Properties of Shape. Year 6

Key vocabulary	Definition
Angle	The number of degrees rotated around a point
Right angle	An angle which measures 90 degrees
Protractor	Used to measure angles in degrees
Horizontal	Describes a line parallel to the earth's surface.
Vertical	A line which is at right angles to a horizontal line.
Parallel	Lines which are always an equal distance apart
Perpendicular	A line at right angles to another line
Polygon	A two-dimensional shape having three or more straight sides
Regular	Shapes which have all equal sides and all equal angles
Irregular	Shapes which do not have all equal sides and all equal angles
Two-dimensional (2d)	Having two dimensions of length and width (cannot be picked up)
Three-dimensional (3d)	Having three dimensions of length, width and height (can be picked up)
Flat face	A flat surface of a three-dimensional (3d) object
Curved surface	A curved surface of a three-dimensional (3d) object
Edge	Where two faces of a three-dimensional object meet.
Vertex / vertices	The point at which two or more arms of an angle meet or the adjacent sides of a polygon meet
Apex	the highest point, the point at the top of a shape

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.

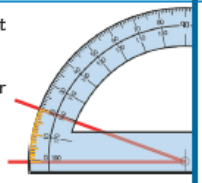
Reflex Angles
Any angle that measures greater than 180° is called a **reflex** angle.

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.

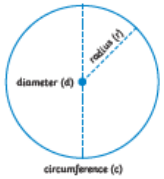


Parts of Circles

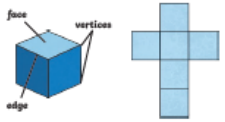
A circle is a 2D shape. The perimeter of a circle is called the **circumference** (c). The distance across the circle, passing through the centre, is called the **diameter** (d).

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.

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) × 180°

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

Pentagon
n = 5
(5 - 2) × 180° = 540°
540° ÷ 5 = 108°

Hexagon
n = 6
(6 - 2) × 180° = 720°
720° ÷ 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

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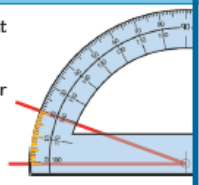

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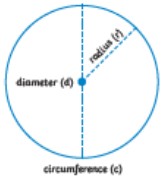

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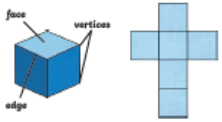

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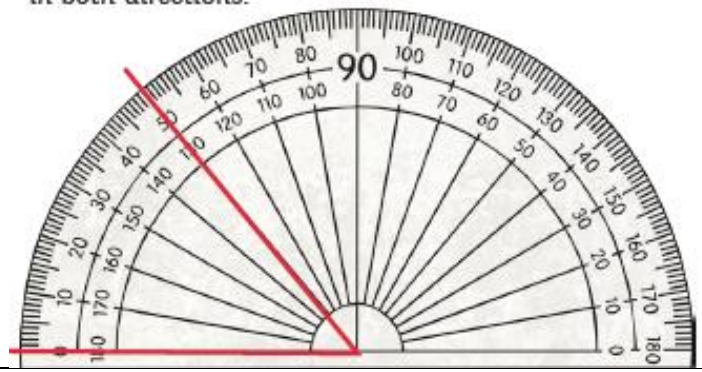
Prior Knowledge

Measuring and Drawing Angles

To measure angles, we use a protractor. Look carefully at how the numbers on the scale count from 0° to 180° in both directions.



Real Life

- **Building:** Making sure shelves / doors are at right angles.
- **Sports players:** Knowing what angle to kick / hit a ball at to pass / score.
- **Deliveries:** Nets of boxes for deliveries / pizza boxes
- **Measuring planets:** How far away from one another are planets / stars?

Zooming out...

- **Ancient Egyptians:** In 1500BC in Egypt, measurements were taken of the Sun's shadow against graduations marked on stone tables (a sun dial)
- **'Geometry'** comes from the Greek word *geometria*, meaning 'earth measurement'
- **Ancient Egyptians** are thought to be the first group to begin studying geometry. We can see evidence of this type of thinking with their design and construction of the Great Pyramids