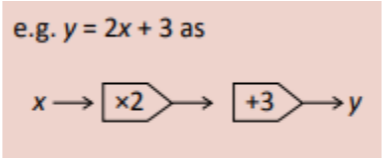| Dates taught / curriculum time	PRIOR KNOWLEDGE What should they already know / when was this last visited	CORE KNOWLEDGE What will they know at the end of this topic		MISCONCEPTIONS/ THRESHOLD CONCEPTS	AMBITION FOR ALL QUESTIONS	FORMAL ASSESSMENT
		Learn that…	Learn how to…			
HT1 Number	Understanding of: - Squares and square roots - Cubes and cube roots - Converting into and out of standard form - Calculating with standard form - Working with decimals - Standard form - Prime numbers - Prime factorisation - Y10 HT2 Chemistry Calculating percentages	• To square a number, we multiply it by itself • To cube a number, we multiply it by itself and by itself again • The inverse of squaring is the square root, and the inverse of cubing is the cube root • Standard form is written as A x 10^n, where 1≤A<10 and n cannot be a decimal/fraction • All positive integers have two square roots • The order of operations are brackets, indices, division and multiplication, addition and subtraction • A prime number has 2 factors which are 1 and itself • Numbers can be expressed as a product of primes by using prime factorisation	• Calculate square numbers up to 12 • Calculate cube numbers up to 5 • Square and cube large numbers and decimals using written methods • Calculate the square and cube roots of numbers • Convert big numbers into standard form • Convert big numbers into ordinary form • Convert small numbers into standard form • Convert small numbers into ordinary form • Order standard form • Multiply and divide with standard form • Add and subtract with standard form • Use representations of directed numbers • Order directed numbers using lines and appropriate symbols • Perform calculations that cross zero • Confidently add and subtract directed numbers • Confidently multiply and divide directed numbers • Use multiplication of negative numbers to show all positive integers have two square roots • Calculate order of operations with directed numbers • Use of a calculator for directed numbers • Identify prime numbers less than 20 and use methods to determine primes up to 100 • Use power notation in expressing a whole number as a product of its	• To square a number, you multiply by 2 • To cube a number, you multiply by 3 • A square root only has one solution • When using index laws, we multiply/divide the powers not add/subtract • 1 is a prime number • 2 is not a prime number • The bigger the number means it is bigger not the power • Any odd number is a prime number • When sorting in a Venn diagram we write the number twice in the intersection	• What is a prime number? • What are the first five prime numbers? • What is a factor? • Can you give a factor of (e.g. 50)? • What is a multiple? • Can you give the first 5 multiples of (e.g. 7)? • What is a square number? • Can you give the first 12 square numbers? • What is a square root? • What is the square root of (eg 49)? • Can you give the first 5 cube numbers? • How would you find the prime factorisation of a number? • What is the highest common factor? • What is the lowest common multiple? • How would convert from a (fraction, decimal or percentage) to a (fraction, decimal or percentage)? • What is one half as a percentage? • What is one quarter as a percentage? • What is 30% as a decimal?	Formal assessment at the end of HT1 50 marks – mixture of AO1, AO2 and AO3

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		Learn that…	Learn how to…			
			prime factors in index form e.g. 600 = 2^3 x 3 x 5^2 • Express a number as a product of its prime factors using the 'FACT' function on a calculator • Find the highest common factor of a set of numbers through listing • Find the lowest common multiple of a set of numbers through listing • Find the highest common factor of a set of numbers through the Venn diagram method • Find the lowest common multiple of a set of numbers through the Venn diagram method • Solve HCF and LCM problems in context • Simplify and find equivalent fractions • Order fractions with different denominators • Find fractions of an amount • Convert between improper fractions and mixed numbers • Add and subtract fractions • Multiply and divide fractions • Recognise key equivalents of fractions, decimals and percentages • Convert between fractions, decimals and percentages both with and without a calculator • Order fractions, decimals and percentages •			
HT1 Percentages Recap	• Percentages in diagrams • Percentages as fractions or decimals • Convert between fraction, decimal, and percentages • Calculate percentages of amounts	• Percentage means 'number of parts per 100' • Percentages can be expressed as fractions or decimals • Multipliers are the decimal equivalent of a percentage • Simple interest is interest paid always on the original amount. • Compound interest is interest paid on the previous year's amount. • Compound interest can be used in many financial situations such as mortgages, bank accounts and credit cards.	• Convert between percentages to decimals and fractions using both written and calculation methods. • Calculate percentages of amounts non calculator (using multiples of 5% and 10%) • Calculate the percentage increase or decrease of an amount non calculator (Examples using multiples of 10%) • Change a percentage to a multiplier • Calculate percentage of amounts with a multiplier using a calculator (any	You can have a percentage over 100% (eg in percentage increase) An increase of 100% gives a multiplier of 2. A multiplier of 7% is 0.7 (mistakes in place value calculations) •	• What is a percentage? • What forms can percentages be expressed as? • What is 20% as a fraction and decimal? • What is the multiplier to find 65% of a number? • What does the multiplier 1.45 represent? • What would the multiplier be to decrease a number by 7%?	End of year assessment Assessing all content from Year 10 GCSE Past Papers

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		Learn that…	Learn how to…			
	• Recall the percentage change formula.	• The formula for percentage change is given by the **difference/original.** • The formula for percentage increase/decrease is **original x percentage multiplier = new**	percentages including decimal examples) • Solve problems step-by-step involving multipliers over a given interval (for example compound interest, depreciation) • Calculate simple interest (amount x multiplier x year) • Calculate compound interest (amount x multiplier^{time}) • Rearrange the formula to work backwards to find either the original amount, the percentage increase or decrease. • Apply percentage knowledge to real financial problems including interest rates, credit cards, bank accounts and loans.		• What is the difference between the multipliers 1.07 and 1.7 • What is 40% of 300? • What is 140 increased by 20%? • What would the multiplier be for a percentage increase of 140%? • What does it mean when something depreciates? • How do you calculate simple interest? • How do you calculate compound interest? • What is the formula for percentage change?	
HT2 Algebra	• Manipulating algebraic expressions • Expanding and factorising single and double brackets • Solving linear equations • Substituting into formulae • Rearranging formulae • Y7 Ht5/6 Technology and Y8 Ht6 IT Y9 HT5 IT Input processes, and output • Y8 HT2 Y9 HT1 IT Excel	• We represent an unknown or a variable with a letter • A term is a variable, a number or the product of variables and numbers • An expression is at least two terms added together • An equation is a statement that the values of two mathematical expressions are equal • Index laws can be used on terms that have the same base • The reciprocal of a term (or number) is one divided by that term (or number) • $x^a \times x^b = x^{a+b}$ • $\frac{x^a}{x^b} = x^{a-b}$ • $(x^a)^b = x^{ab}$ • $x^{-a} = \frac{1}{x^a}$ • $x^{\frac{a}{b}} = \sqrt[b]{x^a}$ • Adding is the inverse of subtracting, multiplying is the inverse of dividing, squaring is the inverse of square rooting • Inequalities are used to compare the size of numbers or variables • That the symbols >, <, ≥, and ≤ represent inequalities (and how to use them).	• Multiply and divide terms • Multiply and divide expressions • Identify like terms • Collect like terms to give an expression in its simplest form • Multiply out a single term over a bracket (including terms that have unknowns, negative numbers and fractions) • Find the highest common factor of terms • Factorise an expression into a single bracket • Substitute numbers into expressions to give a numerical answer • Substitute into formulae with real-life applications (including ~~su~~VAT, density, pressure etc) • Solve linear one and two step equations, including with negative numbers, fractions and decimals • Solve linear equations with unknowns on both sides • Form and solve equations from real-life situations including geometry • Multiply two binomials to give a quadratic equation (using methods such as grid, FOIL etc)	• Not multiplying by the coefficient when substituting in (e.g. when x=2, 5x = 52) • Adding terms which are not like, e.g. 4x + 3 = 7x • Misconceptions around adding negative numbers, e.g. 4x + -3x = 7x • "Answers" always need to be on the right hand side of the equals • Dividing by a coefficient before moving a constant to the other side of the equation • Mixing up inequality symbols • Applying index laws when given different bases	• What is a term? • Can you give me an example of a term? • What is an expression? • Can you give me an example of an expression? • What is an equation? • Can you give me an example of an equation? • What is the difference between an expression and an equation? • What is the inverse of (e.g. adding)? • How would you expand a single bracket? • What is meant by 'highest common factor'? • What is the highest common factor of (e.g. 2x^2 and 4x)? • What does 'substitution' mean in algebra? • What makes an equation "quadratic"? What form does it take? • If I'm multiplying two terms with the same base that have	Formal assessment at the end of HT1 50 marks – mixture of AO1, AO2 and AO3

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		Learn that…	Learn how to…			
			• Factorise a quadratic to give two binomial factors • Solve quadratic equations by factorising • Apply index laws to simplify expressions • Represent inequalities on a number line • Solve linear inequalities • Identify the subject of a formula • Use inverse equations to change the subject of a formula		powers, what should I do with the powers? • If I'm subtracting two terms with the same base that have powers, what should I do with the powers? • What does reciprocal mean? • What is an inequality? • What are the three steps to plotting an inequality on a number line?	
HT2 Function Machines	• What a term and coefficient are and give examples. • What is meant by an inverse operation and give specific examples. • How to solve simple one and two step equations	• An expression is a collection of terms and coefficients which has no set numerical value. • An input is the value we put into the function machine and the output is the resulting value at the end. • A function machine can have an infinite amount of operations. • We can use inverse operations to find the input given the output using a function machine. •	• How to express an expression as a function machine E.g. e.g. y = 2x + 3 as $x \rightarrow \boxed{\times 2} \rightarrow \boxed{+3} \rightarrow y$ • How to apply inverse operations to find an input when given a n output for a function machine. • To use a function machine to show an algebraic expression and find these expressions explicitly. • Apply knowledge of multiplying/diving expressions and collecting like terms to create an expression form a function machine in its simplest form.	• Forgetting to apply inverse operations when working backwards to find an input. • Not applying brackets when multiplying an expression with two terms. • Not writing an expression involving division in a fraction.	• What is an expression? Write down three different examples. • What is the difference between an input and an output in a function machine? • What is the difference between the expressions $2x$ and x^2? • What is an inverse operation? Can you give three different examples? • How can you use a function machine to find an output given an input? • How can you use a function machine to find an input given an output?	
HT2 Simultaneous Equations	• Solving one and two step equations • Substitution • Simultaneous equations graphically Y9 HT2	• You cannot solve a single equation with two different variables • Simultaneous equations are needed for two equations • Solving simultaneous equations means having an answer for both variables	• Form simultaneous equations • Use elimination methods to solve linear simultaneous equations given algebraically • Use substitution methods to solve linear simultaneous equations given algebraically • Form and solve simultaneous equations from worded problems	• Adding instead of subtracting (or vice versa) when eliminating in simultaneous equations • That x and y are the same value	• A child's ticket costs £2 and an adults ticket costs £4, write an expression to show this	

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		Learn that…	Learn how to…			
HT3 Graphing Recap	Plotting and reading coordinates on all 4 quadrants Plotting coordinates to complete polygon • Reflection in lines parallel to the axis • Y10 Ht5 Physics Speed distnace velocity	• A Cartesian grid has four quadrants. • X and y axis are horizontal and vertical respectively • Equation of a straight line is y = mx + c • M stands for the gradient of line and is the steepness of the line. • C stands for the y-intercept of the line. • Coordinates are in the form (x, y) • Gradients can be positive (going up) and negative (gong down) • Gradient can be calculated by the change in y/ change in x •	• Plot and read coordinates in all four quadrants • Generating coordinates given the equation of a straight line • Use a table of values to plot other polynomial graphs (quadratics and cubic) and reciprocal graphs. • Plot coordinates from a given table • Calculate the gradient from a straight line using the gradient formula. • Calculate the gradient from two points • Calculate speed and velocity from graphs • Identify the roots, y-intercept and turning point of a quadratic graph. •	• A gradient of -3 is steeper than a gradient of 2 regardless of the negative • Misreading the gradient and y-intercept for example in the graph y= 10 – 3x	• Can you draw a Cartesian grid and label the x and y-axis? • What is the general equation of a straight line? • In the line y=2x-3, what is the gradient and what is the y-intercept? • A line has gradient -2 and y-intercept 0.5- what is the equation of the line? • What is the formula used to calculate the gradient? •	Formal assessment at the end of HT5 50 marks – mixture of AO1, AO2 and AO3
HT3 Special Graphs	•	• A quadratic graph is in the form $y=ax^2 + bx + c = 0$. Where c is the y-intercept. • A quadratic graph is in the shape of a parabola and can be positive (eg $y=x^2$) or negative (eg $y = -x^2$) • A quadratic graph has roots (solutions) where the curve crosses the x-axis. • A quadratic graph can have two, one of zero roots. • The turning point of a quadratic graph is the coordinate of either the minimum or maximum point. • The graph $y= x^3$ is a "s-shaped" curve which goes through the origin. • An asymptote is a line on a graph where the curve approaches but never meets. • A graph in the form $y=\frac{k}{x}$ is a reciprocal graph where the x and y axes are asymptotes.	• Sketch the graphs of simple linear graphs E.g. in the form y=2, y=x, 2y +3x = 10 • Use a table to find coordinates for quadratic graphs, including negative quadratics. • Identify that the roots of a quadratic graph using a table and finding an estimate for the x-intercepts on the curve. • Find the coordinates of the turning point of a quadratic graph by seeing where the minimum or maximum point is. • Sketch graphs of $y=x^3$ and $y=\frac{1}{x}$ using a table of values which need to be calculated. • Sketch graphs by reflecting them in the x and y-axis.	• Mistaking the shape of the graphs of $y=x^2$ and $y=x^3$ • A reciprocal graph crosses the x and y axis. • A turning point of a quadratic graph is always a minimum point • A root of a graph has to be an integer. •	• Can you sketch the graph of $y=x^2$? • What is a root of a graph? How would you identify them? • What shape is the graph $y=x^3$? • What is the turning point of a quadratic graph? What are the two types of turning point called? •	Formal assessment at the end of HT3 50 marks – mixture of AO1, AO2 and AO3
HT3 – Real life graphs	• Gradient of a line • Speed, Distance, Time • Re-arranging formula	• Velocity is the speed of an object in a given direction • A horizontal line means stationary • Gradient means speed • Distance is on the y-axis • Time is on the x-axis • Speed = distance/time	• Interpret graphs with real-life data. (e.g. costs, exchange rates) • Plot and explain cost curves (e.g. A plumber's cost line could have a y-intercept of 10- which would represent a call out call of £10) • Draw a speed distance time graph • Interpret a speed distance time graph • Calculate speed, distance, and time	• Distance is only one way on a distance time graph • The distance travelled is 0 if you start and end at home • A longer line means a faster speed	• What does the gradient on a speed distance time graph represent?	

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		Learn that…	Learn how to…			
				• A negative gradient means slower speed • You have to start from the origin		
HT3 Ratio	• Ratio as a fraction • Simplifying ratio • Ratio sharing • Unitary method • Exchange rates • Scale diagrams and maps	• Ratio is a <mark>comparison</mark> of size between two or more values • The <mark>unitary method</mark> takes the form 1: n	• Use ratio notation • Represent ratios as <mark>fractions</mark> • Reduce a ratio to its <mark>simplest form</mark> • Write ratio in the form 1:n and n:1 • Divide a quantity into two or more parts • Find the whole, other part(s) or difference when given information about one part • <mark>Combine ratios</mark> to find a:b:c given a:b and b:c • Use a combined ratio to share into parts • Solve worded problems involving ratios	• Choosing the wrong part of the ratio to be the <mark>denominator</mark> of a fraction rather than the total number of parts (e.g. for the ratio 2:3 they might express as 2/3 rather than 2/5) • Only simplifying a ratio by dividing by 2 and not other integers	• What is a ratio? • What's the ratio of boys to girls in your family/friends etc.? • When expressing ratio as a fraction how would I work out the denominator? • Simplify a ratio (e.g. simplify 12:36) • Unitary method questions (e.g. if 3 pens cost me £3.60 how much would 1 pen cost? • What's another word for divide? • What form does the unitary method take? •	
HT3 Direct and Inverse Proportion Recap	• Recall the symbol used for proportion calculations. • Explain the difference between direct and inverse proportion. • Calculate basic direct proportion questions (eg exchange rates) • Science HT2 Y7 distance time graphs • Y10 Ht5/6 basic maths for proportions and area	• X α y means that x is proportional to y. • If two <mark>variables</mark> are directly proportional then as one goes up, the other also goes up by the same constant of proportion. • If two variables are inversely proportional then as one goes up, the other goes down. • Direct proportion can be represented by a straight line graph which goes through the origin. The gradient of the line represents the constant of proportion. • Inverse proportion can be represented by a graph with downward curve. The constant of proportion is given by any two coordinates on the graph multiplied together. • If y = kx, where k is a constant, then y is <mark>directly proportional</mark> to x • If y=k/x, where k is a constant, then y is <mark>inversely proportional</mark> to x • Direct proportion is used in real life contexts such as currency conversions. • Direct proportion graphs are a straight line through the origin and inverse	• Complete recipes proportion problems • Complete exchange rates • Calculate missing values in direct and tables. • Formulate equations and solve problems involving a quantity in direct and or inverse proportion to another quantity. • Solve simple word problems involving quantities in direct or inverse proportion or simple algebraic proportions • Apply direct proportion to real-life examples such as exchange rates or variable costs. • Apply inverse proportion to real-life examples such as distance/speed/time calculations. •	• Confusing inverse proportion with direct proportion • An inverse proportion graph is a negative straight line • Mistakes in rearranging the formula for direct and inverse proportion.	• If x and y are directly proportional, and x increases, what happens to y? • If x and y are inversely proportional, and x increases, what happens to y? • What is meant by a constant of proportionality? • How would direct and inverse proportion be represented by a graph? • If £1 = $1.5, how many dollars would £8 be? • If a car halves its speed, what happens to the time taken to complete the journey? •	•

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		Learn that…	Learn how to…			
		proportion graphs are the same as a reciprocal graph				
HT4 Pythagoras	• Y9 Pythagoras • Finding length of line on a cartesian grid	• Pythagoras' Theorem is $a^2 + b^2 = c^2$ • The hypotenuse is the longest length • Pythagoras has to be a right angled triangle • The hypotenuse is opposite the right angle	• Identify the hypotenuse • Substitute values into a formula • Evaluate values • Re-arrange to find the shorter side length • Find the length of a line in real life contexts (cartesian grid) • Verify if a triangle is right angled • Find missing lengths through multiple triangles/other shapes (square/rectangle in half)	• When labelling, a and b, they have to be a particular side • When a triangle is oriented 'upside down', the hypotenuse is still the one at the top	• What is the hypotenuse? • What is Pythagoras' Theorem? • What does the value c represent in Pythagoras? • How would you find the shorter side length in Pythagoras? • How can you make a right angled triangle in a square?	
HT4 Angle recap	• Basic angle facts	• Angles at a right angle are 90 • Angles on a straight line are 180 • Angles around a point are 360 • Angles in a triangle are 180 • Angles in a quadrilateral are 360 • Angles in a straight line and triangle are the same because if you have a triangle and move all the vertices to a point it makes a straight line. • Notation of a dash means equal lengths, this also means equal angles • If lengths are equal, angles are also equal in a triangle	• Find the missing angle in a right angle, straight line, around a point • Find the missing angle in a triangle • Find the missing angle in an isosceles and equilateral triangle • Find the missing angle in a quadrilateral • Combine angle facts to multi-step problems	• You cannot work out a missing angle if you don't have all the other angles	• What do angles in a X need to add up to? • How many angles are the same in an isosceles triangle?	
HT4 Trigonometry	• Y9 Trigonometry	• You can work out missing angles in right angled triangles using trigonometry • You can work out missing lengths in right angled triangles when you are given angles and other lengths • The hypotenuse is the longest length, opposite the right angle • The adjacent is next to the angle • The opposite is opposite the angle • The three trigonometric ratios ◦ $\text{Sin}\,\theta = \frac{O}{H}$ ◦ $\text{Cos}\,\theta = \frac{A}{H}$ ◦ $\text{Tan}\,\theta = \frac{O}{A}$ • An acronym for the trigonometric ratios is SOHCAHTOA	• Label a right angled triangle opposite, adjacent, hypotenuse • Identify the correct trigonometric ratio to use given the information • Substitute the values from the triangle into the correct ratio • Re-arrange to have the missing length on its own • Create an inverse Sin Cos or Tan to find an angle • Identify a sensible result (if the two lengths are 10 and 11, the third length isn't going to be 1000, the angle cannot be greater than 90). • Combine other angle facts if needed before attempting trigonometry • Combine Pythagoras is needed before attempting trigonometry.	• The opposite and adjacent can be labelled as each other (like in Pythagoras it doesn't matter which is a and b) •	• What does the S stand for in SOHCAHTOA? • What does theta represent? • What type of triangle do we need to use trigonometric ratios?	

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		Learn that…	Learn how to…			
		• To find a missing angle you need to use the inverse Sin, Cos, or Tan • That Sine and Cosine have to be less than 1				
HT5 Probability	• Probability language • Probability scale • Relative frequency • Two way tables • Frequency trees • Sample space • Listing methods	• Experimental probability is the relative frequency of an event (the number of successes out of the number of trials) • Theoretical probability is the relative frequency we would expect for an event • Likelihood is a description of the probability of an event (likely, evens etc) • Probability is a number between 0 and 1 • Tree diagrams are used to show the probabilities of successive events • To work out the probability of both of two events happening, we multiply their individual probabilities • To work out the probability of either of two events happening, we add their individual probabilities • Venn diagrams are used to classify objects or numbers in a set	• Calculate probability of a single event • Indicate the position of events on a probability line • Give examples of events with given likelihoods/probabilities • Complete relative frequency tables • Complete frequency trees • Multiply fractions, using cross cancelling • Complete partially completed tree diagrams, both with replacement and without • Construct tree diagrams from worded problems, both with replacement and without • Calculate probabilities using tree diagrams • Use a two-circle Venn diagram to enumerate (place one by one) sets • Use simple set notation to describe simple sets of numbers or objects • Construct a Venn diagram to classify outcomes • Use a Venn diagram to calculate probabilities	• Experimental and theoretical probability are the same thing • The probability of getting a 3 on the dice is 3/6 • Probability between two options will have a probability of ½ (the probability I will win or lose the lottery is 0.5) • Writing probabilities as a ratio • Expressing probabilities as a percentage • Without replacement on tree diagrams does not change the denominator • We add along branches not multiply • The 4 probabilities on the column of a tree diagram need to add to 1 • When using Venn diagrams, if a number/item does not fit within the two circles, we do not write it • A three intersection circle will only have one area which overlaps	• If you flipped a coin, what is the probability you would get a tails? • If you rolled a dice, what is the probability you would get a 3? • What is the probability if an event is certain? • What is the probability if an event is impossible? • What scale is probability always between? • What is relative frequency? • How do you calculate relative frequency? • What should all frequencies add up to? • What are tree diagrams used for? • How do you work out the probability of both of two events happening? • How do you work out the probability of either of two events happening? • What is a Venn diagram and what is it used for?	

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HT5 Statistics	- Types of data - Collecting data - Tally charts and frequency tables - Drawing and interpreting bar charts and pictograms - IT HT4 Data representation - Y10 HT3/4/5 Analysing data	- Mean, median, and mode are averages - Measure of spread is the dispersion of data - Range is measure of spread of the data set. - In grouped frequency tables we have an estimated mean because we cannot know the exact value due to frequency - Discrete data can only take certain values whilst continuous data can take any value - Bivariate data means two variables that are usually related. - Line graphs are graphs that show information that is connected in some way (such as a change over time) - A scatter graph can show the correlation between bivariate data. - Correlation can either be strong positive, weak positive, none, weak negative or strong negative. - Interpolate means within the data - Extrapolate means outside the data - A line of best fit goes through as many points of a scatter graph as possible and represents the general trend of the two variables. - Correlation does not imply causation.	- Calculate mean, median, and mode and range of a data set/ - Problem solve with a range of averages and spread. E.g. finding a set of numbers when given set averages. - Calculate a missing value given an average or range - Calculate the mode group from a grouped frequency table - Calculate the median group from a grouped frequency table - Calculate the estimated mean from a grouped frequency table by finding midpoints. - Decide whether data is discrete or continuous - Draw a line graph given different information by joining each point - Plot a scatter graph accurately. - Draw a line of best fit - Interpolate and extrapolate the data - Describe correlation of a graph and whether it is strong or week	Muddling up the definitions of the four averages Not putting numbers in order when calculating the median. •	- Name one of the four types of averages - How do you calculate the mean? - What would the median of 2, 3, 3, 4, 5, 10 be? - Why can we only estimate the mean when given grouped data? - What does interpolate mean? - What does extrapolate mean? - Draw a scatter graph which shows a strong positive correlation. - Draw a scatter graph which shows no correlation.	Formal assessment at the end of HT4 50 marks – mixture of AO1, AO2 and AO3
HT5 Area Recap	- An understanding that area is the space inside a shape. - Area of a square is length squared - Area of a rectangle is length x width. - Conversions between mm, cm and m - Area of a triangle - Area of a parallelogram - Area of a trapezium - Area of a circle	- Area is the space inside a 2D shape. - Area is measured in units squared (eg mm², cm², m² or km²) - The formula for an area of a triangle is $\frac{1}{2}$ x base x perpendicular height. - The circumference is the distance around the whole circle - The diameter is the distance across the circle that goes through the centre - The radius is halfway across the circle that goes to the centre - A sector of a circle is section enclosed by two radii - The area of a circle = πr^2 - The circumference of a circle = πd or $2\pi r$ - The area of a sector = $\frac{\theta}{360} \times \pi r^2$	- Substitute values into a formula to calculate area. - Apply knowledge of area of shapes to find areas of compound shapes. (e.g. an "L" shape hexagon) - Rearrange formula to calculate missing variables. (eg height of a triangle given an area) - Use a scientific calculator and the π button to calculate area. - Use multiples of π in exact calculations without a calculator - Convert between different units of measure to calculate area when units are inconsistent.	- Using the slanted edge of a triangle and not its perpendicular height for its area. - Using units of length for area. - Confusing radius and diameter - Area is one dimension	- What is area? - What are the formulae for calculating the areas of a square, rectangle and triangle? - Explain why cm² is a unit of area but cm is not. - What is the value of the constant pi? - What is the difference between the radius and a diameter of a circle? - Can you draw a trapezium and label the pair of parallel lines? - What is the formula for the area of a trapezium?	

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		Learn that…	Learn how to…			
	• Area of compound shapes • Area of a sector • Y7 HT1/2 Y8 Ht5/6 Y9 Ht1/2/3/4 Technology measuring • Y10 HT5/6 basic maths for proportions and area	• Trapeziums have one pair of parallel lines • The area of a trapezium = $\frac{a+b}{2} \times h$ •			• What two sides do we add together for the formula of a trapezium?	
HT6 Volume and Surface Area	• Volume is finding the space inside a 3D shape • What the net of a cube and cuboid looks like. • Difference between a 2D and 3D shape. • Properties of cubes and cuboids (faces/vertices and edges) • Projections • Volume of cubes and cuboids • Nets and surface area • Y7 HT1/3/4 Art 3D shapes • Y9 HT5 Isometric	• Volume is a three-dimensional measurement and is the space taken up by a 3D shape. • The volume of a cuboid is length x width x height. • A prism is a 3D shape with a constant cross section. • Volume of a prism is the area of the cross-section x height. • A pyramid is a 3D shape with a polygon base and triangular faces joined at an apex. • The volume of a pyramid is $\frac{1}{3}$ x Area of Base x Perpendicular Height. • A net of a shape is the 2D representation of the shape's faces.	• Substitute values into a formula to calculate volume of a square, rectangle, triangle and trapezium. • Apply knowledge of area of shapes to find areas of compound shapes. • Rearrange formula to calculate missing variables. (eg radius of a sphere given a volume) • Use a scientific calculator, the pi button and fraction button, to calculate volume. • Convert between different units of measure to calculate volume when units are inconsistent. • Sketch nets of cubes, cuboids, prisms and cylinders. • Use knowledge of area of shapes to calculate surface areas of cubes, cuboids, prisms and cylinders. •	• Confusing units for area and volume. • Not squaring the radius first before multiplying by pi. • Using the fraction button incorrectly on a calculator. • Volume is two dimensions • Surface area and volume are the same	• What is the difference between area and volume? • Which units would be used for area? Which units would be used for volume? • What is the formula for the volume of a cube and cuboid? • What is the formula for the volume of a cylinder? • What is a meant by a prism? Can you draw three examples of a prism? • What does the net of a cuboid look like? • What does the net of a cylinder look like? •	
HT6 Similar Shapes	• Area and volume of shapes • Similar shapes in Y9	• Congruent shapes are the same size • Similar shapes are the same shape but can be different sizes	• Identify and prove that shapes are congruent • Prove that two triangles are congruent using the cases SSS, ASA, SAS and RHS • Identify and prove that shapes are similar • Use scale factors and how they affect dimensions	• Confusing congruency and similarity • Calculating the scale factor the wrong way e.g. saying 25 to 5 has a scale factor of 5 rather than 1/5	• What does it mean for two shapes to be congruent? • What does it mean for two shapes to be similar? • What is a scale factor? • What is a criteria needed for shapes to be congruent? • What is a criteria needed for shapes to be similar?	
HT6 Transformations	• An understanding of the terms rotation and reflection.	• A reflection is a transformation mapping of a shape through a mirror line. • Lines in form y=a are horizontal and x=b are vertical.	• Reflect a simple shape in a given mirror line • Identify the mirror line of a shape and its image in the form y=a or x=b.	• Mistaking clockwise and anticlockwise direction. • Confusing the x and y axes.	• Can you draw a Cartesian grid and label the x and y axis? • How many degrees are there in a full turn?	

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		Learn that…	Learn how to…			
	- There are 360 degrees in a full turn. - The x-axis is horizontal and y-axis is vertical - Plot points on a Cartesian grid. - Clockwise and anticlockwise movements. - Vector basics - Translations - Rotations - Reflections - Enlargements (positive SF) - Enlargements (negative SF) - Combining transformations - HT1/2 Art Line of Symmetry - Y10 Ht4 Vectors	- The line y=x is a diagonal line through the origin. - A rotation is a movement of a point or shape around a fixed point. - A translation is a movement of a point or shape by a given column vector. - A scale factor is the scalar value in which we enlarge a shape by.	- Recognise a reflection in the line y=x and y=-x - Rotate a shape clockwise and anticlockwise through a multiple of 90 degrees given a centre of rotation. - Describe a rotation of two given shapes and its centre of rotation. - Use a column vector to translate shapes and points. - Describe the translation of two congruent shapes in the form of a column vector. - Describe multiple transformations of shapes. - Enlarge a shape by a given positive scale factor (could be fractional) and a given centre of enlargement. - Find the scale factor and centre of enlargement of two given shapes.	- Enlargements do not always make shapes larger (e.g. scale factor of 0.5) - Transformation is a translation	- Describe the process of a rotating a shape 90 degrees anticlockwise about the origin. - How would you reflect a square in the x-axis? - Describe what the column vector $\begin{bmatrix} 2 \\ -3 \end{bmatrix}$ represents. - A square with length 3cm is enlarged by a scale factor of 4, what will the length of the enlarged shape be? - An enlargement always makes a shape bigger- true or false?	

Subject and Year: 10H Mathematics   Specification (KS4/5 only): https://ocr.org.uk/Images/168982-specification-gcse-mathematics.pdf   VOCABULARY

Dates taught / curriculum time	PRIOR KNOWLEDGE What should they already know / when was this last visited	CORE KNOWLEDGE What will they know at the end of this topic		MISCONCEPTIONS/ THRESHOLD CONCEPTS	AMBITION FOR ALL QUESTIONS	FORMAL ASSESSMENT
		Learn that…	Learn how to…			
HT1 Number recap	• Square numbers, cube numbers, square roots and cube roots (Y7 HT2) • Exponents and powers • Indices rules (Y9 HT6) •	• Exponent means powers • Powers and roots are inverses of each other • A square root of a square number is not a surd • Evaluate and simplify are different meaning (evaluate means having a numerical answer) • Standard form is written as A x 10^n, where 1≤A<10 and n cannot be a decimal/fraction • Multiplication by 10, 100, 1000 • For addition of standard form you need the same n value • Prime numbers have exactly 2 factors • 1 is not a prime number • Prime factorisation can have multiple ways to get the same answer • Factors are divisions of a number • Multiples are multiplications of a number • A Venn diagram is more suitable for HCF and LCM with larger numbers	• Calculate with exponent • Calculate square numbers up to 12 squared and 5 cubed • Go backwards with square root and cube root • To write in index form • Use negative integer indices to represent reciprocals • Calculate and estimate with powers and roots • Calculate with negative integer powers • Calculate with fractional powers • Use the indices rules • Prove a^0 = 1 • Decide if a number is in standard form • Combine indies rules to either evaluate or simplify • Convert big numbers into standard form • Convert big numbers into ordinary form • Convert small numbers into standard form • Convert small numbers into ordinary form • Order standard form • Multiply and divide with standard form • Add and subtract with standard form • Decide if a number is a prime number through division methods • Find the product of primes of a number • Use a calculator to find the product of primes of a number • Write prime factor decomposition in index notation	• To square a number, you multiply it by 2 • To cube a number, you multiply it by 3 • A square root only has one solution • When using index laws, we multiply/divide the powers not add/subtract • Standard form can be any value • 1 is a prime number • 2 is not a prime number • The bigger the number means it is bigger not the power • Any odd number is a prime number • When sorting in a Venn diagram we write the number twice in the intersection • Standard form can have any A number	• What are your first 12 square numbers? • What are the first 5 cube numbers? • What is $\sqrt{16}$? Give both answers • What is $\sqrt[3]{125}$? • How would you write 2 x 2 x 2 x 2 in index form? • Evaluate 2^5 • How do we write in standard form? • In standard form, what value can A (the number we multiply by 10) not be greater than? • When we use a negative power in standard form, what type of ordinary number is this? • What is 2839 in standard form? • What is 3.45 x 10^5 in standard form? • What is 0.065 in standard form? • What is 4.52 x 10^{-2} in standard form? • Is 32.5 x 10^3 in standard form? • Which is greater, 2 x 10^5 or 5 x 10^2? • Give the first 10 prime numbers? • Is 47 a prime number? • What is the prime factor decomposition for 48? • What button do you press on your calculator to find the product of primes? • What is the difference between a factor and a multiple? • What part of the Venn diagram will give you the HCF? And then the LCM?	Formal assessment at the end of HT2 50 marks – mixture of AO1, AO2 and AO3

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		Learn that…	Learn how to…			
			• List HCF and LCM for small numbers • Find the HCF and LCM of a set of numbers using a Venn diagram			
HT1 Recurring decimals	• FDP conversion between basic FDP • 50% = 0.5 = ½ • Division methods (mental, written – bus stop – divisibility rules)	• Decimals can be infinite • Fractions are divisions • Terminating means has a finish • Recurring means never ending • We write a dot over the number which is recurring • When converting decimals over 1 into a fraction, we ignore the ones column and then change this to a mixed number at the end	• Operate fluently with decimals (addition, subtraction, multiplication, division, square/root etc) • Apply different methods of multiplication/division of decimals including 'borrowing 10' or more formal grid method • Convert from a decimal to a fraction by putting the fraction over 1 and then multiplying by how many place values after the decimal point, we have • Convert from a recurring decimal to a fraction, using algebraic methods • 0.99999 = 1? • Convert a fraction to a recurring decimal using standard division	• More values in the decimal implies a greater number • ¼ = 0.4 the denominator is the first decimal value • Fractions and decimals are separate things • Fractions are just numbers (not a division representation) • Fractions are not on a number line • $0.7\dot{6} = \frac{76}{100}$	• Which is a larger decimal value A or B? • Which is a larger fraction value A or B • Which is larger, the fraction A or decimal B? • What is X.XX multiplied by X.XX? • What is X.X divided by X? • What would you convert 0.XX to? • Why when you have a decimal value greater than 1 do you ignore any column after (and including) ones? • What is X.X as a fraction? • What is X/X as a decimal?	•
HT1 Surds	• Square numbers, square roots, cube numbers, cube roots • Algebraic terminology (3a means 3 x a) • Expanding double brackets • Anything divided by itself is 1	• Square roots can have two answers (positive and negative) • A surd is an irrational number • An irrational number is a real number that cannot be written as a simple faction • A surd can have a decimal or fraction (e.g. $\sqrt{0.125}$ or $\frac{\sqrt{2}}{9}$) • Laws of surds • $\sqrt{a} \times \sqrt{b} = \sqrt{ab}$ • $\sqrt{a} \times \sqrt{a} = a$ • $a\sqrt{b} \times c\sqrt{d} = ac\sqrt{bd}$ • $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$ • $b\sqrt{a} = b \times \sqrt{a}$ • Rationalising the denominator means removing the root • Conjugate means to change the sign in the middle of two terms	• Find square numbers 1-12, 15, 20, square roots, cube numbers 1, 2, 3, 5, 10, and cube roots • Simplify a surd by breaking into square factors • To add and subtract surds by simplifying to a common irrational term • Multiply and divide surds, by changing the surd term • Multiply surds to expand brackets, into single and both binomials • Rationalise a denominator to a single term surd denominator • Rationalise a two term denominator using conjugate method • Apply surds methods to solve problems including geometrical problems (area, perimeter, Pythagoras, trig, volume)	• Square root of a square number is a surd • $\sqrt{5^2} = 2\sqrt{5}$ • A prime number cannot be a surd • We can work with surds like we can ordinary numbers • The number outside the square root should be added together •	• Simplify $\sqrt{X}$ • What is the 3rd square number? • What is the 5th cube number? • What is the square root of 49? • What is the cube root of 1000? • What types of number do we need to split our surd into before simplifying? • Can $4\sqrt{5}$ and $4\sqrt{6}$ be added together? • What is $4\sqrt{5} + 6\sqrt{5}$? • What is $4\sqrt{5} \times 6\sqrt{5}$? • To rationalise the denominator of $\frac{8}{\sqrt{2}}$ what would you multiply by?	

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		Learn that…	Learn how to…			
HT1 Circle Theorems	• Circle nomenclature •	• The tangent at any point on a circle is perpendicular to the radius at that point • Tangents from an external point are equal in length • The angle subtended at the circumference by a semicircle is a right angle • Angles in the same segment in a circle are equal • Opposite angles in a cyclic quadrilateral sum to 180˚ • Area of a triangle is 0.5 x base x height or 0.5 x absinC • the angle subtended by an arc at the centre is twice the angle at the circumference. • the angle on the circumference subtended by a diameter is a right angle • two angles in the same segment are equal. • a radius or diameter bisects a chord if and only if it is perpendicular to the chord • for a point P on the circumference, the radius or diameter through P is perpendicular to the tangent at P • for a point P on the circumference, the angle between the tangent and a chord through P equals the angle subtended by the chord in the opposite segment • the opposite angles of a cyclic quadrilateral are supplementary •	• Prove that the angle subtended by an arc at the centre is twice the angle at the circumference. • Prove that the angle on the circumference subtended by a diameter is a right angle • Prove that two angles in the same segment are equal • Prove that a radius or diameter bisects a chord if and only if it is perpendicular to the chord • Prove that for a point P on the circumference, the radius or diameter through P is perpendicular to the tangent at P • Prove that for a point P on the circumference, the angle between the tangent and a chord through P equals the angle subtended by the chord in the opposite segment • Prove that the opposite angles of a cyclic quadrilateral are supplementary •	• Applying circle theorems when conditions are not met, e.g. a quadrilateral that does not touch the circumference at all four vertices	• Name a circle theorem and what it means • What is the circumference of a circle? • What is the diameter of a circle? • What is the radius of a circle? • What is a chord in a circle? • What is a tangent? • What is a segment of a circle?	•

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		Learn that…	Learn how to…			
HT2 Algebra recap Algebraic fractions	- Addition and subtraction of fractions - Multiplication and division of fractions - Solving linear equations - Order of operations - HCF - Y7 Ht5/6 Technology - Y8 HT6 IT Y9 HT5 IT Input processes, and output	- Solve means find the value of a variable - When we solve, we use the order of operations backwards - Highest common factor can also be a variable - Simplifying algebraic fractions means writing as one fraction - Expand means to multiply - We multiply across fractions to create the same common denominator	- Rearrange formula to change the subject fluently - Use kinematics formulae - Solve equations, including one step, two step, brackets, and fractions - Expand a single bracket with a constant or variable, constant*variable term as the coefficient - Expand two binomials to form a quadratic, including negatives - Expand more than two binomials systematically - Divide by the highest common factor to factorise an expression into a single bracket - Factorise a quadratic into two binomial factors (using the acronym TEAM) - Factorise including difference of two squares - Factorise a quadratic with a>1 by splitting in the middle or through sight - Completing the square – including solving - Eliminate from an algebraic fraction with the same term - Eliminate from an algebraic fraction by factorising prior - Add and subtract algebraic fractions by finding the common denominator by multiplication across fractions - Factorise quadratics using TEAM or through inspection and then solve - Rearrange quadratics to be in the format $ax^2+bx+c = 0$ if the quadratic does not equate to 0 - Use the quadratic formula - Use the correct a, b, and c value for the quadratic formula	- Answers need to be on the right hand side - We can add different terms - We are 'flipping the sign' not balancing the equation - Multiplying by 3/3 is multiplying by 3 not 1 - Expanding we add not multiply - ab and ba are separate things - when factorising, the HCF can only be a coefficient OR a variable - When we add fractions the denominator is also added together - Simplify means to solve - If there is no bx term the quadratic cannot be factorised - We flip the sign when solving quadratic equations - When using the quadratic formula there can only be one answer	- What is solving? - What does expand mean? - What is a term? - What is a variable? - What is a coefficient? - What does solve mean? - What is a highest common factor? - Expand …. - What is an inverse operation? - What is the inverse of multiplication? - What is the inverse of division? - What is the inverse of addition? - What is the inverse of subtraction? - What is the inverse of squaring? - What is the inverse of square rooting? - When factorising a quadratic, what is the value we multiply to make? - When factorising a quadratic, what is the value we add to make? - What does simplifying algebraic fractions mean?	Formal assessment at the end of HT1 50 marks – mixture of AO1, AO2 and AO3
HT2 Simultaneous equations Iteration	Factorising quadratics (Y10 HT1)	- Solve means to find a value for a variable - We give the inverse of the sign within a bracket after we have factorised because we want the bracket to equal zero - Factorising is the opposite of expanding	- Solve simultaneous equations through elimination - Solve simultaneous equations through substitution	When using simultaneous equations, the answer we get for both is only the first value we find	- In a quadratic expression, which value do we multiply for? - What is the opposite of factorising? - Solve (x+4)(x-3)=0 - Factorise and solve $x^2+3x+2 = 0$	

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		Learn that…	Learn how to…			
	• Quadratic Formula (Y9 HT6) • Solving equations • Inequalities • Straight line graphs • Y8 HT2 Y9 HT1 IT Excel	• We use the quadratic formula when a question asks for a decimal as an answer • We use the quadratic formula when there are no factors that TEAM • There are two answers when solving quadratics (Except when a perfect square) • The quadratic formula is $x = \frac{-b \pm \sqrt{(b^2 + 4ac)}}{2a}$ • When solving simultaneous equations (if x and y) would give you the coordinates of the intersection • We stop doing iteration when the change signs over	• Use substitution to solve simultaneous equations when we have a non-linear equation • Plot both equations of a simultaneous equation and find the intersection graphically • Iterate an equation through substituting in values • Find the value between the positive and negative through trial and error to 2 decimal places • Find approximate solutions to equations using systematic sign-change methods when there is no simple analytical method of solving them	•	• Factorise and solve $x^2 + 3x = -2$ • Solve giving your answer to 2 decimal places $x^2 + 7x + 111 = 0$ • Solve these simultaneously through elimination 2x + 3y = 3 6x + 3y = 9 • Estimate a value of f(x)=x^2 + 5x + 3, starting at -1	
HT3 Functions, Graphing, Graphing Inequalities, Transformations of graphs	Understanding of • Basic algebra skills • Plotting straight lines • Deriving equation of a line • To calculate gradients • Calculating parallel and perpendicular gradients • HT1/2 Art Line of Symmetry Y10 Ht5 Physics Speed distance velocity	• A function is just a set of instructions • Functions can be combined into composite functions by processing a number through one and then the other • A function can be inverted by following the instructions backwards • Graphs can be identified by looking for key features (intercepts and turning points) • Graphs can be sketched using intercepts, turning points and an idea of direction/shape • < and > are drawn with a dotted line • $\leq$ and $\geq$ are drawn with a solid line • Y = and x = are horizontal and vertical lines respectively • Trig graphs can be sketched using calculator values • Sin/Cos graphs are similar, but translated • Tan graph is fairly unique looking given it's repeated asymptotes • Transformations of graphs can be identified by their position in the equation • A circle has an equation in the form $x^2 + y^2 = r^2$ (at GCSE level) • At GCSE level, all circles will have the origin as their centre (as in the formula above)	• Process a number through a function • Process a number through multiple functions, without explicit composite expression • Express functions in the form f(x) g(x) etc. • Express and use composite functions in the form fg(x) • Calculate inverse functions, and express them in the form f'(x) • Identify key graphs by their appearance • Use a table of values to plot exponential graphs • Find roots, y-intercept, and turning point from a quadratic. • Identify a range of graphs, linear and quadratic, by their turning points and intercepts • Sketch linear, quadratic, cubic, exponential, reciprocal etc. graphs when given their equation, using turning points, intercepts and/or asymptotes • Draw inequalities on a graph • Read off inequalities of a graph • Recognise graphs of trigonometric functions • Sketch graphs of trigonometric functions	• Processing functions in the wrong order with composite functions • Mistakes around function notation, fg(x) etc • Inverse functions being calculated incorrectly • Mixing up translations in the x direction (as + is – and so on) • Y is vertical and x is horizontal for inequalities on a graph • Inequality drawing is always a solid line • Mixing up Sin/Cos graphs • Errors in amplitude of trig graphs when sketching • Forgetting the radius value is squared in the equation of a circle •	• What is the value of f(x)=3x + 2 when x is 4? • If a composite function is fg(x), which function should be processed first f or g? • What is the transformation for moving up in the y direction by 3? • What is the transformation for moving left in the x direction by 6? • What is the transformation for a stretch SF 5 in the y direction? • What does the sin graph look like? • What does the cosine graph look like? • What does the tan graph look like? • What is the equation of a circle with the origin as its centre and a radius of 5?	Formal assessment at the end of HT5 50 marks – mixture of AO1, AO2 and AO3

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		Learn that…	Learn how to…			
			• Recognise and use the equation of a circle with centre at the origin • Calculate the equation of a tangent to a circle at a given point • Identify and sketch translations and reflections of graphs, given the graphs or their equation • Give the equation of a graph, given its original equation and an image of the transformation • Use distance/time and velocity/time graphs			
HT3 Ratio	Understanding of • Ratio notation • Simplifying ratio • Sharing into a ratio • Combining ratio	• Ratio is a comparison of size between two or more values • The unitary method takes the form 1: n • Fractions can be taken from ratios • Ratios can be taken from fractions • Two ratios can be combined if they have a common value/variable • Ratios can be simplified by dividing by a common factor • A value can be shared into a ratio • A share in a ratio can be calculated given the other share and the ratio • A share in a ratio can be calculated given the difference between the two shares, and the ratio itself	• Use ratio notation • Represent ratios as ==fractions== • Reduce a ratio to its ==simplest form== • Write ratio in the form 1:n and n:1 • Divide a quantity into two or more parts • Find the whole, other part(s) or difference when given information about one part • Combine ratios to find a:b:c given a:b and b:c • Use a combined ratio to share into parts • Solve worded problems involving ratios	• Not dividing both sides by the same common factor • Making the wrong side into one (in form n:1) • Not multiplying/dividing all parts by the same value when combining ratios • Mixing up the order of a ratio from a worded problem • Writing a fraction from a ratio as part/part rather than part/whole	• What is a ratio? • What's the ratio of boys to girls in your family/friends etc.? • When expressing ratio as a fraction how would I work out the denominator? • Simplify a ratio (e.g. simplify 12:36) • Unitary method questions (e.g. if 3 pens cost me £3.60 how much would 1 pen cost? • What's another word for divide? • What form does the unitary method take? •	•
HT4 Proportion	• Recipes • Exchange rates • Direct proportion tables • Unitary method	• Direct proportion is the relation between two quantities where the ratio of the two is equal to a constant value • The proportion symbol is ∝ • Inverse proportion is as one quantity increases, the other decreases at a constant rate	• Use algebraic direct proportion • Use algebraic inverse proportion • Write X in terms of Y… • Substitute values, after finding the constant • Have squares, cubes, roots.	• Inverse proportion they both go up • The square of means square root	• What is the proportion symbol? • What is the difference between direct and inverse proportion? • A is directly proportional to B, write a formula linking the two	•
HT4 Geometry	• Using Pythagoras' theorem to find missing side lengths for 2D triangles • Using SOHCAHTOA to find missing sides and angles	• Pythagoras and Trigonometric ratios are for right angled triangles • Sine rule, cosine rule, and area of a triangle is for non-right-angled triangles • Sine rule is $\frac{a}{sinA} = \frac{b}{SinB} = \frac{c}{SinC}$ • Sine rule can be re-arranged to $\frac{SinA}{a} = \frac{SinB}{b} = \frac{SinC}{c}$	• Recall and use Pythagoras' theorem, to find hypotenuse, and shorter sides. • Combine shapes to find the missing length using Pythagoras' theorem • Use ==Pythagoras'== theorem to calculate lengths in solids, e.g. the diagonal across a cuboid • Use the three trigonometric ratios, SOHCAHTOA for missing lengths	• In Pythagoras' theorem c can be any length not just the hypotenuse • Pythagoras' theorem can be applied to triangles that are not right angles	• What does SOHCAHTOA stand for? • What is Pythagoras' Theorem? • What is the sin rule? • What is the cosine rule? • Name two formulas used to calculate the area of a triangle • What is a vector? • What is a column vector?	Formal assessment at the end of HT4 50 marks – mixture of AO1, AO2 and AO3

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		Learn that…	Learn how to…			
	• Calculating area of a triangle using A = ½bh • Basic vectors used in translations • Y7 HT1/2 Y8 HT5/6 Technology measuring • Y10 Ht4 Vectors • Y10 HT5/6 basic maths for proportions and area	• Cosine rule is $a^2 = b^2 + c^2 - 2bcCosA$ • Area of non-right-angled triangle is $A = \frac{1}{2}abSinC$	• Use the three trigonometric ratios, SOHCAHTOA for missing angles • Use the Sine rule to calculate missing lengths and angles in triangles • Use the Cosine rule to calculate missing lengths in triangles • Apply area of a triangle is 0.5 x base x height or 0.5 x absinC • Apply SOHCAHTOA to calculate the area of a triangle	• Always adding up the squares of the sides when they may need to be subtracted • Giving a positive and negative answer to a square root • Using the sine rule with sides and angles that are not 'pairs' •	• Describe how you would add vectors • Describe how you would subtract vectors • What is a scalar multiplication? • Describe how you would multiply a vector using scalar multiplication •	
HT5 Probability	Understanding of • The probability scale • Calculating probabilities of simple single events • Using sample space diagrams • Using systematic listing strategies	• Experimental probability is the relative frequency of an event occurring, i.e. the actual number of occurrences divided by the total possible number of occurrences • Theoretical probability is the number of times an outcome can occur, divided by the total number of outcomes. • As the number of trials increases, experimental probability gets closer to theoretical probability. • Likelihood is a word or description, ie unlikely or certain • Probability always sums to 1 • Tree diagrams are used to show the probabilities of successive events • To work out the probability of both of two events happening, we multiply their individual probabilities • To work out the probability of either of two events happening, we add their individual probabilities • Venn diagrams are used to classify objects or numbers in a set	• Calculate probability of a single event • Indicate the position of events on a probability line • Give examples of events with given likelihoods/probabilities • Complete relative frequency tables • Complete frequency trees • Multiply fractions, using cross cancelling • Complete partially completed tree diagrams, both with replacement and without • Construct tree diagrams from worded problems, both with replacement and without • Calculate probabilities using tree diagrams • Use a two-circle Venn diagram to enumerate sets • Use simple set notation to describe simple sets of numbers or objects • Construct a Venn diagram to classify outcomes • Use a Venn diagram to calculate probabilities • Use Venn diagrams when given the intersection to calculate probabilities • Use Venn diagrams when given the A and B values to calculate the intersection and probabilities	• Forgetting that branches on a tree diagram must sum to 1 • Forgetting to multiply across a tree diagram • Mixing up likelihood and probability (words vs numbers) • Mistakes with fractions in tree diagrams • Not allowing for the intersection of a Venn diagram to be included in the values of A and B • Not summing to 1 in relative frequency tables •	• If you flipped a coin, what is the probability you would get a tails? • If you rolled a dice, what is the probability you would get a 3? • What is the probability if an event is certain? • What is the probability if an event is impossible? • What scale is probability always between? • What is relative frequency? • How do you calculate relative frequency? • What should all frequencies add up to? • What are tree diagrams used for? • How do you work out the probability of both of two events happening? • How do you work out the probability of either of two events happening? • What is a Venn diagram and what is it used for?	•

Dates taught / curriculum time	PRIOR KNOWLEDGE What should they already know / when was this last visited	CORE KNOWLEDGE What will they know at the end of this topic		MISCONCEPTIONS/ THRESHOLD CONCEPTS	AMBITION FOR ALL QUESTIONS	FORMAL ASSESSMENT
		Learn that…	Learn how to…			
HT5 Statistics	• Measures of central tendency for ungrouped and grouped data • Measures of spread (including IQR) for ungrouped data • Plotting graphs (including scatter graphs, line graphs, bar charts etc) • IT HT4 Data representation • Y10 HT3/4/5 Analysing data	• Cumulative frequency is the sum of the frequencies of each successive group • Cumulative frequency curves are used to estimate median and quartiles for grouped data • Box plots display the median, quartiles and range of a set of data • Frequency density is equal to frequency divided by class width • The area of each bar in the histogram shows the frequency	• Plot a box plot • Interpret box plots in context • Compare data displayed as cumulative frequency curves and box plots • Calculate cumulative frequency for a grouped frequency table • Plot a cumulative frequency curve • Use a cumulative frequency curve to estimate median • Use a cumulative frequency curve to estimate upper and lower quantiles and other percentiles • Plot a time series graph • Interpret time series graphs • Calculate frequency density • Plot a histogram • Interpret a histogram • Use a histogram to estimate the median and quartiles • Use a histogram to estimate the mean • Problem solve with histograms	• Not adding every previous frequency for cumulative frequency • Histograms should have gaps between each bar (like a bar chart)	• Which axis is which? • What are the different types of correlation? • What is the Y axis on a histogram? • How do you calculate frequency density? • How do you calculate frequency from a histogram? • What does the key on a stem and leaf diagram show you? • What is the difference between frequency and cumulative frequency? • Where should the point be plotted on a cumulative frequency graph, the start, middle, or end of the interval? • How much of the data is contained within each quartile of the boxplot?	
HT6 Surface area and Volume	• Surface area of cubes and cuboids • Surface area of prisms • Volume of cubes and cuboids • Volumes of prisms • Science HT2 Y7 distance time graphs • Y7 HT1/3/4 Art 3D shapes • Y9 HT5 Isometric	• Surface area of a sphere is given by the formula $A = 4\pi r^2$ • Surface area of a cone is given by the formula $A = \pi r(r + \sqrt{h^2 + r^2})$ • Volume of a sphere is given by the formula $V = \frac{4}{3}\pi r^3$ • Volume of a pyramid is given by the formula $V = \frac{lwh}{3}$ • Volume of a cone is given by the formula $V = \pi r^2 \frac{h}{3}$ • An enlargement is a transformation that changes the size of an object	• Calculate surface area of cubes and cuboids • Calculate surface area of any prism • Calculate surface area of a pyramid • Calculate surface area of a cone • Calculate surface area of a sphere • Solve problems based on surface areas • Calculate volume of cubes, cuboids and prisms • Calculate volume of a pyramid • Calculate volume of a cone • Calculate volume of a sphere • Solve problems based on volumes	• Incorrect dimensions • Enlarging only makes objects larger •	• What is volume? • How is volume different to area? • What is surface area? • How is surface area different to area? • What do the two faces of a cone look like if you drew a net? • How are the formulae for area of a cone and area of a pyramid linked? • What is an enlargement? • What kind of scale factor results in an image that is smaller than the object?	•
Similarity and congruence, Angles in parallel lines HT6	• Angles in parallel lines • Area and Volume of shapes	• Corresponding angles are equal • Alternate angles are equal • Vertically opposite angles are equal • Co-interior angles sum to 180^0 • Congruent shapes are the same size • Similar shapes are the same shape but can be different sizes	• Identify and prove that shapes are congruent • Prove that two triangles are congruent using the cases SSS, ASA, SAS and RHS • Identify and prove that shapes are similar	• Confusing congruency and similarity • Calculating the scale factor the wrong way e.g. saying 25 to 5 has	• What does it mean for two shapes to be congruent? • What does it mean for two shapes to be similar? • What is a scale factor? • What is a criteria needed for shapes to be congruent?	•

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		Learn that…	Learn how to…			
		• Know that a length scale factor, area scale factor (squared), and volume scale factor (cubed) differ •	• Use scale factors and how they affect dimensions • Identify angles in parallel line facts • Prove congruency through angles in parallel lines • Work out a length scale factor • Work out an area scale factor • Work out a volume scale factor • Enlarge an object by a positive scale factor • Enlarge an object by a fractional scale factor	a scale factor of 5 rather than 1/5	• What is a criteria needed for shapes to be similar?	
Transformations HT6	• Y9 Transformations Understanding of • Lines of symmetry • Rotational symmetry	• Translations can be described using a column vector instruction • In column vector notation x is horizontal, y is vertical and negative values represent left and downwards movements. • A rotation is described using a centre point, a direction of rotation and an angle of turn. • That lines of symmetry (or lines to be used for reflection) can be identified by giving the equation of the line. • Enlargements are described using a centre and scale factor. • Fractional scale factors reduce the size of an object • Negative scale factors resize and rotate objects • Multiple transformations can often be described using one single transformation •	• Translate objects on a grid by a given vector • Describe the translation of an object using a column vector • Rotate objects using a given set of instructions • Describe the rotation of an object giving its centre, angle and direction. • Reflect an object in a given or indicated line, both parallel to the axis and orthogonally. • Enlarge an object from a centre of enlargement by a given scale factor • Describe an enlargement by giving the centre of enlargement and the scale factor • Describe multiple (two mostly) transformations as a single transformation.	• Transformation is a translation • Enlargements only make things bigger • You can only rotate around the origin	• What are the 4 main transformations? • How is a translation described? • How is a rotation described? • How is a reflection described? • How is an enlargement described? • What is the equation of the positive line going through the origin at 45°? • How do you find the centre of a rotation? • What effect does a fractional scale factor have on an enlargement? • What effect does a negative scale factor have on an enlargement?	•