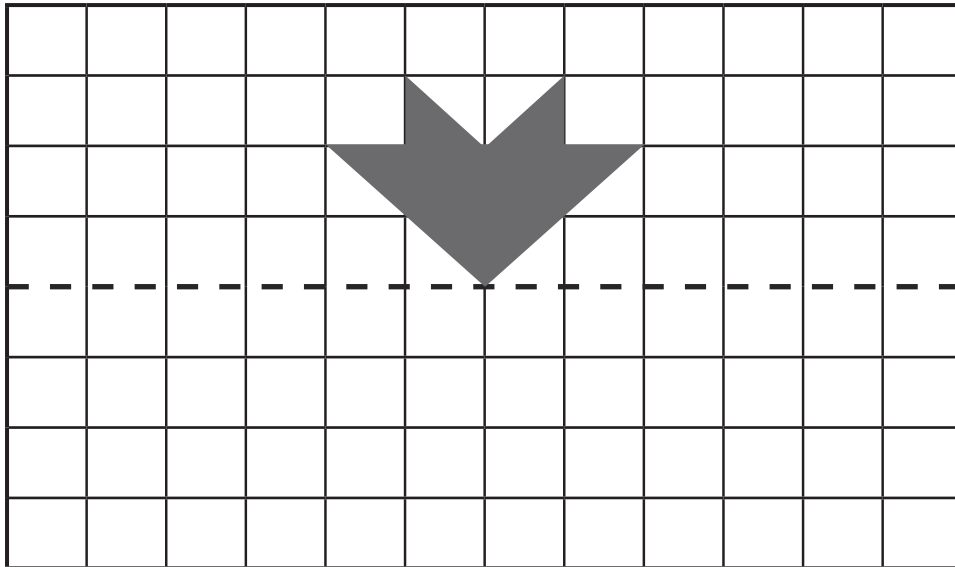


1 mark



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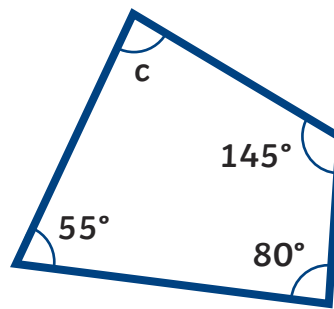
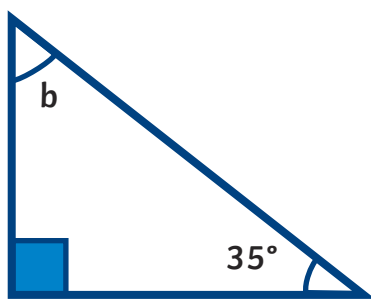
4. Use a ruler to draw the reflection of the shape in the mirror line.



1 mark

😊 😐 😞


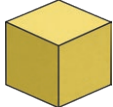

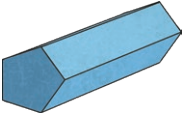
5. Calculate the missing angles in these 2D shapes.



2 marks

😊 😐 😞

6. Complete this table describing the properties of 3D shapes.

	Number of Faces	Number of Edges	Number of Vertices	2D Shape Faces
Triangular Prism 				
Cube 				
Octahedron 				
Pentagonal Prism 				

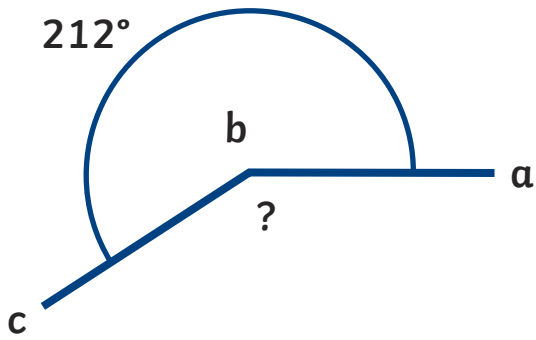
2 marks

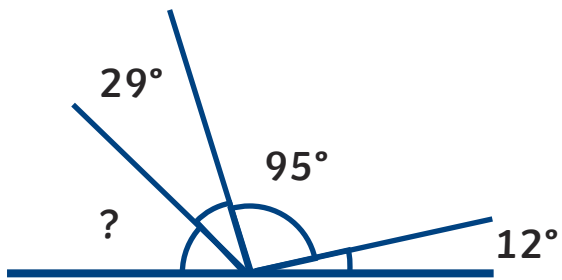
😊 😐 😞

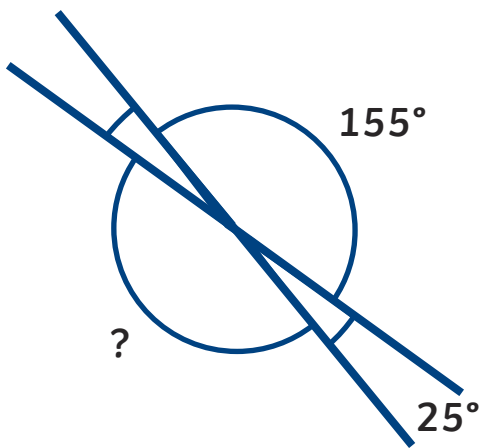
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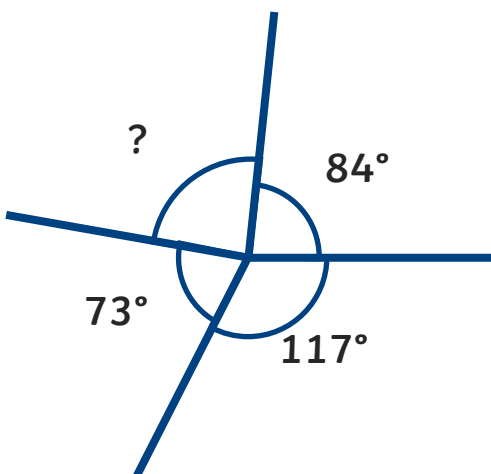
7. Calculate the missing angles in these diagrams.

4 marks







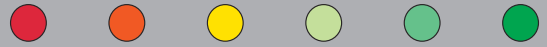


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Self-Assessment

Colour in the superhero strength-o-meter to show how you feel about each of these statements:



Compare and classify 2D shapes based on their properties.

Draw 2D shapes using given dimensions and find unknown angles in 2D shapes.

Compare and classify 3D shapes and their nets.

Identify cubes and cuboids from 2D representations.

Identify lines of symmetry in 2D shapes and complete a simple symmetric figure.

Illustrate and name parts of circles.

Identify and find missing angles at a point or on a straight line.

Comments