The Sutton Academy

Knowledge Rich Curriculum Plan

Year 9 Prime – Perimeter, Area, Pythagoras and Trigonometry

Lesson objective	Intended Knowledge:	Tiered Vocabulary	Prior Knowledge:	Steps to Success	Feedback
To learn how to calculate the perimeter and area of 2D shapes.	• Students will know how to find the perimeter of 2D shapes. • Students will know how to use inverse operations to find the missing lengths of shapes when given the perimeter. • Students will know how to solve real life problems involving perimeter. • Students will know how to calculate the area rectangles, parallelograms and triangles. • Students will know how to use inverse operations to find the missing lengths of shapes when given the area. • Students will know how to solve real life problems involving area.	Perimeter – the distance around the outside of a shape Area – the amount of space inside a 2D shape	• Students need to know how to find the perimeter of basic shapes.	<u>Steps to Success – Perimeter</u> To calculate the perimeter, add the length of all of the sides together. Remember even if there are only two measurements on the shape if it has 4 sides you will need to add 4 numbers. <u>Steps to Success – Perimeter of compound shapes</u> **Step 1:** Firstly, identify whether or not you need to find any missing lengths, if it is necessary subtract the smaller length from the larger length. **Step 2:** Add up the lengths of all the sides. **Step 3:** Don't forget to write your units – cm or mm or m. <u>Steps to Success – Area of shapes</u> **Step 1** – Identify the formula from the list needed: • Area of a **Square/Rectangle** = Base x Height • Area of a **Parallelogram** = Base x Height • Area of a **Triangle** = ½ x Base x Height **Step 2** – Substitute the measurements into the required formula. **Step 3** – Don't forget to write your units cm^2 or mm^2or m^2.	
To learn how find the area of compound shapes and trapezia.	• Students will know how to calculate the area of compound shapes. • Students will know how to use inverse operations to find the missing sides of a compound shape. • Students will know how to solve problems involving the area of compound shapes. • Students will know how to calculate the area of a trapezium. • Students will know how to use inverse operations to find the height or missing side of a trapezium. • Students will know how to solve problems involving the area of trapezia.	Area – the amount of space inside a 2D shape Trapezium – a quadrilateral with one pair of parallel sides. Parallel – two lines that are the same distance apart and never touch Compound shape – a shape made up of two or more geometric shapes	• Students need to know how to find the area of rectangles and triangles. • Students need to know how to substitute in to expressions/formulae.	<u>Steps to Success – Area of trapezia ½(a+b)h</u> **Step 1:** Label your trapezium, a and b are the **parallel** lengths of your trapezium and h is the **perpendicular** height. **Step 2:** Substitute a, b and h into the formula ½(a + b)h. **Step 3:** Calculate using BIDMAS. **Step 4:** Don't forget to write your units - cm^2 or mm^2or m^2. To calculate the missing sides of a trapezia, the **inverse** operations of ½(a + b)h will be used. <u>Steps to Success – Area of compound shapes</u> **Step 1:** Firstly, identify whether or not you need to find any missing lengths, if it is necessary subtract the smaller length from the larger length. **Step 2:** Divide the compound shape into smaller shapes, and calculate the area of each individual shape. **Step 3:** To find the total area of the compound shape, add the area of the individual shapes together. **Step 4:** Don't forget to write your units - cm^2 or mm^2or m^2.	
To learn how to find the circumference and area of a circle.	• Students will know how to calculate the circumference of a circle. • Students will know how to find the circumference of a circle when the diameter or radius is known (mixture). • Students will know how to calculate the perimeter of semi circles/quarter circle and three quarter circles. • Students will know how to solve problems involving the circumference of circles.	Circumference – the perimeter of a circle Arc – a part of a curve, a part of the circumference of a circle Radius – a straight line from the centre to the circumference of a circle or sphere Diameter – a straight line passing from side to side	• Students need to know how to round to a given decimal place or significant figure. • Students need to know how to identify the radius, diameter and circumference of a circle.	<u>Steps to Success: Circumference of a circle</u> **Step 1:** Find the diameter of your circle, if you are given the radius, double it to find the diameter. **Step 2:** Substitute your diameter into the formula – π x d **Step 3:** Type your calculation in the calculator. **Step 4:** Write your answer from the calculator, check to see if the question wants you to round or answer in terms of π.	

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	• Students will know how to calculate the area of a circle. • Students will know how to calculate the area of a semi-circle, quarter circle, three-quarter circle. • Students will know how to solve problems involving the area of circles.	through the centre of a circle or sphere		**Steps to Success: Circumference of a semi-circle/quarter circle** **Step 1:** Find the diameter of your circle, if you are given the radius, double it to find the diameter. **Step 2:** Substitute your diameter into the formula – π x d **Step 3:** Divide the circumference of the circles by 2 for semi circle, 4 for quarter of a circle. **Step 4:** Add the diameter onto the circumference of the semi circle **Steps to Success: Area of a circle** **Step 1:** Find the radius of your circle, if you are given the diameter, half it to find the radius. **Step 2:** Substitute your radius into the formula – πr^2 **Step 3:** Type your calculation in the calculator. **Step 4:** Write your answer from the calculator, check to see if the question wants you to round or answer in terms of π **Steps to Success: Area of a semi circle/quarter circle** **Step 1:** Find the radius of your circle, if you are given the diameter, half it to find the radius. **Step 2:** Substitute your radius into the formula – $\frac{\pi r^2}{2}$ for a semi circle or $\frac{\pi r^2}{4}$ for a quarter circle. **Step 3:** Type your calculation in the calculator. **Step 4:** Write your answer from the calculator, check to see if the question wants you to round or answer in terms of π	
To learn how to calculate the area of sectors	• Students will know how to calculate the area of a sector. **Opportunity for challenge:** • Students will know how to calculate the angle or radius of a sector given its area using inverse operations.		• Students need to know how to find the area of a circle	**Steps to Success – Area of a Sector** To calculate the area of a **sector** you need to find the fraction of the circle that you have, this is the same as the angle in the sector divided 360 degrees. You then multiply the fraction by the area of the circle. **The formula for the area of a sector is:** $\frac{\theta}{360} \times \pi r^2$	
To learn how to find the arc length and perimeter of a sector.	• Students will know how to find the length of an arc. • Students will know how to find the perimeter of a sector. • Students will know how to find the arc length or perimeter of a sector in terms of Pi. **Opportunity for challenge:** • Students will know how to calculate the angle or radius of a sector given its arc length using inverse operations.		• Students need to know how to calculate circumference of circles.	**Steps to Success – Arc lengths and perimeter of a Sector.** To calculate arc length, you need to find the fraction of the circle that you have, this is the same as the angle in the sector divided 360 degrees. You then multiply the fraction by the **circumference** of the circle. **The formula for arc length is:** $\frac{\theta}{360} \times \pi \times diameter$ If you need to find the perimeter of the sector you must remember to add on the two radii once you have calculated the **arc length**	

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To learn how to calculate missing sides using Pythagoras' Theorem.	• Students will know how to find the hypotenuse, using Pythagoras' theorem • Students will know that the hypotenuse is the longest side in a right-angled triangle. • Students will know how to find the shorter sides of the triangle using Pythagoras' theorem. Students will know that they subtract when finding the shorter side. • Students will know how to identify whether they need to add or subtract when using Pythagoras' theorem. They will know that it is important to label the sides. • Students will know how to use Pythagoras' theorem to solve a multi-step problem with 2 triangles. • Students will know how to use Pythagoras' Theorem to solve problems involving perimeter or area. • Students will know how to use Pythagoras' theorem to solve simple worded problems.	Hypotenuse – the longest side in a right-angled triangle. It can always be found opposite the right angle Theorem – a statement that has been proved, or can be proved	• Students will need to substitute values into expressions/formulae. • Students need to be able to square and square root numbers.	<u>Steps to Success: Using Pythagoras' Theorem to find the hypotenuse.</u> **Step 1:** In order to find the missing side of a triangle using Pythagoras' theorem, we need to work out which side corresponds to each of the letters a, b and c in the equation $a^2+b^2=c^2$, remembering that the longest side is the hypotenuse which is known as c. a and b will be either one of the two perpendicular sides. **Step 2:** Label your diagram. **Step 3:** Next we substitute the values into the equation $a^2+ b^2= c^2$ **Step 4:** Calculate the square numbers and then add the values (BIDMAS). **Step 5:** Don't forget to square root your value to get the length of the side. **Step 6:** Round your answer to an appropriate degree of accuracy if necessary. **Step 7:** Check that your answer looks right. Is the hypotenuse the longest side? <u>Steps to Success: Using Pythagoras' Theorem to find one of the perpendicular sides.</u> **Step 1:** In order to find the missing side of a triangle using Pythagoras' theorem, we need to work out which side corresponds to each of the letters a, b and c in the equation $a^2+b^2=c^2$, remembering that the longest side is the hypotenuse which is known as c. a and b will be either one of the two perpendicular sides. **Step 2:** Label your diagram. **Step 3:** Next we substitute the values into the equation $a^2+ b^2= c^2$ **Step 4:** Rearrange the equation to get either $a^2= c^2- b^2$ OR $b^2= c^2- a^2$ **Step 5:** Calculate the square numbers and then add the values (BIDMAS). **Step 6:** Don't forget to square root your value to get the length of the side. **Step 7:** Round your answer to an appropriate degree of accuracy if necessary. **Step 8:** Check that your answer looks right. Is the hypotenuse the longest side?	
To learn how to calculate missing sides using Pythagoras' Theorem including in 3D shapes.	• Students will know how to use Pythagoras' theorem to solve 3D problems, including calculating the lengths of diagonals.		• Students needs to be able to find missing sides using Pythagoras' Theorem.		

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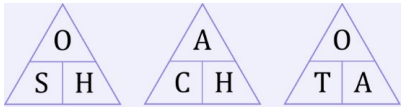
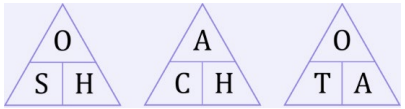
To learn how to calculate missing sides in right-angled triangles using trigonometry.	• Students will know how to fill in the trigonometric triangles. • Students will know how to find the missing side in a right-angled triangle by using trigonometry.	Trigonometry – Relationships between side lengths and angles of triangles Hypotenuse – the longest side in a right-angled triangle. It can always be found opposite the right angle Adjacent – next to, in maths the adjacent side in a right-angled triangle is the side that is adjacent to the angle, forming the angle with the hypotenuse Opposite – for right angled triangles the opposite is the side opposite the angle that we know or are trying to find.	• Students will know how to input the trigonometric values onto a calculator.	<u>Steps to Success – Calculating a missing side using SOHCAHTOA:</u> **Step 1:** Label the sides O, H and A. **Step 2:** Circle the side you know and the side you are trying to find. **Step 3:** Identify the trig function you are using (sin, cos or tan). **Step 4:** Substitute the lengths and angles into the correct place in the formula triangle. **Step 5:** Write down the calculation you need to do and then use your calculator to work out the answer. 	
To learn how to calculate missing angles in right-angled triangles using trigonometry.	• Students will know how to find the missing angle in a right-angled triangle using trigonometry. • Students will know how to solve multi-step problems involving more than one right-angled triangle using SOHCAHTOA. • Students will know how to use trigonometry to solve simple problems involving perimeter or area.		• Students need to know how to find the missing sides of a right-angled triangle using trigonometry.	<u>Steps to Success – Calculating a missing angle using SOHCAHTOA:</u> **Step 1:** Label the sides O, H and A. **Step 2:** Circle the two sides you know. **Step 3:** Identify the trig function you are using (sin, cos or tan). **Step 4:** Substitute the lengths and angles into the correct place in the formula triangle. **Step 5:** Write out the formula that is created. **Step 6:** Use the inverse trig function to calculate the missing angle (Sin^{-1}, Cos^{-1}, Tan^{-1}). 	
Mini-Assessment 7					