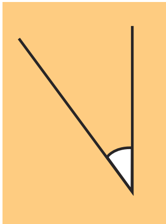
Properties of Shapes

Knowledge Organiser

Key Vocabulary

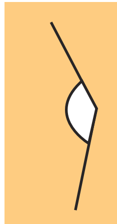
- angle
- right angle
- acute
- obtuse
- reflex
- protractor
- horizontal
- vertical
- parallel
- perpendicular
- polygon
- regular
- irregular
- two-dimensional
- three-dimensional
- flat face
- curved surface
- edge
- curved edge
- vertex
- vertices
- apex
- radius
- diameter
- circumference

Angle Types



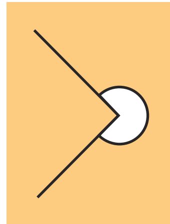
Acute Angles

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



Obtuse Angles

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

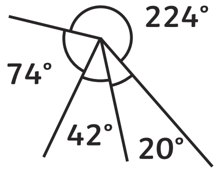


Reflex Angles

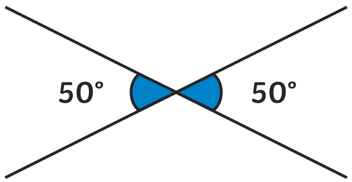
Any angle that measures greater than 180° is called a **reflex** angle.

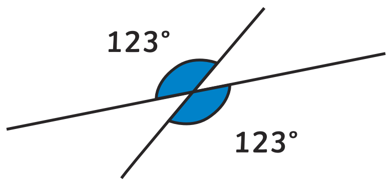
Calculating Angles

Angles on a straight line always total 180°.

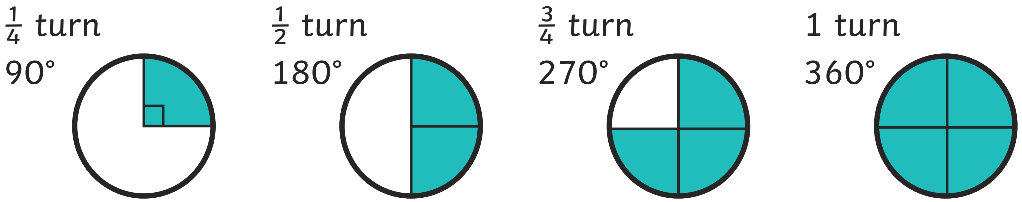


Angles around a point always total 360°.



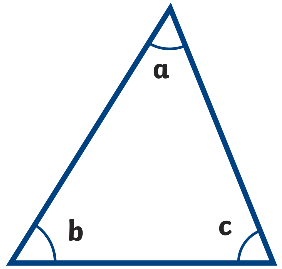


Opposite angles that share a vertex are equal.



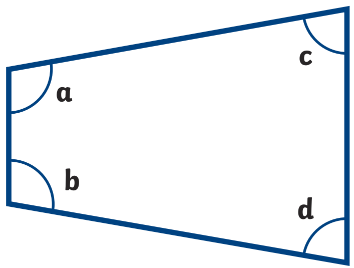
Multiples of 90° can be used as descriptions of a turn.

Angles in a Triangle



$$a + b + c = 180°$$

Angles in a Quadrilateral



$$a + b + c + d = 360°$$

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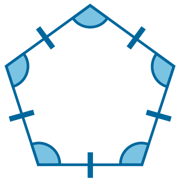
Angles in Regular Polygons

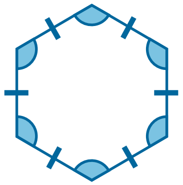
As the number of sides of a polygon increases by one, the total of the interior angles increases by 180°. When n = number of sides, this formula can be used to find the size of each angle in a **regular polygon**:

Sum of Interior Angles = $(n - 2) \times 180°$

Each Angle = $\frac{(n - 2) \times 180°}{n}$



Pentagon
n = 5
$(5 - 2) \times 180° = 540°$
$540° \div 5 = 108°$

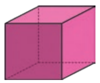
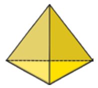
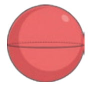
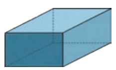
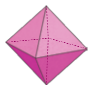
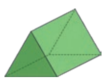
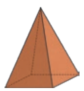
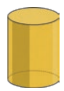


Hexagon
n = 6
$(6 - 2) \times 180° = 720°$
$720° \div 6 = 120°$

Properties of 3D Shapes

3D shapes have three dimensions – **length**, **width** and **depth**.

A **polyhedron** is a 3D shape with flat faces. Spheres, cylinders and cones are not polyhedrons as they have curved surfaces.

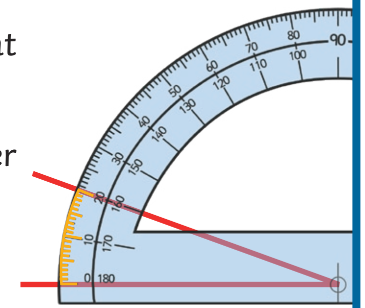
Cube  6 square faces 12 edges 8 vertices	**Tetrahedron**  4 triangular faces 6 edges 4 vertices	**Sphere**  1 curved surface 0 edges 0 vertices
Cuboid  6 faces 12 edges 8 vertices	**Octahedron**  8 faces 12 edges 6 vertices	**Triangular prism**  5 faces 9 edges 6 vertices
Square-based pyramid  5 faces 8 edges 5 vertices	**Cone**  1 circular face 1 curved surface 1 curved edge 1 apex	**Cylinder**  2 circular faces 1 curved surface 2 curved edges 0 vertices

Using a Protractor

Place the cross or circle at the point of the angle you are measuring.

Read from the zero on the outer scale of your protractor.

Count the degree lines carefully.



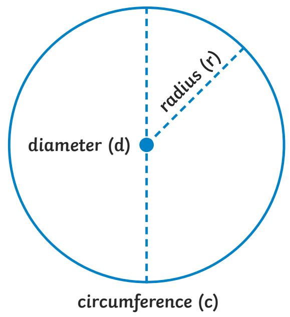
Parts of Circles

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).

$r \times 2 = d$

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



Nets of 3D Shapes

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.