



Year 6 – Maths – Geometry: Properties of Shape

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

Links to other learning

Year 5 - Identify 3-D shapes, including cubes and other cuboids, from 2-D representations; Know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles; Draw given angles, and measure them in degrees ($^{\circ}$); Identify angles at a point and 1 whole turn (total 360°), angles at a point on a straight line and half a turn (total 180°), and other multiples of 90° ; Use the properties of rectangles to deduce related facts and find missing lengths and angles; Distinguish between regular and irregular polygons based on reasoning about equal sides and angles.

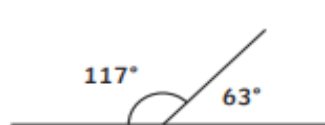
Key questions

What do angles on a straight line total?
Can you give me an example?

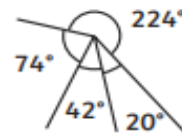
Three angles around a point total 267° .
What is the fourth angle?

How do you work out the radius of a circle?

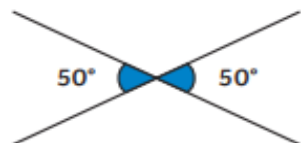
Calculating Angles



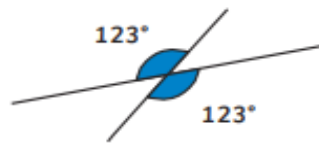
Angles on a straight line always total 180° .



Angles around a point always total 360° .



Opposite angles that share a vertex are equal.



$\frac{1}{4}$ turn
 90°



$\frac{1}{2}$ turn
 180°



$\frac{3}{4}$ turn
 270°

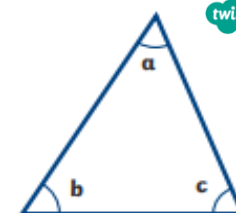


1 turn
 360°



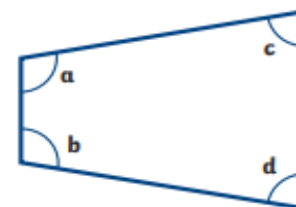
Multiples of 90° can be used as descriptions of a turn.

Angles in a Triangle



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

Angles in a Quadrilateral



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

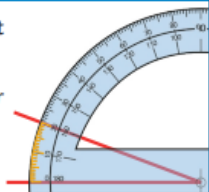
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Using a Protractor

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.

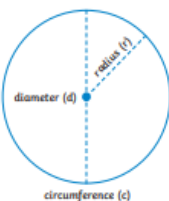


Parts of Circles

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).

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



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.

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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**:

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

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



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



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

Properties of 3D Shapes

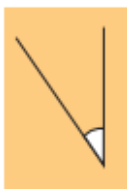
3D shapes have three dimensions – **length**, **width** and **depth**.

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

Angle types

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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.