Edward Peake Church of England Middle School			
Topic: Properties of Shape		**Year: 6**	**NC Strand: Geometry**

## What should I already know?

- Hoe to 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
- How to draw given angles, and measure them in degrees (o)
- How to identify:
  - angles at a point and one whole turn (total 360o)
  - angles at a point on a straight line and half a turn (total 180o)
  - other multiples of 90o
- How to use the properties of rectangles to deduce related facts and find missing lengths and angles
- How to distinguish between regular and irregular polygons based on reasoning about equal sides and angles.

What will I know by the end of the unit?

- How to measure with a protractor
- Understand angles
- How to calculate missing angles
- The properties of vertically opposite angles
- How to solve problems using the sum of angles in a triangle

- How to solve problems using the sum of angles in a triangle–special cases
- How to solve angle problems in special quadrilaterals
- How to solve angle problems in regular polygon
- How to draw shapes accurately
- How to draw nets of 3-D shapes

Key Information/Diagrams

Angle Types
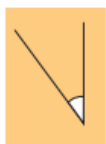
Acute Angles
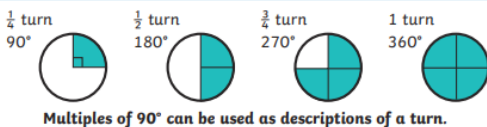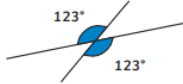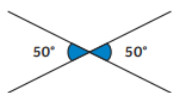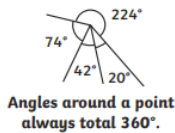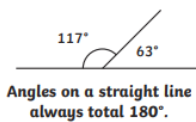Any angle that measures less than 90° is called an **acute** angle.

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.

Angles in a Triangle

$$a + b + c = 180°$$

Calculating Angles

117° 63°
Angles on a straight line always total 180°.

224°
74°
42° 20°
Angles around a point always total 360°.

50° 50°
123°
123°
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°

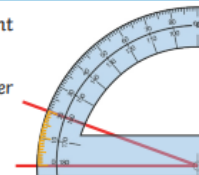**Multiples of 90° can be used as descriptions of a turn.**

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).

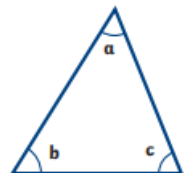The distance from the centre of the circle to the circumference is called the **radius** (r).

$r × 2 = d$ $\frac{d}{2} = r$

diameter (d), radius (r), circumference (c)
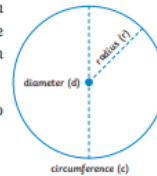
Using a Protractor

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.
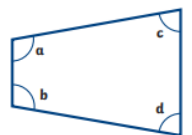
Count the degree lines carefully.

Angles in a Quadrilateral

$$a + b + c + d = 360°$$

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

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 = $\frac{(n - 2) × 180°}{n}$

Pentagon
n = 5

Hexagon
n = 6

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Vocabulary			
Angle	Vertical	Three-Dimensional	Apex
Right angle	Parallel	Flat face	Radius
Acute	Perpendicular	Curved surface	Side
Obtuse	Polygon	Edge	Diameter
Reflex	Regular	Curved Edge	Circumference
Protractor	Irregular	Vertex	Perimeter
Horizontal	Two-dimensional	Vertices	

Investigate/Homework tasks
● Homework will be set by your teacher using google classroom ● You should complete at least 30 minutes of maths tasks using the website and log in provided by your teacher. Please attend help sessions if you do not have access to the internet at home ● Additional work you could complete: ○ Find out more about the meaning of the vocabulary list using http://www.amathsdictionaryforkids.com/ ● To challenge yourself: Answer the key questions to deepen your knowledge

Key Questions

Can we name and describe the 4 different types of angles? (right angle, obtuse, acute, reflex)

What unit do we use to measure angles?

Does it matter which side of the protractor I use?

What mistakes could we make when measuring with a protractor?

How would I measure a reflex angle?

Look at a compass, what angles can we identify using the compass?

If there are 90 degrees in one right angle, how many are there in two? What about three?

How many degrees are there in a quarter/half turn?

Between which two compass points can you see a right angle/half turn/three quarter turn?

What do we know about a and b? How do we know this?

Which angle fact might you need to use when answering this question?

Which angles are already given? How can we use this to calculate unknown angles?

What sentences can we write about vertically opposite angles in relation to other angles?

How can we find the missing angle?

Is there more than one way to find this angle?

What's the same and what's different about the four types of triangle?

What do the three interior angles add up to? Would this work for all triangles?

Does the type of triangle change anything?

Does the size of the triangle matter?

How can we identify sides which are the same length on a triangle?

How can we use the use the hatch marks to identify the equal angles?

If you know one angle in an isosceles triangle, what else do you know?

Can you have an isosceles right-angled triangle?

Is it sensible to estimate the angles before calculating them? Are the triangles drawn accurately?

Can you identify the type of triangle? How will this help you calculate the missing angle?

Which angle can you work out first? Why? What else can you work out?

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What is a regular polygon? What is an irregular polygon?

What is the sum of interior angles of a triangle?

How can we use this to work out the interior angles of polygons?

Can we spot a pattern in the table? What predictions can we make?

Is a rectangle a parallelogram? Is a parallelogram a rectangle?
What do you notice about the opposite angles in a parallelogram?
Is a square a rhombus? Is a rhombus a square?
What do you notice about the opposite angles in a rhombus?
What is the difference between a trapezium and an isosceles trapezium?
If you know 3 of the interior angles, how could you work out the fourth angle?

What do you know about the shapes which will help you draw them?

How can we ensure our measurements are accurate?

How would you draw a triangle on a plain piece of paper using a protractor?