NAME		TEACHER				
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YEAR 9H (DELTA/THETA) CYCLE 1: NUMBER & SURDS

	Knowledge	Prior knowledge	End of topic
Number	**Estimation** – I can estimate the answer to calculations by rounding to one significant figure and apply to problem solving questions		
	Number Problems – I can work out the total number of ways of performing a series of tasks		
	HCF & LCM – I can write any number as a product of its prime factors and find the highest common factor and lowest common multiple of two numbers		
	Indices - I can use powers and roots in calculations		
	Index Laws – I can use multiply and divide using index laws and work out a power raised to a power		
	Negative Indices – I can use negative indices to work out calculations and simplify expressions		
	Fractional Indices – I can use fractional indices to work out calculations and simplify expressions		
	Standard Form – I can use standard form to write big or small numbers as a power of 10		
	Calculate with Standard Form – I can calculate (multiply / divide) with numbers in standard form and apply to problem solving questions		
Surds	**Surds** – I understand the difference between rational and irrational numbers		
	Surds 2 – I can simplify surds using square number factors		
	Surds & Brackets – I can expand single and double brackets involving surds and simplify		
	Rationalising – I can rationalise the denominator of a surd (including of the form a√b + c)		

LEARNING TOOLS				
KEY CONCEPTS	**Standard Form**	Why do we use standard form to write really big or really small numbers?		
	Surd	An irrational number - another name for the square root		
KEY WORDS	**Estimate**	**Prime Number**	**Nth Term**	**Indices**
KEY EQUATION	(A number between 1 and 10) x (10 to the power)			
PRE-LEARNING	**Y9 Higher Cycle 1 HegartyMaths Videos:** • 32 (Highest Common Factor: Prime Factorisation) • 35 (Lowest Common Factor: Prime Factorisation) • 121 (Powers of 10) • 115 (Simplifying Surds)			
CAREERS	**Scientists** use standard form when working with the speed of light and distances between galaxies, which can be enormous. The size of bacteria or atoms may also be referred to in standard form as they are so tiny. Surds are used in real life to make sure that important calculations are precise, for example by **engineers** building bridges.			

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YEAR 9H (DELTA/THETA) CYCLE 2: ALGEBRA & SEQUENCES

	Knowledge	Prior knowledge	End of topic
Algebra	**Re-arranging Formulae** – I can re-arrange/change the subject of simple formulae such as SDT		
	Advanced Substitution – I can substitute numbers (including negatives and fractions) into formulae and re-arrange for ease; and apply to real life contexts		
	Algebraic Indices – I can use the rules of indices to simplify algebraic expressions		
	Expanding Single Brackets - I can expand single brackets involving positive and negative numbers and powers greater than 2		
	Factorising Single Brackets - I can find the highest common factor and factorise algebraic expressions		
	Solving Equations 1 – I can solve equations **involving brackets** and with **unknowns on both sides** and apply to problem solving questions involving shapes		
	Solving Equations 2 – I can solve equations involving numerical fractions		
	Expanding Double Brackets – I can expand the product of two brackets involving positive and negative numbers		
	Factorising Quadratics – I can factorise quadratics of the form $x^2 + bx + c$ and know and use the difference of two squares when necessary		
	Quadratics – I can find the roots of a quadratic function of the form $x^2 + bx + c = 0$ and sketch		
Sequences	**Linear Sequences** – I can find subsequent terms in a sequences and determine whether a number is a part of a sequence		
	Nth Term – I can find the nth term of an arithmetic sequence		
	Geometric Sequences – I can continue and solve problems using geometric sequences		
	Fibonacci Sequences – I can work out terms in Fibonacci sequences		
	Quadratic Sequences – I can find the nth term of a quadratic sequence		

LEARNING TOOLS				
KEY CONCEPTS	**Fibonacci**	What do you know about this famous sequence?		
KEY WORDS	**Estimate**	**Substitute**	**Nth Term**	**Factorise**
KEY EQUATION	**Quadratic Equation** $ax^2 + bx + c$			
PRE-LEARNING	**Y9 Higher Cycle 2 HegartyMaths Videos:** • 278 (Substitution into complex formulae) • 223 (Factorise quadratic expressions 1) • 197 (Linear sequences: term-to-term rule) • 263 (Fibonacci Sequences)			
CAREERS	• Quadratic equations are often used to describe the motion of objects that fly through the air. If you plan to join the **military** and work with artillery or tanks, then you will regularly use the quadratic equation to predict where shells will land. • **Health Care Professional:** The health care field often uses linear equations to calculate medical doses. Linear equations are also used to determine how different medications may interact with each other and how to determine correct dosage amounts to prevent overdose with patients using multiple medications. Doctors also use linear equations to calculate doses based on a patient's weight.			

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YEAR 9H (DELTA/THETA) CYCLE 3: DATA & NUMBER

	Knowledge	Prior knowledge	End of topic
Data	**Stem & Leaf Diagrams** – I can construct and use single and back-to-back stem and leaf diagrams and find the median and range		
	Averages & Range – I can decide which average is best for a set of data, estimate the mean and range from a grouped frequency table and find the modal class		
	Pie Charts – I can construct and interpret pie charts and make comparisons in context		
	Frequency Polygons – I can construct and use frequency polygons		
	Scatter Graphs – I can plot and interpret scatter graphs and determine if there is a relationship between two variables AND use a line of best fit to estimate values		
	Two Way Tables - I can complete and construct my own two-way tables to solve problems		
	Time Series - I can plot and interpret time series graphs and forecast future trends		
Fractions & Percentages	**Numerical Fractions** – I can add subtract, multiple and divide fractions and mixed numbers		
	Algebraic Fractions– I can simplify, add & subtract basic algebraic fractions by finding the LCM		
	Percentage of Amount – I can find any percentage of an amount (with & without a calculator)		
	Percentage Change - I can find percentage increases / decreases and apply to problems		
Ratio	**Conversions –** I can change freely between related standard units (such as time, length, area, volume/capacity and mass)		
	Proportion 1 - I can express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1		
	Proportion 2 - I can recognise and use direct proportion and apply to problems involving money and measures		
	Ratio 1 – I can simplify and compare ratios and write ratios using the unitary method		
	Ratio 2 – I can divide a given quantity into 2+ parts in a given part:part or whole:part ratio		

LEARNING TOOLS				
KEY CONCEPTS	**Pie Chart**	A way of presenting data to easily make comparisons		
KEY WORDS	**Median**	**Reciprocal**	**Line of Best Fit**	**Factorise**
KEY EQUATIONS		**Percentages tricks:** To find 10%, divide by ___ To find 5%, divide by ___	To find 2%, divide by ___ To find 1%, divide by ___	
PRE-LEARNING	**Y9 Higher Cycle 3 HegartyMaths Videos:** • 427 (Pie Charts 1) • 441 (Frequency Polygon)	• 97 Percentage Change • 329 (Simplify ratios) • 330 (Write ratios as fractions/proportions)		
CAREERS	• Pie charts are often used in **business**. Examples include showing percentages of types of customers, percentage of revenue from different products, and profits from different countries. Pie charts can be helpful for showing the relationship of parts to the whole when there are a small number of levels. • **Real Estate Lenders:** Lenders who lend money for the purchase of real estate (mortgages) are concerned with more than your debt ratio. They are going to use the real estate as collateral for their loan.hey need to know how much the collateral is worth in relation to the amount of money they are lending. This is called "LTV" or "Loan-to-value" ratio. The smaller the loan in relation to the value of its collateral, the safer the lender is in making the loan.			

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YEAR 9H (DELTA / THETA) CYCLE 4: ANGLES & TRIGONOMETRY

	Knowledge	Prior knowledge	End of topic
Angles	**Angle Properties** – I can derive and use the sum of angles in a triangle and quadrilateral		
	Angle Facts – I know and can use angle facts to find missing angles (vertically opposite, angles on a straight line, supplementary)		
	Angles in Polygons 1 – I can derive the formula for the sum of the interior angles of any regular polygon		
	Angles in Polygons 2 – I can calculate the interior and exterior angles of regular polygons		
	Angles in Parallel Lines - I can understand and use the angles properties in parallel lines and find missing angles using corresponding, alternate and supplementary angle rules		
	Angles & Algebra – I can solve angle problems by forming and solving equations		
Trigonometry	**Pythagoras Theorem 1–** I can calculate the length of the hypotenuse and shorter side in a right-angled triangle and solve problems		
	Pythagoras Theorem 2 – I can calculate the length of a shorter side in a right-angled triangle and solve problems		
	Trigonometry 1 - I can use trigonometric ratios to find lengths in a right-angled triangle and solve problems in 2D		
	Trigonometry 2 - I can use trigonometric ratios to calculate angles in a right-angled triangle and solve problems in 2D		
	Trigonometry 3 – I can find angles of elevation and depression using trigonometry		
	Exact Trig Values _ I know the exact values of the sine, cosine and tangent of angles of 0, 30, 45, 60 and 90 degrees AND can derive using an equilateral / isosceles triangle		

LEARNING TOOLS				
KEY CONCEPTS	**Angles in a Polygon**	Sum of Interior Angles: **(n-2) x 180** Exterior Angle: **360/n** (where n is the number of sides)		
	Pythagoras Theorem	**$a^2 + b^2 = c^2$ in any right angled triangle**		
KEY WORDS	**Interior**	**Exterior**	**Corresponding**	**Alternate**
KEY EQUATION	**SOH CAH TOA**			
PRE-LEARNING	**Y9 Higher Cycle 4 HegartyMaths Videos:** • 477 (Angle on a Straight Line 1) • 812 (Angles Around a Point) • 485 (Angles in a Triangle 1) • 497 (Pythagoras' Theorem: proof) • 508 (Trigonometry: introduction)			
CAREERS	**Architecture/Construction:** Commercial and residential builders use geometric formulas to make important calculations. They work with right angles – angles measuring 90 degrees – frequently. Builders also use geometric formulas to determine the best way to create building frames, walls and features that meet the specifications outlined in architectural plans. The Pythagorean theorem aids in the construction of stable buildings, bridges, etc. **Crime Scene Investigators:** Investigators use trigonometry to determine the position of individuals involved in the crime, entry and exit points of bullet wounds, etc.			

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YEAR 9H (DELTA/THETA) CYCLE 5: GRAPHS & SHAPE

	Knowledge	Prior knowledge	End of topic
Graphs	**Linear Graphs** – I can plot straight line graphs with equations ax + by = c and compare two graphs from their equations		
	Equation of a Line – I can sketch graphs using the gradient and intercepts and find the equation of a line, given the graph in the form **y = mx + c**.		
	Gradient – I can find the gradient of a line between two points, with and without a graph		
	Distance Time Graphs – I can draw & interpret distance-time graphs and calculate average speed.		
	Velocity Time Graphs – I can find acceleration and distance from velocity-time graphs		
	Real Life Graphs – I can draw & interpret real life graphs and draw & use a line of best fit		
	Line Segments - I can find the co-ordinates of the midpoint of a line segment and find the gradient and length of a line segment (using Pythagoras)		
	Parallel & Perpendicular Lines – I can find the equations of lines parallel or perpendicular to a given line		
	Quadratic Graphs – I can draw quadratic graphs from a table of values and solve quadratic equations using a graph		
	Cubic / Reciprocal Graphs – I can draw graphs of cubic functions & solve and draw graphs of reciprocal functions using a table of values		
	Graph of a Circle - I can draw the graph of a circle using a table of values with (0,0) as the origin and deduce the general equation of a circle		
Shape	**Perimeter & Area** - I can find the perimeter & area of compound shapes (including trapezia)		
	Units & Limits of Accuracy – I can convert between metric units of area and volume and calculate the minimum and maximum possible values of a measurement		
	Prisms – I can find the volume and surface area of any prism; including cuboids, trapezoids, triangular prisms and apply to problem solving questions		
	3D Shape Problem Solving – I can form equations using area / volume formulae and use to find unknown lengths in 3D shapes		

LEARNING TOOLS					
KEY CONCEPTS	**y = mx + c**	In the equation of a line **y = mx + c** m represents _____ and c represents _____			
	Lines	Perpendicular lines meet at a _____ _____			
KEY WORDS	**Solve**	**Roots / Solutions**	**Acceleration**	**Mid-Point**	
KEY EQUATION	**Volume of a Prism =** Area of Cross Section x Length				
PRE-LEARNING	**Y9 Higher Cycle 5 HegartyMaths Videos**: • 207 - Straight line graphs 2 • 570 - Prisms (1) • 880 - Speed-time graphs (1)				
CAREERS	• Car companies use velocity time and distance time graphs to analyse the data of new car concepts and take actions with regards to improving their safety as well as their performance. • Architects and room decorators examine the surface areas and the volume of shapes (rooms, buildings etc.) to make decisions on different matters like designing and furnishing. • Scientists use digital scales, which can typically measure the mass of an object more precisely. Whereas a mechanical balance may only read the mass of an object to the nearest tenth of a gram, many digital scales can measure the mass of an object up to the nearest thousandth of a gram.				

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YEAR 9H (DELTA/THETA) CYCLE 6: CIRCLES & TRANSFORMATIONS

	Knowledge	Prior knowledge	End of topic
Circles	**Circle Calculations –** I can calculate the area & circumference of a circle and use to solve problems (including in terms of **π**)		
	Sectors of Circles – I can calculate the perimeter and area of semicircles and quarter circles and calculate **arc lengths**, angles and **areas of sectors**		
	Cylinders & Spheres – I can calculate the volume and surface area of a cylinder and sphere and apply to problem solving questions		
	Pyramids & Cones – I can calculate the volume and surface area of pyramids and cones and apply to problem solving questions		
Transformations	**Reflection –** I can reflect a 2D shape on a 4-quadrant axis including in the line y=x and describe a reflection		
	Rotation – I can rotate a 2D shape on a 4-quadrant axis using a centre of rotation and describe a rotation fully		
	Enlargement 1 – I can enlarge shapes by a positive integer scale factor about the origin and a given centre of enlargement		
	Enlargement 2– I can enlarge shapes by a fractional and negative scale factor about a centre of enlargement		
	Translation – I can translate a shape using a column vector and describe a translation		
	Transformations Combined - I can carry out and describe combinations of transformations		
Shape	**3D Solids** – Draw plans and elevations of 3D solids (using isometric and squared grids)		
	Bearings – I can solve problems involving bearings (and apply to basic trigonometry)		
	Constructions – I can accurately construct triangles using a rule and compasses (SSS, ASA)		
	Constructions 2 – I can construct a perpendicular bisector and angle bisector		
	Loci – I can draw a locus of points and use loci to solve problems		

LEARNING TOOLS			
KEY CONCEPTS	**Column Vector**	Used to describe a translation on a co-ordinate axis	
	π (pi)	π (pi) is the relationship between the _____ and _____ of a circle	
KEY QUESTIONS	Area of a Circle =	Circumference of a Circle =	
KEY EQUATION	**Volume of a Sphere = $4/3\pi r^3$**		
PRE-LEARNING	**Y9 Higher Cycle 6 HegartyMaths Videos**: • 650 - Describe transformations (1) • 580 - Spheres (1) • 461 - Drawing angles		
CAREERS	• Robotics engineers use programming in conjunction with mathematical constructions and shape transformations to design and build machines to do automated jobs in industries like manufacturing, aerospace and medicine. • Pottery artists, one of the oldest and most widespread decorative arts, use clay to construct 3D shapes and other mathematical constructions such as ornaments, vessels for holding liquids or plates or bowls from which food can be served.		