Unit Overview: Reasoning with Geometry								
Half-Term:	AUT 1	AUT 2	SPR 1	**SPR 2**	SUM 1	SUM 2	**No of Lessons:**	**24**

Key Focus for Unit:

<u>Weeks 1 and 2: Deduction</u>
In this block students revise and extend their knowledge of angles rules and properties of shapes, applying them to increasingly complex problems. The block also builds on the ideas of the earlier Testing Conjectures block looking at deduction in a geometric rather than algebraic and numerical contexts. Students also revise the constructions covered in Year 8 and look more deeply at how and why these work.

<u>Weeks 3 and 4: Rotation and Translation</u>
Building on their study of line symmetry and refection in Year 8, students now took at rotational symmetry and rotation. They then move on to study translations, which are described in vector form They compare the different effects of the transformations studied so far, noticing that the objects and images are congruent.

<u>Weeks 5 and, 6: Pythagoras' Theorem</u>
Students revise squares and square roots before moving on to investigate the relationship between the sides of a right-angled triangle. The converse of the theorem is emphasised so that students are aware that if the sides of a triangle satisfy the rule $a^2 + b^2 = c^2$ then the triangle must be right-angled. Students explore using the theorem in a variety of context, including on coordinate axes, and a higher step is included using 3-D shapes. There is an opportunity to revisit the learning in the next block when students explore similarity in right-angled triangles as an introduction to trigonometry.

Key:
MASTERY – The skills and knowledge we want all our students to master and recall quickly.
SECURE – The skills and knowledge that we will need to return to regularly and interleave in order for our middle and lower attaining students to secure mastery or for which they might struggle.
DEVELOPING – The skills and knowledge that we will use to stretch and challenge our most abled students.

Deduction:	**Rotation and Translation:**	**Pythagoras' Theorem:**
• Angles in parallel lines (R) • Solving angles problems (using chains of reasoning) • Angles problems with algebra • Conjectures with angles • Conjectures with shapes • Link constructions and geometrical reasoning (H)	• Identify the order of rotational symmetry of a shape • Compare and contrast rotational symmetry with line symmetry • Rotate a shape about a point on a shape • Rotate a shape about a point not on a shape • Translate points and shapes by a given vector • Compare rotation and reflection of shapes • Find the result of a series of transformations (H)	• Squares and square roots (R) • Identify the hypotenuse of a right-angled triangle • Determine whether a triangle is right-angled • Calculate the hypotenuse of a right-angled triangle • Calculate missing sides in right-angled triangles • Use Pythagoras theorem on coordinate axes • Explore proofs of Pythagoras' theorem • Use Pythagoras' theorem in 3-D shapes (H)
Scaffolded Guidance: • Use Geometry software to model and	**Scaffolded Guidance:** • Use of tracing paper to allow students to	**Scaffolded Guidance:** • Use of integers (Pythagorean triples) and counting squares to find square root - arrays

demonstrate angles in parallel lines • Use Straws to represent angles in parallel lines <mark>Stretch Guidance:</mark> • Link constructions to angle and shape facts. • Solve more complex problem involving several steps. • Prove Geometric Facts • Setting up and solving equations, including with unknowns on both sides.	physically see transformations • Rotate the page to start facing "up" or "north" and rotate from there • Use of arrows with vectors, comparing the a graph <mark>Stretch Guidance:</mark> • Non standard rotations- e.g. 45° • Investigating if order matters, rotate then reflect vs reflect then rotate	<mark>Stretch Guidance:</mark> • Investigate Chords and Radii The chord AB has a length of 16 cm. The shortest distance from the chord to the centre of the circle is 6 cm. • Work out the length of the radius. • Explore proofs of Pythagoras' theorem • Use Pythagoras' theorem in other mathematical contexts

Key Knowledge and Big Ideas:
*What **Powerful Knowledge** and **Big Ideas** are explored in this Unit?* *How have these progressed from previous learning? What **gaps in knowledge** have you identified from **baselining** and how are the being closed?*

BIG IDEAS:

Number, Geometry and Algebra

Powerful Knowledge:
- Find missing angles in a variety of shapes
- Solve complex angle problems
- Prove geometrical facts about shapes and angles
- Find missing angles in parallel lines
- Use algebra to solve angle problems.
- Compare rotational and line symmetry
- Rotate shapes on a grid
- Perform a translation describe as a vector.
- Use Pythagoras Theorem to find missing length
- Use Pythagoras Theorem in a variety of context
- Use Pythagoras Theorem in 3D

Previous Learning:
- Plotting points on the coordinate plane
- Angles on a straight line
- Angles around a point
- Angles in a Triangle
- Angles in a quadrilateral
- Solving equations
- Opposite angles in a Rhombus and Parallelogram are equal
- Squares and Square roots

Gaps in Knowledge and Misconceptions:
- That all angles on a straight line add to make 180 instead of angles on a straight line at a point
- Don't fully appreciate what constitute vertically opposite angles.
- Don't fully appreciate that the positioning for angles in parallel lines are important and reluctant to rotate their book or paper to make the diagram look more familiar

Unit Assessment:
How will this unit be assessed?
What is the frequency of assessments – baselines etc?

How will this unit be assessed?	Main Topics Covered in assessments
• Baseline Testing with EOB A or similar at start • End of Block Assessment with EOB B at end	• Angle facts • Angles in parallel lines • Angles at a point on a straight-line including algebra • Angles in quadrilaterals • Constructing locus of points from a fixed point (circle) • Rotate a shape about a point on a shape • Translate a shape by a given vector • Describe a transformation that maps one shape to another • Double transformation • Find the length of a side given the area of a square • Identify right angle triangles • Find the length of a missing side in a right-angle triangle by applying Pythagoras' theorem • Prove that a triangle has a right angle by applying Pythagoras' theorem. • Pythagoras' theorem on coordinate axes. • Calculate height of a square base pyramid.

Retrieval Practice:	Key Retrieval Topics (Interleaving):
• T/F Retrieval starter • Homework tasks • Formula Quiz • Timetable Quiz	• Simplifying expressions • Forming expressions • Solving equations • Angles on a straight line • Angles around a point • Angles in a triangle • Vertically opposite angles

Key Skills Explored	Vocabulary Selected for DVI	Links to Previous Unit
• Finding missing angles on straight lines, around a point and in 2D shapes • Finding missing angles in problems involving parallel lines • Using algebra to set up and solve equations • Rotate a given shape • Describe the rotation • Translate a given shape • Describe the Translation • Using Pythagoras' theorem to find missing length • Use Pythagoras' theorem in a variety of mathematical contexts	Alternate angles Corresponding angles Co-interior angles Transversal, Bisector Perpendicular Rotational, Symmetry Invariant, Anti-clockwise Translate, Vector Hypotenuse Right-angled triangle Adjacent Origin, Quadrant Gradient ,3-D, Diagonal	• Angles on a straight line • Angles around a point • Angles in a triangle • Vertically opposite angles • Simplifying expressions • Solving equations • Constructions • Reflection • Draw lines parallel to the x and y axis • Congruence • Similarity

Links to Careers/Employability	How does this unit prepare students for the next unit?
• Design Industry • Science and research (engineer)	• Trigonometry • Enlargement • Similarity