

Unit Overview: Directed Numbers and Fractional Thinking								
Half- Term:	AUT 1	AUT 2	SPR 1	SPR 2	SUM 1	SUM 2	No of Lessons:	24
<p>Key Focus for Unit:</p> <p><i>What is the key knowledge being delivered? What is the intent of this unit?</i></p> <p><u>Weeks 1 – 2- Angles and Bearings</u></p> <p>As well as the formal introduction of bearings, this block provides a great opportunity to revisit other materials and make links across the mathematics curriculum. Accurate drawing and use of scales will be vital, as is the use of parallel line angles rules; all of these have been covered at Key Stage 3. Students will also reinforce their understanding of trigonometry and Pythagoras from earlier this year, applying their skills in another context as well as using mathematics to model real-life situations.</p> <p><u>Weeks 3 – 4 – Working with Circles</u></p> <p>This block also introduces new content whilst making use of and extending prior learning. The formulae for arc length and sector area are built up from students’ understanding of fractions They are also introduced to the formulae for surface area and volume of spheres and cones; here higher students can enhance their knowledge and skills of working with area and volume ratios.</p> <p>Higher tier students are also introduced to four of the circle theorems; the remaining theorems will be introduced in Year 11 when these four will be revisited.</p> <p><u>Weeks 5 – 6 - Vectors</u></p> <p>Students will have met vectors to describe translations during Key Stage 3 This will be revisited and used as the basis for looking more formally at vectors, discovering the meaning of $-a$ compared to a to make sense of operations such as addition, subtraction and multiplication of vectors. This will connect to exploring ‘journeys’ within shapes linking the notation AB with $b - a$ etc. Higher tier students will then use this understanding as the basis for developing geometric proof, making links to their knowledge of properties of shape and parallel lines.</p>								
<p>Key:</p> <p>MASTERY – The skills and knowledge we want all our students to master and recall quickly.</p> <p>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.</p> <p>DEVELOPING – The skills and knowledge that we will use to stretch and challenge our most abled students.</p>								
Angles and Bearings			Working with Circles			Vectors		
<ul style="list-style-type: none"> • Use cardinal directions and related angles R • Draw and interpret scale diagrams R • Understand and represent bearings • Measure and read bearings • Make scale drawings using bearings • Calculate bearings using angles rules • Solve bearings problems using Pythagoras and trigonometry 			<ul style="list-style-type: none"> • Recognise and label parts of a circle R • Calculate fractional parts of a circle • Calculate the length of an arc • Calculate the area of a sector • Circle theorem: Angles at the centre and circumference H • Circle theorem: Angles in a semicircle H 			<ul style="list-style-type: none"> • Understand and represent vectors • Use and read vector notation • Draw and understand vectors multiplied by a scalar • Draw and understand addition of vectors • Draw and understand addition and subtraction of vectors 		

<ul style="list-style-type: none"> Solve bearings problems using the sine and cosine rules 	<ul style="list-style-type: none"> Circle theorem: Angles in the same segment H Circle theorem: Angles in a cyclic quadrilateral 	<ul style="list-style-type: none"> Explore vector journeys in shapes H Explore quadrilaterals using vectors H Understand parallel vectors
<p>Scaffolded Guidance:</p> <ul style="list-style-type: none"> Making and using actual scale drawings such as architect's drawings is helpful when looking at scale. Straws are always useful for reminding what happens with parallel and intersecting lines. Scaffolding, by providing partly-drawn diagrams may be useful. They will need support initially to form diagrams from worded questions. It is a good idea to use plain paper rather than squared paper (as in examinations) to promote accurate use of a protractor. The need for accuracy can be emphasised by comparing answers. <p>Stretch Guidance:</p> <ul style="list-style-type: none"> Include questions where the length is given as a surd 	<p>Scaffolded Guidance:</p> <ul style="list-style-type: none"> This is a very visual unit of work and students should be encouraged to make accurate diagrams and meaningful sketches throughout. Dynamic geometry is very useful to illustrate the circle theorems. Students may need help to reinforce the language of 'segment', which can often be confused with 'sector', and 'subtend'. Varying the diagram is again useful so that students do not only look for the common 'bow-tie' shape. <p>Stretch Guidance:</p> <ul style="list-style-type: none"> For area of a sector looking at examples both in terms of π and in decimal form is useful, as is working backwards to find θ, r or d For arc length, getting the students to work backwards to find the angle. Get the students to find the area of the segment 	<p>Scaffolded Guidance:</p> <ul style="list-style-type: none"> Use of concrete representations and visuals is vital. In initial stages, reinforce the idea of magnitude and displacement by either asking students to physically move objects according to instructions, or to move themselves. Dynamic geometry packages can be used to visually represent vectors and this can aid production of diagrams from a set of information. Comparing what's the same and what's different about vectors, using diagrams is also helpful. A common misconception is that parallel vectors are equal; you may need to highlight that they have the same direction, but not necessarily the same size. Throughout, students should make generalisations about different quadrilaterals. <p>Stretch Guidance:</p> <ul style="list-style-type: none"> Prove that three points are collinear Solve vector problems with ratio

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:

Geometry and Measures

Powerful Knowledge:

- Measure and read bearings
- Make scale drawings using bearings
- Calculate bearings using angles rules
- Solve bearings problems using Pythagoras and trigonometry
- Calculate fractional parts of a circle
- Calculate the length of an arc
- Calculate the area of a sector
- Use the circle theorems
- Draw and understand vectors multiplied by a scalar
- Draw and understand addition of vectors
- Draw and understand addition and subtraction of vectors
- Understand parallel vectors
- Solve vector geometry problems

Previous Learning:

- Use cardinal directions and related angles
- Draw and interpret scale diagrams
- Recognise and label parts of a circle

Gaps in Knowledge and Misconceptions:

- Reinforce that 24.5 is not written in three figures- three digits before the decimal point is needed
- Students not fully grasping the concept that the bearing from A to B is different from the bearing of B from A and that the sum of the two add to make 360 degrees.
- Students sometimes swap round the order for the circle theorem rule for angle at the centre is twice the angle at the circumference and also not fully recognising that the angle at the circumference must be formed at the circumference.
- Students not fully recognising that the theorem for cyclic quadrilateral only works for quadrilateral
- For vectors not realising that the negative of a-b is b-a
- Students not fully appreciating the difference between displacement and position vector.

Unit Assessment:

How will this unit be assessed?

What is the frequency of assessments – baselines etc?

How will this unit be assessed?

- Baseline Testing with EOB A or similar at start
- End of Block Assessment with EOB B at end

Main Topics Covered in assessments

- Draw and measure angles
- Angles around a point
- Angles in parallel lines
- Measure the bearing of Q from P.
- Draw scale diagram
- Use SOH CAH TOA
- Solve bearing problems
- Parts of a circle
- Area and circumference of a circle
- Area of a sector

	<ul style="list-style-type: none"> • Length of an arc • Volume of Prisms and Pyramids • Volume of Cone and Sphere • Use the circle Theorems to solve problems • Draw and understand addition and subtraction of vectors • Explore vector journeys in shapes • Explore quadrilaterals using vectors • Understand parallel vectors • Show that three point are collinear 	
<p>Retrieval Practice:</p> <ul style="list-style-type: none"> • T/F Retrieval starter • Homework tasks • Formula Quiz • Timetable Quiz 	<p>Key Retrieval Topics (Interleaving):</p> <ul style="list-style-type: none"> • Use cardinal directions and related angles • Draw and interpret scale diagrams • Recognise and label parts of a circle • Finding circumference and area of circle • Solve area and volume of similar shapes • Form and solve equations • Plotting point • Properties of quadrilaterals 	
<p>Key Skills Explored</p>	<p>Vocabulary Selected for DVI</p>	<p>Links to Previous Unit</p>
<ul style="list-style-type: none"> • Draw and measure angles • Angles around a point • Angles in parallel lines • Measure the bearing of Q from P. • Draw scale diagram • Use SOH CAH TOA • Solve bearing problems • Parts of a circle • Area and circumference of a circle • Area of a sector • Length of an arc • Volume of Prisms and Pyramids • Volume of Cone and Sphere • Use the circle Theorems to solve problems • Draw and understand addition and subtraction of vectors • Explore vector journeys in shapes • Explore quadrilaterals using vectors • Understand parallel vectors • Show that three point are collinear 	<ul style="list-style-type: none"> • North line • Clockwise • Due East/West....of • Bearing • Corresponding • Alternate • Co-interior • Alternate • Perpendicular • Tangent • Chord • Segment • Sector • Arc • Subtend • Cyclic • Frustum • Magnitude • Resultant • Vector • Multiplier • Scalar • Collinear 	<ul style="list-style-type: none"> • Use cardinal directions and related angles • Draw and interpret scale diagrams • Recognise and label parts of a circle • Solve area and volume of similar shapes • Solving linear equations and inequalities • Form and solve equations and inequalities • Draw straight line graphs •
<p>Links to Careers/Employability</p>	<p>How does this unit prepare students for the next unit?</p>	
<ul style="list-style-type: none"> • Meteorologist • Scientist • Astronaut • Pilot • Sea Captain • Car/bike repair shop or dealership • Plumber • Animator • Mathematics teacher • Interior design 	<ul style="list-style-type: none"> • Algebraic reasoning - Forming and solving equations • Multiplicative reasoning • Geometric reasoning 	