MATHEMATICS

Year 8

What are the aims and intentions of this curriculum?

The aim of our Key Stage 3 Curriculum is to consolidate the numerical and mathematical capability and skills learnt from key stage 2 and to extend students' understanding of the number system and place value to include decimals, fractions, powers and roots. The curriculum also seeks to equip students with the knowledge to be able to make generalisations about the number system that will help them to make the necessary connections between mathematical topics and voids re-teaching when developing concepts in isolation. It also seeks to develop fluent understanding of the axioms and structures of number that are fundamental to mathematics which underpins the understanding of algebraic notations developed in this year and in the subsequent years. The KS3 Curriculum also aims to equip Students to apply algebraic reasoning in new contexts such as Geometry, and to also make linkage to different interpretations of fractions and be introduced to ratio. To provide students with a holistic experience, prepare them for future success, help them aspire and value mathematics, Personal Social Health and Economic (PSHE) education and Careers Education (CE) are incorporated into the curriculum.

Term	Topics	Knowledge and key terms	Skills developed	Assessment
Summer 2	**Factors and multiples** ➢ Prime factor decomposition ➢ Laws of Indices ➢ STEM: Powers of 10 ➢ Calculating and Estimating **Working with Powers** ➢ simplifying expressions	**Students will be able to:** • Use multiples, factors, common factors, HCF, LCM and primes **Factors: families – using the factor tree** **Multiples: extended families (number of family members living together** **Prime: Single parent – Mom and 1 child or Dad and 1 child** • Find the prime decomposition of a number • Work out the laws of indices for positive powers. • Show that any number to the power of zero is 1. • Use the laws of indices for multiplying and dividing. • Use the prefixes associated with powers of 10. • Use and understand powers of 10. • Understand the effect of multiplying and dividing by any integer power of 10. • Round to a number of significant figures **Next of Kin, money budget, sale figures** **# Engineering, Accounting Finance, Economics** • Simplify expressions involving powers and brackets. • Understand the meaning of an identity. • Use the index laws in algebraic calculations and expressions. **Government having the power to say what will happen**	• Breaking numbers down into prime factors to investigate their structure and connections with other numbers • Using geometric knowledge to solve problems • Identifying the mathematical aspects of the situation or problem. • Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem • understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors	• All Students will be sitting an End of term assessment. • Students will be assessed additionally as best seen fit by their subject teacher. Mathswatch Group work Class discussions Targeted Questioning

	➢ More simplifying ➢ Expanding and simplifying ➢ Substituting and solving ➢ Solving Equations	• Simplify expressions with powers. • Write and simplify expressions involving brackets and powers. • Factorise an algebraic expression. • Substitute integers into expressions. • Construct and solve equations. • Solving two step equations with brackets and variables on both sides. # Budget Analyst, Auditors, Accountants, Loan Officers	• simplify and manipulate algebraic expressions by: ● collecting like terms ● multiplying a single term over a bracket ● taking out common factor ● simplifying expressions involving sums, products and powers, including the laws of indices	
	• Arithmetic sequence	• Generate terms of a linear sequence using term to term and position to term rules • Use linear expressions to describe the nth term of an arithmetic sequence #Banking, Savings	• Using algebra and sequences to investigate problems	
	• Angles and transversals (build on Year 7 knowledge)	• Recognise alternate and corresponding angles • Calculate missing angles using the angle concepts. • Find interior and exterior angles in polygons Tesselations # Architecture, Designer	• Recognising and explaining how to calculate angles in diagrams • Identifying and classifying shapes by their geometrical properties • Explaining the method when calculating angles in diagrams • Explaining the different properties of quadrilaterals.	
	• Probability ➢ Review year 7 ➢ Experimental Probability	• Interpret the results of an experiment • Use diagrams and tables to record in a systematic way all possible mutually exclusive outcomes for single events and for two successive events • Compare estimated experimental probabilities with theoretical probabilities Data Analyst, Actuary, Data Scientist. Cons of Gambling, Taking risks	• Develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems • Select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems.	

	• Pythagoras' Theorem	Use Pythagoras' theorem in right-angled triangles.	• **To find missing sides from a right angled Triangle.** • **To understand the longest side is the side opposite to the Right angle** **Ramps on buses and moving trucks** **Constructing staircases** **Safe use of ladder**	
Autumn 1	• Fraction, decimal and Percentages • Fractions • Percentages **2D shapes and 3D solids** • Plans and elevations • Surface area of prisms • Volume of prisms	**Students will be able to:** • Convert between fractions, decimals and percentages • Add and subtract fractions by writing them with a common denominator - include mixed numbers • Calculate fractions of a quantity; multiply and divide an integer by a fraction • Multiply and divide fractions including with mixed numbers • Calculate percentages of a quantity • Calculate a percentage change • Calculate percentage increases and decreases using the multiplier method • Repeated percentage change Calculate the effect of repeated percentage changes. Mortgage, Savings, Utility bills, Better value for money, Profit and Loss #Banking, Accounting, Data Analysts, Businesses. Use 2D representations of 3D solids. **Seeing things from a different view point** • Sketch nets of 3D solids. • Calculate the surface area of prisms. • Calculate the volume of right prisms.	• Solve problems involving percentage change, including: ○ percentage increase, ○ decrease ○ original value problems ○ and simple interest in financial mathematics **Pharmacist making a mixture (medication) for a given patient** • <u>construct and</u> interpret plans and elevations of 3D shapes • know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders) • identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference • Explore relationship between circumference and diameter/radius.	• All Students will be sitting an End of term assessment. • Students will be assessed additionally as best seen fit by their subject teacher. Mathswatch Group work Class discussions Targeted Questioning

	• Circles ➢ Area, circumference Compound shapes • Cylinders • Pythagoras' theorem	• Name the different parts of a circle. • Finding Area and Circumference of circles. **Race track debate: why do people argue a choice between lane 1 and lane 8** • Calculate the radius or diameter when you know the circumference. • Calculate area and perimeter of composite shapes involving sectors of circles • Calculate the volume and of a cylinder. • Use Pythagoras' theorem in right-angled triangles. #Construction worker, Interior decorator, Plumber	• Explore relationship between area and radius, area and circumference of a semi-circle and other sectors. • Introduce to pi as the constant linking the relationship between the two measures. • know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes. • know the formulae for: Pythagoras' theorem $a^2 + b^2 = c^2$	
	5 Transformations (build on year 7 knowledge) • Reflection and translation • Rotation • Enlargement • More enlargement • STEM: Combining transformations • 2D shapes and 3D solids	• Describe and carry out translations by a given vector • Describe and carry out reflections. • Describe and carry out rotations. • Enlarge a shape. • Describe an enlargement. • Enlarge a shape using negative scale factors. • Enlarge a shape using fractional scale factors. • Transform 2D shapes using a combination of reflection, rotation, enlargement and translation. • Identify planes of reflection symmetry in 3D solids. • Find the perimeter and area of 2D shapes after enlargement. • Find the volume of 3D solids after enlargements. • Identifying the symmetries of 2-D and 3-D shapes and the different transformations of 2-D shapes • Explaining the different properties of reflections, rotations, translations and enlargements.	• describe translations as 2D vector • use scale factors, scale diagrams and maps • identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional) • Reflect a shape in a line, including on coordinate axes • Rotate a shape about a centre, including on coordinate axes • Identify the type of transformation carried out by comparing an object and image • Enlarge 2-D shapes given a centre of enlargement and a positive integer scale factor	

		#Animator, Construction worker	• **Describe the changes and invariance achieved by combinations of rotations, reflections and translations**	
Autumn 2	• Indices • Standard Form • Probability • Comparing probabilities • Mutually exclusive events • Estimating probability • Experimental probability • Probability diagrams	**Students will be able to:** • Know and apply the laws of indices for multiplying and dividing with powers • Use standard form to express very large and small numbers • Convert between standard form and ordinary numbers • Order large and small numbers NASA – Space, the use of Macro and Micro Astronomy Engineers, Scientists, Medicine • Understand that the probabilities of all possible outcomes sum to 1 • Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities. • Frequency tree diagrams • Calculate and compare probabilities. • Decide if a game is fair. • Identify mutually exclusive outcomes and events. • Find the probabilities of mutually exclusive outcomes and events. • Find the probability of an event not happening. • Calculate the relative frequency of a value. • Use relative frequency to make estimates. • Use relative frequency to estimate the probability of an event. • Use estimated probability to calculate expected frequencies. • Carry out a probability experiment.	• Simplifying expressions involving sums, products and powers, including the laws of indices • Use the language and notation associated with reflections, rotations, translations and enlargements. • Calculate with and interpret standard form A x 10n, where 1 ≤ A < 10 and n is an integer. • Use language and properties precisely to probability and statistics. • record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees • apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments • relate relative expected frequencies to theoretical probability, using appropriate language and the 0-1 probability scale • apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one • construct theoretical possibility spaces for single and combined experiments with equally	• All Students will be sitting an End of term assessment. • Students will be assessed additionally as best seen fit by their subject teacher. Mathswatch Group work Class discussions Targeted Questioning

		• Estimate probability using data from an experiment. • Work out the expected results when an experiment is repeated. • List all the possible outcomes of one or two events in sample space diagrams or Venn diagrams. • Calculate probabilities of repeated events.	likely outcomes and use these to calculate theoretical probabilities	
Spring 1	**Constructions and loci** • Accurate drawings • Constructing shapes • Constructions 1 • Constructions 2 • Loci **Scale drawings and measures** • Maps and scales • Bearings • Scales and ratio • Congruent and similar shapes • Solving geometry problems	**Students will be able to:** • Draw triangles accurately using a ruler and protractor. • Draw diagrams to scale. • Draw accurate nets of 3D solids. • Construct triangles using a ruler and compasses. • Construct nets of 3D solids using a ruler and compasses. • Bisect a line using a ruler and compasses. • Construct perpendicular lines using a ruler and compasses. • Bisect angles using a ruler and compasses. • Draw accurate diagrams to solve problems. • Draw a locus. • Use loci to solve problems. **Performing a skill- doing a job or action to a given specification** **Engineering, Construction** • Use scales in maps and plans. • Use and interpret maps. • Measure and use bearings. • Draw diagrams to scale using bearings. • Draw diagrams to scale. • Use and interpret scale drawings. • Identify congruent and similar shapes. • Use congruence to solve problems in triangles and quadrilaterals.	• use conventional terms and notation: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries; • use the standard conventions for labelling and referring to the sides and angles of triangles; draw diagrams from written description • use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings apply the concepts of congruence and similarity, including the relationships between lengths, in similar figures	• All Students will be sitting an End of term assessment. • Students will be assessed additionally as best seen fit by their subject teacher. Mathswatch Group work Class discussions Targeted Questioning

	• Congruency of 2-D shapes • Ratio and Proportion • Solve linear equation with unknown variable on both sides	• Use similarity to solve problems in 2D shapes. • Know the criteria for congruence of triangles • Apply properties of plane figures, and the criteria for congruence, using appropriate language • Use ratio notation, including reduction to simplest form • Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction • Relate the language of ratios and the associated calculations to the arithmetic of fractions • Construct and solve linear equations with integer coefficients (unknown on either or both sides, with or without brackets) by an appropriate method	• Show how ratio can be used in a geometrical context. • Solve linear equations with an unknown on one side (revise from Year 7) • Solve linear equations with an unknown on both sides • Solve equations involving fractional terms and brackets	
Spring 2	• Data collection • 2-way tables • Range and Averages for grouped data • Stem and leaf diagram • Pie Charts • Bar Graphs • Frequency diagrams	**Students will be able to:** • Decide what data to collect to answer a question and the degree of accuracy needed • Identify possible sources and consider sample size. • Plan how to collect the data • Construct frequency tables with equal class intervals to gather continuous data and 2-way tables for recording discrete data • Collect data using a suitable method • Calculate statistics for sets of data and recognise when it is appropriate to use the range, mean, median and mode and for grouped data the modal class. • Construct graphical representations and identify which are most useful in the context of the problem. Include stem and leaf diagrams; pie charts for categorical data, bar charts and frequency diagrams for discrete and continuous data; simple scatter graphs • Interpret tables, graphs and diagrams and relate findings to questions being explored • Gather data from specified secondary sources, including printed tables and lists and the internet	• Draw and interpret two-way tables • Collect bivariate data and use the graphical representation to make simple inferences about the relationship. • Appreciate the difference between discrete and continuous data • Understand why the exact mean cannot be found from grouped data • Find an estimate of the mean from grouped data and continuous data • Describe, interpret and compare distributions, involving appropriate measures of central tendency and spread.	• All Students will be sitting an End of term assessment. • Students will be assessed additionally as best seen fit by their subject teacher. Mathswatch Group work Class discussions Targeted Questioning

	• Scatter Diagram	• Plot scatter graphs • Describe the type of correlation observed • Interpret correlation in the context of the data set	• Collect bivariate data and use the graphical representation to make simple inferences about the relationship. • Make links with science and other areas of the curriculum during this unit.	
Summer 1	**Graphs** • Plotting linear graphs • The gradient • $y = mx + c$ • Parallel and perpendicular lines • STEM: Non-linear graphs • Construction of Linear graphs and interpretation • Gradients and their interpretations • Real life graphs and rate of change • Plan and elevation • Bearing and loci	**Students will be able to:** • Identify the equations of horizontal and vertical lines • Plot coordinates from a rule to generate a straight line • Identify key features of a linear graph-Gas bills, Electricity bills • Interpret and use conversion graphs and other graphs of proportional relationship • Plot straight-line graphs. • Find the *y*-intercept of a straight-line graph. • Find the gradient of a straight-line graph. • Plot graphs using the gradient and *y*-intercept. • Use $y = mx + c$ • Find the equation of a straight-line graph. • Identify parallel and perpendicular lines. • Find the inverse of a linear function. • Plot and use non-linear graphs. • Plot the graphs of linear functions where y is given explicitly in terms of x • Construct linear functions arising from real life problems and plot their graphs; discuss and interpret graphs arising from real situations such as distance time graphs. • Identify and interpret gradients and intercepts of linear functions graphically and algebraically **Cardiac Monitor: Life has ups and downs** **Health – covid pandemic** • use simple plans and elevations. • Visualise and use 2-D representations of 3-D objects. • Make scale drawings (Isometric paper). • Use and interpret maps and scale drawings. • Find simple loci. • Use bearings to specify direction. • Introduce conventions for drawing and measuring bearings.	• Plot coordinates from a rule to generate a straight line, work with coordinates in all four quadrants • Make links between the graphical and the algebraic representation • Build on the previous one and is students' first formal introduction to straight line graphs. • Use real contexts to help assign practical meaning to the gradient and the intercept. • See the links/similarities/differences between the different mathematical representations of a relationship e.g. the equation, the coordinates and the graphical representation. • plot graphs of equations that correspond to straight-line graphs in the coordinate plane; <u>use the form y = mx + c to identify parallel lines;</u> • <u>interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion</u> • Use real contexts will help assign practical meaning to the gradient and the intercept. • Interpret the solution to an equation based on the context from which it is derived. • Gradient is a measure of rate of vertical change divided by horizontal change. • Parallel lines have the same gradient • The y intercept always has the x value equal zero. • Use 2-D representations for 3-D shapes • Use scale diagrams and map scales • Represent situations by using a locus	• At the end of each unit there will be a unit test. • There will be online assessments for each topic covered. • All Students will be sitting an End of term assessment. • Students will be assessed additionally as best seen fit by their subject teacher. Mathswatch Group work Class discussions Targeted Questioning

		• Plot and measure the position of an object on a given bearing and distance from a specified point. • Solve problems involving bearings. **Writing a one year plan** **How does our plans fit into school/society in an acceptable manner** **Engineering, Medicine, Construction, Air Traffic Controller, Navigator.**	• Use bearings to specify direction • Use an isometric grid to draw cuboids • Recognise the different ways to represent 3-D shapes • Identify when to use loci in problems • Record methods, solutions and conclusions when solving a geometric problem.	