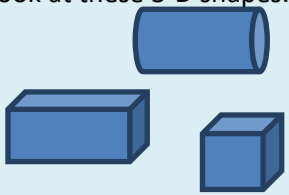
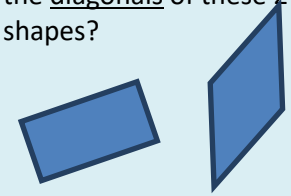
Geometry: Properties of Shapes with Reasoning

National Centre for Excellence in the Teaching of Mathematics

Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
IDENTIFYING SHAPES AND THIER PROPERTIES					
recognise and name common 2-D and 3-D shapes, including: * 2-D shapes [e.g. rectangles (including squares), circles and triangles] * 3-D shapes [e.g. cuboids (including cubes), pyramids and spheres].	identify and describe the properties of 2-D shapes, including the number of sides and line symmetry in a vertical line identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid]		identify lines of symmetry in 2-D shapes presented in different orientations	identify 3-D shapes, including cubes and other cuboids, from 2-D representations	recognise, describe and build simple 3-D shapes, including making nets (appears also in Drawing and Constructing) illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius
What's the same, what's different? Find a rectangle and a triangle in this set of shapes. Tell me one thing that's the same about them. Tell me one thing that is different about them.	**What's the same, what's different?** Pick up and look at these 3-D shapes.  Do they all have straight edges and flat faces? What is the same and what is different about these shapes?	**What's the same, what's different?** What is the same and different about these three2-D shapes? 	**What's the same, what's different?** What is the same and what is different about the diagonals of these 2-D shapes? 	**What's the same, what's different?** What is the same and what is different about the net of a cube and the net of a cuboid?	**What's the same, what's different?** What is the same and what is different about the nets of a triangular prism and a square based pyramid?

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Visualising Put some shapes in a bag. Find me a shape that has more than three edges.	**Visualising** In your head picture a rectangle that is twice as long as it is wide. What could its measurements be?	**Visualising** I am thinking of a 3-dimensional shape which has faces that are triangles and squares. What could my shape be?	**Visualising** Imagine a square cut along the diagonal to make two triangles. Describe the triangles. Join the triangles on different sides to make new shapes. Describe them. (you could sketch them) Are any of the shapes symmetrical? Convince me.	**Visualising** I look at a large cube which is made up of smaller cubes. If the larger cube is made up of between 50 and 200 smaller cubes what might it look like?	**Visualising** Jess has 24 cubes which she builds to make a cuboid. Write the dimensions of cuboids that she could make. List all the possibilities.
DRAWING AND CONSTRUCTING					
		draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them	complete a simple symmetric figure with respect to a specific line of symmetry	draw given angles, and measure them in degrees (^{o})	draw 2-D shapes using given dimensions and angles recognise, describe and build simple 3-D shapes, including making nets (appears also in Identifying Shapes and Their Properties)
		Other possibilities Oneface of a 3-D shape looks like this. What could it be? Are there any other possibilities?	**Other possibilities** Can you draw a non-right angled triangle with a line of symmetry? Are there other possibilities.	**Other possibilities** Here is one angle of an isosceles triangle. You will need to measure the angle accurately. What could the other angles of the triangle be? Are there any other possibilities?	**Other possibilities** If one angle of an isosceles triangle is 36 degrees. What could the triangle look like – draw it. Are there other possibilities . Draw a net for a cuboid that has a volume of 24 cm^3.

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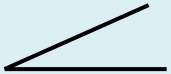
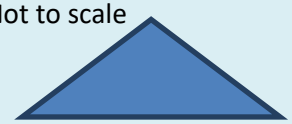
					
COMPARING AND CLASSIFYING					
	compare and sort common 2-D and 3-D shapes and everyday objects		compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes	use the properties of rectangles to deduce related facts and find missing lengths and angles distinguish between regular and irregular polygons based on reasoning about equal sides and angles	compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons
True or false? All 2-D shapes have at least 4 sides **Other possibilities** Can you find shapes that can go with the set with this label?	**Always, sometimes, never** Is it always, sometimes or nerver true that when you fold a square in half you get a rectangle. **Other possibilities** Can you find shapes that can go with the set with this label?	**Always, sometimes, never** Is it always, sometimes or never that all sides of a hexagon are the same length. **Other possibilities** Can you find shapes that can go with the set with this label?	**Always, sometimes, never** Is it always, sometimes or never true that the two diagonals of a rectangle meet at right angles. **Other possibilities** Can you show or draw a polygon that fits both of these criteria? What do you look for?	**Always, sometimes, never** Is it always, sometimes or never true that the number of lines of reflective symmetry in a regular polygon is equal to the number of its sides n. **Other possibilities** A rectangular field has a perimeter between 14 and 20 metres . What could its dimensions	**Always, sometimes, never** Is it always, sometimes or never true that, in a polyhedron, the number of vertices plus the number of faces equals the number of edges. **Other possibilities** Not to scale 

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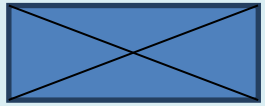
"Have straight sides"	"Have straight sides and all sides are the same length"	"Have straight sides that are different lengths."	"Has exactly two equal sides." "Has exactly two parallel sides."	be?	The angle at the top of this isosceles triangle is 110 degrees. What are the other angles in the triangle?
ANGLES					
		recognise angles as a property of shape or a description of a turn		know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles	
		identify right angles, recognise that two right angles make a half-turn, three make three quarters of a turn and four a complete turn; identify whether angles are greater than or less than a right angle	identify acute and obtuse angles and compare and order angles up to two right angles by size	identify: * angles at a point and one whole turn (total 360°) * angles at a point on a straight line and ½ a turn (total 180°) * other multiples of 90°	recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles
		identify horizontal and vertical lines and pairs of perpendicular and parallel lines			
		Convince me Which capital letters have perpendicular and / or parallel lines? Convince me.	**Convince me** Ayub says that he can draw a right angled triangle which has another angle which is obtuse.	**Convince me** What is the angle between the hands of a clock at four o clock? At what other times is the	**Convince me** 

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			Is he right? Explain why.	angle between the hands the same? Convince me	One angle at the point where the diagonals of a rectangle meet is 36 degrees. What could the other angles be? Convince me