Framework for developing schemes of work for the geometry curriculum for ages 11-14

CURRICULUM CONTENT							TOPIC	TEACHING OPPORTUNITIES			
LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8	EXCEPTIONAL PERFORMANCE		INVESTIGATION AND ILLUSTRATION	DEDUCTION AND PROOF	USE OF ICT	CONTEXT AND APPLICATION
Classify 2D shapes using angle and side properties.	Recognise congruence of shapes in different orientations.	Know and use the angle sum of a triangle.	Know and use angle, side, diagonal and symmetry properties of quadrilaterals. Know and use angle and symmetry properties of polygons.				**EUCLIDEAN PLANE GEOMETRY**	Angle sum of a triangle by practical demonstration. Angle sum of polygons by practical demonstration. Exploring properties of quadrilaterals.	Angle sum of a triangle using parallel lines. Angle sum of polygons using triangles.	Use of dynamic geometry to investigate and illustrate. Use of Logo to investigate polygons and stars.	History of Euclidean geometry. Tessellations. Fabric and graphic design.
	Distinguish between, acute, right, obtuse and reflex angles.	Know and use the sum of angles at a point, and the sum of angles at a point on a line.	Know and use angle properties of intersecting and parallel lines.	Know and use the properties of tangents to circles.				Angle facts relating to intersecting and parallel lines using practical demonstration. The properties of tangents to circles. Tessellations.	Angle facts relating to intersecting and parallel lines.	Use of dynamic geometry to investigate and illustrate.	
			Understand Pythagoras's theorem in the context of squares on sides of triangles.	Use Pythagoras's theorem to solve problems in 2D.		Use Pythagoras's Theorem 3D.		Pythagoras's Theorem Pythagorean triples.	Understand various proofs of Pythagoras's Theorem.	Use of a spreadsheet to assist with investigation.	History of the relationship between the sides of right angled triangles (Babylonians, Chinese and Greeks). Spider and fly problems.

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			Understand the concept of similarity and be able to identify similar shapes.	Appreciate the constant ratios of sides in similar right angled triangles. Use knowledge of similarity to solve problems.	Use trigonometry to solve 2D problems involving right angled triangles. Solve problems involving bearings and angles of elevation and depression.	Use right angled triangle trigonometry to solve problems in 3D.		Similar triangles leading to trigonometrical ratios.		Use of dynamic geometry to investigate and illustrate. Use of dynamic geometry to investigate and illustrate.	Bearings. Using angles of elevation & depression to determine heights & distances. Scale diagrams, maps & models. Ramps & slopes.
Use coordinates in the first quadrant.	Use coordinates in all four quadrants.			Calculate the length of a line segment given the coordinates of the end points.	Understand and use 3D coordinates.		**COORDINATE GEOMETRY**	Investigation of the distance between two points on a coordinate grid.	Derivation of a general result for the distance between tw o points on a coordinate grid.	Use of dynamic geometry and graph plotters, including graphic calculators, to investigate and illustrate.	Locating positions on a map or grid. Air traffic control. Computer images in medicine & engineering.

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				Understand the concept of gradient and use triangles to calculate gradient.				Investigation of gradients.			Link with algebra and y = mx+c. Link with distance time and velocity time graphs. Gradients of roads and slopes.
Classify shapes using faces, edges, and vertices. Use practical equipment to construct 3D shapes.	Construct nets of square based cuboids. Recognise nets of, prisms, pyramids cylinders and cones.	Construct nets of pyramids, and prisms cones and cylinders.	Represent 3D objects in 2D including isometric drawings, simple sections, plans and elevations.	Explore polyhedra whose faces are regular polygons. Investigate Euler's rule F+V = E + 2		More difficult sections e.g. a cube.	**3D GEOMETRY**	Euler's rule. Existence of only 5 Platonic solids linked to regular tessellations.	Existence of only 5 Platonic solids.	Use of CAD programs to view polyhedra from different angles.	Effective use of space in architecture and town planning. Design of packaging and storage. Crystal structures. Links with design technology.
Draw lines of symmetry in simple 2D shapes.	Reflect simple shapes in a mirror line.	Identify all lines of symmetry for 2D shapes. Use computer packages to reflect shapes. Identify order of rotational symmetry.	Rotate shapes using a centre of rotation and a specified angle.				**SYMMETRY, TRANSFORMATIONS AND VECTORS**	Investigation of the effects on a shape of single and combined transformations. Exploring invariant properties of transformations.		Use of software to perform transformations.	Symmetry in the natural world and art. Equiangular spirals.

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	Use practical equipment to investigate simple tiling patterns.		Determine which regular polygons will tessellate either singly (regular) or in combination with others (semi-regular).		Demonstrate that any triangle will tessellate.				Prove that any triangle will tessellate.	Use of Logo for drawing and tessellating polygons.	Tessellations. Escher.
Understand and use vertical and horizontal displacement for location and movement.	Understand and use vector notation for translation.	Describe combinations of translations as a single translation. Use computer packages to translate shapes.									
			Enlarge shapes using a centre of enlargement and a positive whole number scale factor.	Enlarge shapes using a centre of enlargement and any positive scale factor.	Enlarge shapes using a centre of enlargement and a negative scale factor.						Self similar shapes. Photographs. Desk top publishing.
			Devise instructions for a computer to generate and transform shapes.								Pattern design.

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						Stretch shapes using an invariant horizontal or vertical line and a scale factor.					
Use metric units of length.	Estimate lengths. Choose and use appropriate instruments and units for measuring	Use geometrical equipment to construct 2D shapes. Use computer packages to construct shapes.				Construct the circumscribed and inscribed circles of triangles using geometrical equipment or computer packages.	**DRAWING, CONSTRUCTION AND LOCI**			Use of dynamic geometry. Use of Logo.	Links with plane geometry.
	Estimate the size of an angle in degrees. Use a 360° angle measurer to draw and measure angles.		Understand measure and use simple bearings.								
Use simple maps and plans.		Use knowledge of scales to interpret maps and plans.	Interpret and use scale drawing including maps, plans and enlargement with a positive whole number scale factor.							Use of CAD.	Maps, plans and elevations. Templates for DIY and garment making.

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		Find and sketch loci from practical examples.		Construct loci using geometrical equipment and computer packages.						Dynamic geometry software to draw more complex constructions and loci.	Link with coordinate geometry equations as loci.
	Find perimeters of simple shapes.		Know and use formulae for finding circumferences of circles.	Calculate lengths areas and volumes in plane shapes and right prisms.	Understand the relationships between lengths, areas and volumes of similar figures with whole number scale factors. Distinguish between formulae for perimeter area and volume by considering dimensions.	Find lengths of circular arcs.	**MENSURATION**	Investigation into the relationship between diameter and circumference of circles.		Investigate π on the internet.	Practical measurement of real objects, calculations from plans, blueprints or photographs.
	Understand the concept of area and find areas by counting squares.	Derive and use the formula for the area of a rectangle.	Derive and use the formulae for the areas of parallelograms and triangles. Know and use formulae for finding areas of circles. Calculate the areas of plane compound shapes.			Find areas of sectors of circles. Find the surface areas of cylinders. Use the formula to find the surface area of spheres.		Investigate approximations for the area of a circle by cutting the circle into sectors and arranging to make an approximate rectangle. Investigate the relationship between radius and area of circles.	Prove that triangles with the same base and height have the same area.	Dynamic geometry or CAD software to measure area.	

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		Understand the concept of volume and find the volume of cuboids by counting cubes.	Derive and use the formula for the volume of cuboids.			Use formulae to calculate the volume of pyramids and cones.					
	Use network diagrams to represent information on simple maps.	Understand and use the terms arcs, even and odd nodes, and regions to solve problems involving networks and traversability.		Understand and use Euler's rule for networks R+N=A+2 and the equivalent rule for a tree. N = A + 1		Represent solids as networks.	**NETWORKS**		Only even nodes makes unicursal, two odd nodes makes traversable.		Bridges of Konigsberg, 'Op-Art', 'Mystic Roses'.