

(Mathematics – KS3) Year 8 Long Term Plan

Rationale (with end points): In Year 8 we will build on students knowledge from Year 7 to help aid their learning prior to KS4. The focus is to build their problem solving skills across all aspects of the unit.

Term	Topic	Knowledge	Skills	Reading /wider reading
Autumn term 1	<p>Unit 1 - Number Unit 1.1 Calculations Recap/Retrieval Lesson MM Y7 Unit 1 Place Value Lesson 2 Unit 1.2 Divisibility and Division MM Y7 U2 L3 Unit 1.3 Calculating with Negative Numbers Recap/Retrieval Lesson MM Y7 U5 L4, 6, 9 and 10 Unit 1.4 Powers and Roots MM Y9 U15 L1 and 2 Unit 1.5 Powers, Roots and Brackets MM Y9 U15 L5 and 6 Unit 1.6 More Powers, Multiples and Roots Recap/Retrieval Lesson MM Y7 U3 L1 MM Y9 U15 L7 and 8</p>	<ul style="list-style-type: none"> • Subtraction • Addition • Exchanging between columns • Multiplication • Division • Facts using the commutativity • Adding a negative number. • Students look at equivalent calculations. • Multiplication with a negative scale factor • Division involving negative numbers • Index notation. • Students look at roots as the inverse of indices • Multiplying expressions with the same base. Including with negative indices • Dividing expressions with the same base. Including with negative indices. • Represent factors and factor pairs of integers. • Prime numbers. • Negative indices. 	<ul style="list-style-type: none"> • Understand how and why to make exchanges in written subtraction and addition calculations – Be able to perform subtraction and addition calculations using a ‘column’ arithmetic method. • Understand the connections between multiplication and division facts – Be able to use the commutativity of multiplication in the context of solving division problems. • Be able to model addition of a negative number as a translation on the number line. • Understand that subtracting positive numbers is equivalent to the addition of the additive inverse – Be able to subtract a negative number from another number. • Be able to find the product of two negative numbers • Be able to divide a negative number by a positive numbers • Understand in the expression a^b, a is called the base and b the index • Understand in the expression a^b, a is called the base and b the index • – Be able to evaluate expressions involving positive, negative and fractional bases • Understand when numbers with the same base are multiplied, the indices are added • Understand how to simplify fractions by dividing the numerator and denominator by common factors • – Understand when numbers with the same base are divided, the indices are subtracted 	<p>Multiplying Menace: the Revenge of Rumpelstiltskin by Pam Calvert</p>

	<p>Unit 2 - Area and Volume Unit 2.1 Area of a Triangle Recap/Retrieval Lesson MM Y7 U11 L7 Unit 2.2 Area of a Parallelogram and Trapezium Recap/Retrieval Lesson MM Y7 U11 L6 Unit 2.3 Volume of Cubes and Cuboids MM Y8 U14 L9, 10 and 11 Unit 2.4 2D representations of 3D solids MM Y8 U14 L1, 2, 3 and 6 Unit 2.5 Surface Area of Cubes and Cuboids MM Y8 U14 L4, 5, 7 and 12 Unit 2.6 Measures</p>	<ul style="list-style-type: none"> ● Forming a formula for area of a triangle ● Forming a formula for area of a parallelogram ● Volume of Cuboids ● Volume of other prisms ● Classify solid shapes, identifying the number of faces, edges and vertices ● Nets of prisms, emphasising all faces but the cross-sections are rectangles. ● Students work with nets of cuboids to calculate the surface area of cuboids. They also use information about area of faces to deduce dimensions of cuboids. ● Fractions of quantities by first considering fractions of unit measures 	<ul style="list-style-type: none"> ● Understand the pattern of factors for prime and square numbers ● – Be able to find all factors of an integer ● Be able to identify prime and square numbers ● Be able to evaluate expressions with a ‘power-to-a-power’ ● Understand that when two congruent triangles are joined to form a rectangle or parallelogram– ● Be able to identify the perpendicular height of a triangle ● Be able to use the formula to calculate the area of a triangle ● Be able to calculate the area of a parallelogram by rearranging into a rectangle and by using the formula ● Understand how the formula for the area of a parallelogram arises ● Be able to calculate the volume of a shape by counting cubes ● Be able to calculate the volume of a cuboid ● Experience visualising prisms as layers of cross sections ● Understand why the volume of a prism is the cross-sectional area multiplied by its length ● Understand a net is a 3-D shape opened out flat – ● Experience using vocabulary including face, edge, vertex/vertices, net, opposite ● Be able to construct nets of cuboids – ● Experience visualising folding nets into pyramids and prisms ● Understand a prism has two cross-sectional faces and the others are rectangles – Be able to identify whether a shape is a prism or not from its net ● Understand the surface area of a 3-D shape is the sum of the area of its faces – Understand the surface area of a 	
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	<p>Recap/Retrieval Lesson MM Y7 U14 L2</p>		<p>3-D shape is the area of its net – Be able to calculate the surface area of a cuboid</p> <ul style="list-style-type: none"> • Understand and use the terms cross-section, congruent and prism – • Be able to identify whether a 3-D shape is a prism or not – Be able to identify a cross section of a prism from a manipulative or 2-D representation • Understand the difference between volume and surface area • Be able to describe and calculate fractions of single units of measure (eg 1 litre) and multiple units of measure (eg 6 m²) • Experience connecting fractions of a whole with quantities of a measure • Understand that a fraction must be described in the context of its whole 	
<p>Autumn 2</p>	<p>Unit 3 - Statistics, Graphs and Charts Unit 3.1 Pie Charts MM Y8 U9 L4 Unit 3.2 Using tables MM Y8 U9 L3 and 8 MM Y8 U10 L8 Unit 3.3 Stem and Leaf Diagrams Unit 3.4 Comparing Data MM Y8 U9 L9, 10 and 11 Unit 3.5 Scatter Graphs MM Y8 U10 L1, 2, 3, 4, and 5 Unit 3.6 Misleading Graphs</p>	<ul style="list-style-type: none"> • Students compare ways of representing data including pie charts, considering how best to compare • Students continue to interpret grouped frequency, tally chart frequency, bar charts and consider grouped data. • Find the mean from frequency tables, connecting the data represented in charts and bar models. • Understand the similarities and differences between stem and leaf diagrams and bar charts • Students examine data sets with outliers • Averages and range are calculated from data represented in different ways. • Students are introduced to bivariate data. • Scatter graphs are introduced as a key representation of bivariate data. 	<ul style="list-style-type: none"> • Experience data being represented in multiple ways • Understand that pie charts are good for comparing proportions • Understand that bar charts are good for comparing absolute values • Be able to compare simple proportions in pie charts • Be able to interpret grouped frequency bar charts • Experience comparing tally charts and bar charts – Be able to calculate the mean from a frequency table • Be able to use and understand two-way tables – Be able to record and interpret data represented in a two-way table • Experience mathematical thinking skills including: pattern spotting, conjecturing, and justifying • Draw and interpret stem and leaf diagrams with different stem values. • Find mode, median and range from stem and leaf diagrams. 	<p>Sir Cumference and the Dragon of Pi by Cindy Neuschwander</p>

	<p>Unit 4 - Expressions and Equations Unit 4.1 Algebraic Powers Recap/Retrieval Lesson MM Y7 U6 L5 Unit 4.2 Expressions and Brackets Recap/Retrieval Lesson MM Y7 U6 L3 Unit 4.3 Factorising Expressions</p>	<ul style="list-style-type: none"> ● Students are introduced to correlation ● Lines of best fit are drawn and used ● Understand when a statistical diagram is appropriate/inappropriate to represent a set of data. <ul style="list-style-type: none"> ● Students are formally introduced to equations. ● Multiplications to expand brackets, included those with negative elements. ● Students consider what a factor of an expression might be. ● Bar models are used to capture the structure of algebraic relationships. ● Forming and solving linear equations with unknowns on both sides including negative and fractional coefficients. ● Form and solve equations including through balancing methods. 	<ul style="list-style-type: none"> ● Experience the limitations of the mean – Understand the three measures of average: mean, median and mode – Understand the range is not an average but a measure of spread – Be able to find the mean, median, mode and range of a set of data ● Experience how changing the data set affects the position of the median ● Be able to calculate the mode, median and range from bar charts and frequency tables ● Understand that data sets can have more than one variable – Understand bivariate means two sets of data – Be able to interpret bivariate data sets from tables ● Understand bivariate data can be represented in a scatter diagram – Understand each point on the scatter diagram shows how a single object is measured according to two variables ● Understand correlation and use lines of best fit to interpolate within a data set ● Interpret graphs and charts. ● Explain why a graph or chart could be misleading. <ul style="list-style-type: none"> ● Understand what is meant by an equation and the key features of an equation ● Be able to form equations from a diagram ● Understand that the distributive property can be used to ‘expand brackets’ with linear expressions. ● Understand what a factor might describe ● Be able to factorise basic linear equations ● Be able to use bar models to write and solve linear equations ● Experience representing algebraic relationships pictorially ● Be able to equate two expressions to form and solve a linear equation 	
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	Recap/Retrieval Lesson MM Y7 U6 L4 Unit 4.4 One Step Equations MM Y8 U2 L4 Unit 4.5 Two Step Equations MM Y8 U2 L6 Unit 4.6 The Balancing Method MM Y8 U2 L5		<ul style="list-style-type: none"> ● Be able to form and solve linear equations involving unknowns on both sides with negative coefficients ● Be able to equate two expressions to form and solve a linear equation ● Experience representing perimeter algebraically ● Experience reasoning algebraically in a geometric context 	
Spring 1	Unit 5 - Real-life graphs 5.1 Conversion graphs MM Y8 U7 L1 to 3 5.2 Distance-time graphs MM Y8 U7 L6 5.3 Line graphs 5.4 More-line graphs 5.5 Real-life graphs MM Y8 U7 L7 and 8 5.6 Curved graphs MM Y8 U7 L4 Unit 5 Check, Strengthen & Extend Unit 5 Test	<ul style="list-style-type: none"> ● Understand that 'rate' can be calculated through gradient. ● Speed is looked at in the context of a distance time graph and students are asked to consider what the average speed might look like. ● On a line graph, intermediate points are only estimates and not actual values. ● Understand that a graph may show seasonal or other variations, but still show an upward or downward trend. ● Be able to describe displacement-time graphs ● Displacement-time graphs in the context of 2-D shape. ● Sketches of graphs are used to convey and describe changing rate 	<ul style="list-style-type: none"> ● Be able to interpret graphical representations of linear relationships ● Be able to interpret x- and y-intercepts on graphical representations of ● Experience visualising and comparing changing rate in a context ● Understand piecewise relationships as expressions of changing rate ● Be able to interpret and calculate positive, negative and zero gradient as rate in a context ● Be able to draw and interpret piecewise distance-time graphs ● Be able to calculate average speed ● Plot line graphs from tables of data. ● Interpret line graphs. ● Draw and interpret line graphs and identify trends. ● Understand and draw displacement-time graphs – Be able to calculate speed from displacement-time graphs ● Experience multiple representations of journeys that stress and ignore different features ● Understand curved graphs as constantly changing rate ● Be able to use sketched graphs to express and interpret qualitative changes in rate 	Think of a number by Johnny Ball

	<p>Unit 6 - Decimals and ratio 6.1 Ordering decimals and rounding MM Y8 U5 L3 and 4 L5 and 8 6.2 Place-value calculations Recap/Retrieval Lesson MM Y7 U1 L3 6.3 Calculations with decimals 6.4 Ratio and proportion with decimals MM Y8 U6 L1 – 4</p>	<ul style="list-style-type: none"> ● Understand when it is more appropriate to round to decimal places than significant figures ● Understand the impact of rounding. ● Base 10 manipulatives are used to represent decimals. The idea of digits getting 10 x smaller as they move to the right is explored to deepen understanding of decimals and place value. ● Understand the relative sizes of answers to related decimal calculations. ● Students discuss proportion using ratio language and compare that to fractional and or proportional language. ● Students explore the relationship between ratio and rate of change 	<ul style="list-style-type: none"> ● Round decimals to two or three decimal places. ● Round numbers to a given number of significant figures. ● Round numbers to an appropriate degree of accuracy. ● Order decimals of any size, including positive and negative decimals. ● Be able to exchange between columns ● Be able to perform subtraction and addition calculations with decimals ● Experience connecting representations of integers and decimals ● Multiply any number by 0.1 and 0.01. ● Divide by 0.1 and 0.01. ● Multiply and divide by decimals. ● Solve problems involving decimals and all four operations. ● Be able to use ratio statements to produce fractional statements ● Be able to simplify ratios ● Be able to share quantities into unequal parts ● Be able to use part-part bar models to represent sharing in a ratio ● Be able to use ratios to express rates of change ● Experience graphical representations of ratio on the Cartesian plane. 	
<p>Spring 2</p>	<p>Unit 7 - Lines and angles Un7.1 Quadrilaterals MM Y8 U11 L1 7.2 Alternate angles and proof Recap/Retrieval Lesson MM Y7 U7 L7 7.3 Angles in parallel lines Recap/Retrieval Lesson</p>	<ul style="list-style-type: none"> ● Students are reintroduced to polygons and look at definitions of polygons, as well as characteristics of specific polygons ● Students identify pairs of alternate angles on two lines crossed by a transversal and using their knowledge of vertically opposite angles. ● Students now move on to identifying corresponding and allied angles and continue to calculate missing angles. 	<ul style="list-style-type: none"> ● Be able to identify examples of polygons. ● Be able to use basic terminology related to angles and polygons ● Experience comparing and sorting different polygons. ● Understand that the intersection between a transversal and two parallel lines creates equivalent angles ● Be able to identify alternate angles and explain why they are equal ● Understand that the intersection between a transversal and two parallel lines creates equivalent angles 	<p>Euclid's Window: The story of Geometry from parallel lines to hyperspace by Leonard Mlodinow</p>

	<p>MM Y7 U7 L8 7.4 Exterior and interior angles MM U11 L5 – 8 L9 – L12 7.5 Solving geometric problems MM U11it 7 Lines and angles</p>	<ul style="list-style-type: none"> ● Interior angles linked to the amount of triangles a shape makes ● Solving geometric problems may involve using angles in parallel lines. 	<ul style="list-style-type: none"> ● Be able to identify corresponding angles and explain why they are equivalent ● Experience imagining rotating lines about a point to satisfy different angle conditions ● Calculate the sum of the interior and exterior angles of a polygon. ● Work out the sizes of interior and exterior angles of a polygon. ● Solve geometrical problems showing reasoning. ● Solve problems involving angles by setting up equations. 	
<p>Summer 1</p>	<p>Unit 8 - Calculating with fractions 8.1 Calculating with fractions Recap/Retrieval Lessons MM Y7 U14 L7 8.2 Adding and subtracting fractions Recap/Retrieval Lessons MM Y7 U15 L9 – 11 8.3 Multiplying fractions Recap/Retrieval Lessons MM Y7 U15 L3 and 4 8.4 Dividing fractions Recap/Retrieval Lessons MM Y7 U15 L5 – 8 8.5 Calculating with mixed numbers Recap/Retrieval Lessons MM Y7 U15 Embedded</p>	<ul style="list-style-type: none"> ● Students now move on to using arrays to represent decimal fractions. ● Adding or subtracting fractions with the same denominator. ● Use of a fraction wall ● Multiplication of two fractions. ● Consider the multiplication of decimals ● Divide a fraction by an integer. ● Division of an integer by a fraction ● Understand the four operations with mixed numbers, where one or more mixed number is negative, or the answer is a negative mixed number ● Apply BIDMAS to mixed number calculations 	<ul style="list-style-type: none"> ● Be able to recognize tenths and hundredths in an array to form decimal fractions ● Understand that decimal fractions are an alternative representation of fractions ● Be able to add fractions with the same denominator ● Be able to subtract fractions with the same denominator ● Be able to add or subtract fractions written in their simplest forms by connecting them to the array ● Be able to use the area model to multiply two fractions ● Be able to multiply two fractions together without a model ● Understand that multiplying two decimal fractions which are less than 1 will give a smaller decimal ● Be able to divide a fraction by an integer ● Be able to use a bar model to represent division by integers ● Be able to use a bar model to represent the division of an integer by a fraction. ● Be able to divide an integer by a fraction ● Be able to divide by a fraction ● Write a mixed number as an improper fraction. ● Use the four operations with mixed numbers. 	

	<p>Unit 9 - Straight Line Graphs 9.1 Direct proportion on graphs 9.2 Gradients Y8 MM U4 L6 and 7 9.3 Equations of straight lines Y8 MM U4 L8, 10 and 11</p>	<ul style="list-style-type: none"> ● Understand when one (or more) part of a graph shows quantities in direct proportion, but another part does not ● Understand when quantities may sometimes be in direct proportion and sometimes not ● Students identify characteristics of linear relationships. ● The concept of gradient is introduced. ● Students connect the equation of a line to the graphical representation. ● The gradient and y-intercept are connected to the equation of a line. ● Students identify the equation of lines and consider the gradient of horizontal and vertical lines. 	<ul style="list-style-type: none"> ● Recognise when values are in direct proportion with or without a graph. ● Plot graphs and reading values to solve problems. ● Experience comparing linear and non-linear graphs ● Experience spotting patterns in coordinates of linear-graphs ● Be able to identify the gradient ● Be able to determine whether a pair of coordinates satisfy a linear equation ● Be able to identify the gradient of a graph from its graph ● Experience relating the gradient and y-intercept to the equation of a linear relationship ● Be able to identify the gradient and y-intercept from a linear graph and equation ● Be able to draw a linear graph from its equation ● Understand the gradient of a horizontal line is 0 and vertical is infinite 	
<p>Summer 2</p>	<p>Unit 10 - Percentages, decimals & fractions 10.1 Fractions and decimals 10.2 Equivalent proportions Y8 MM U8 L9 and 10 10.3 Writing percentages Y8 MM U8 L12 10.4 Percentages of amounts Recap/Retrieval Lesson Y7 MM U17 L6 and 8</p>	<ul style="list-style-type: none"> ● Understand what is the same and what is different about a terminating decimal ● Recognise where fractions of time result in a recurring decimal ● Students compare directly and inversely proportional relationships ● Students generalise directly and inversely proportional relationships and write equations to describe them. ● Students apply their prior learning of percentages in the context of direct and inverse proportion. ● Students will explore methods to calculate a percentage of an amount. ● Students will be able to increase or decrease any amount by any percentage. 	<ul style="list-style-type: none"> ● Recall equivalent fractions and decimals. ● Recognise recurring and terminating decimals. ● Order fractions by converting them to decimals or equivalent fractions. ● Change time to decimal hours. ● Experience comparing the features of direct and inverse proportion ● Be able to find missing values for directly and inversely proportional relationships ● Be able to identify directly and inversely proportional relationships ● Understand percentage change in the context of direct proportion ● Understand percentage change in the context of inverse proportion ● Be able to connect percentage calculations with decimal calculations 	



			<ul style="list-style-type: none">• Be able to use a variety of methods to calculate a percentage of an amount (integer and non-integer percentages)	
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