

Year 9 Mathematics					
	Embarking (Grade 1)	Emerging (Grade 2/3)	Developing (Grade 4)	Securing (Grade 5)	Mastering (Grade 6)
Number	<ul style="list-style-type: none"> Order and subtract positive and negative integers in context. Round decimals to the nearest integer. Round decimals to given decimal places confidently. Add and subtract decimals, including those with differing number of decimal places. Use a calculator to calculate square and cube roots. List and simplify equivalent fractions. Convert between fractions, decimals and percentages. Calculate percentage of amounts. Identify and calculate highest common factors and lowest common multiples in contexts. Express one number as a fraction of another. 	<ul style="list-style-type: none"> Rounding decimals one and two places confidently. Use efficient methods with fractions. Round to a given significant figures. Multiply and divide integers by 0.1 and 0.01. Multiply and divide decimals. Convert integers to standard form. Use positive and negative square roots, cube and cube roots. Used index notations for small positive integer powers. Write and integer as a product of prime factors. Multiply integers by fractions. Add and subtract fractions by converting one fractions. Order decimals including those which have different decimal places. Use inequality signs to show comparisons between two fractions, or decimals. Calculate percentage of amounts using multipliers. Solve reverse percentages. 	<ul style="list-style-type: none"> Round decimals to any given accuracy. Recognise equivalences and perform calculations with powers of 10. Recall from memory the cubes of 1, 2, 3, 4, 5, . . . Know the laws of indices. Calculate LCM and HCF using Venn diagrams. Convert between ordinary numbers and numbers in standard form. Add, subtract, multiply and divide numbers that are written in standard form. Divide any integer by a decimal by converting to division by an integer. Understand the term reciprocal and calculate reciprocals of any integer, decimal or fraction. Calculate percentage increase and decrease. Convert simple fractions into recurring decimals using bus-stop method. Calculate simple interest. 	<ul style="list-style-type: none"> Use index notation, including the use of integer powers. Estimate the answer to square roots & cube roots e.g.: $\sqrt{70}$ must lie between 8 and 9. Calculate LCM and HCF of a number when given the prime factorisation of each number. Calculate the upper and lower bounds of a number to a given degree of accuracy. Use upper and lower bounds of numbers for addition and subtraction. Estimate answers to calculations with the use of rounding numbers. Multiply and divide integers and decimals by a number between 0 - 1. Add, subtract, multiply and divide mixed numbers. 	<ul style="list-style-type: none"> Recall index laws such as $a^0 = 1$ and involving $9^{1/2}$ and $8^{1/3}$. Understand the definition of a surd and perform calculations involving roots e.g.: $\sqrt{16} \times \sqrt{4} = 8$. Simplify surds e.g.: $\sqrt{12} = 2\sqrt{3}$. Convert a fraction to a recurring decimal and vice versa. Solve problems involving standard form.
Geometry and Measure	<ul style="list-style-type: none"> Identify and calculate angles on a straight line, around a point and vertically opposite. Measure and draw angles to nearest degree. Construct a triangle given sides and angles. Identify properties of 3D shapes. Identify and construct nets of common 3D shapes. Draw plans and elevations of 3D shapes. Reflect, translate and rotate shapes. Classify quadrilaterals and triangles given their properties. 	<ul style="list-style-type: none"> Calculate volume of prisms Calculate the surface area of prisms Calculate the area of a trapezium Calculate the circumference and area of a circle. Identify and calculate angles in parallel lines, eg. Alternate, corresponding and allied angles. Calculate angles angles in isosceles and equilateral triangles. Draw and find bearings Describe rotations, translations and reflections. Identify congruent shapes. 	<ul style="list-style-type: none"> Construct triangles accurately given SSA, ASA, SAS Use ruler and compass to bisect an angle Construct perpendicular lines Enlarge any shape given a positive scale factor. Describe a rotation, reflection and translation on a co-ordinate grid. Calculate the circumference and area of a semi-circle and quarter of a circle. Calculate missing lengths using Pythagoras' Theorem. Calculate interior, exterior and the sum of angles in a polygon. 	<ul style="list-style-type: none"> Calculate the area and arc length of a sector Calculate the length of a line given two coordinates Use and apply trigonometry to right-angled triangle, including worded problems. Calculate volumes of 3D shapes and prisms. Transform shapes by reflecting, rotating, enlarging and translating (using column vectors). Use construction to solve loci problems. 	<ul style="list-style-type: none"> Enlarge a shape given a negative scale factor Describe fully a single transformation Describe the changes and invariance achieved by transformation. Calculate and solve vector problems involving ratios. Calculate the number of sides on a regular polygon given the interior and exterior angles. Understand and use the formula. $(n-2) \times 180 = \text{sum of degrees in a polygon.}$ Recall and use the formulae for volume and surface area

	<ul style="list-style-type: none"> Calculate the area and perimeter of rectangles/squares/triangles. Calculate area and perimeter of compound shapes involving rectangles. 				<p>for pyramids, frustums and cones.</p> <ul style="list-style-type: none"> Calculate the dimensions given the volume or surface area.
Statistics and Probability	<ul style="list-style-type: none"> Draw and interpret frequency diagrams for discrete and continuous data. Calculate the mode, median, mean and the range from a set of data. Draw and interpret line graphs. Understand and use probability scale from 0 to 1. Write probabilities in words or fractions, decimals and percentages. Calculate the probability of an event happening using theoretical probability. List all outcomes using dice, spinners and coins. Calculate the probability of an event happening using relative frequency. 	<ul style="list-style-type: none"> Draw and interpret scatter graphs including line of best fit. Calculate modal class from grouped data. Plan and construct two-way tables. Understand that the sum of probabilities of all mutually exclusive outcomes is 1. List all outcomes systematically. Draw sample space diagrams for two events. Add simple probabilities. Estimate the number of times an event will occur. Interpret results of an experiment using the language of probability. Compare estimated experimental probabilities with theoretical probability. Work out probabilities from Venn diagram. 	<ul style="list-style-type: none"> Apply and work out the fraction of each sector on a pie chart. Draw and interpret distance-time graph. Calculate averages from frequency tables. Use 1-p to calculate the probability of an event not occurring. Calculate a missing probability from a list or table including algebraic terms. Use numerical scale from 0 to 1 to express and compare experimental and theoretical probabilities in a range of context. Compare relative frequencies from samples of different sizes. Complete Venn diagrams and use union and intersection. 	<ul style="list-style-type: none"> Construct and interpret pie chart. Construct and interpret composite bar charts. Display data with an appropriate graph. Write probabilities using fractions, percentages or decimals. Use tree diagrams to calculate the probability of two dependent events. Understand and use experimental and theoretical probability to calculate and estimate outcomes. Work out probabilities from Venn diagrams to represent real-life situation and also "abstract" sets of numbers/values. 	<ul style="list-style-type: none"> Plot and interpret cumulative frequency graphs. Plot and interpret boxplots. Plot and interpret time series. Construct and interpret tables and calculate averages from continuous data. Calculate the outcomes of two or more events by using the product rule. Calculate a missing probability from a list or two-way-table, including algebraic terms. Use a two-way table to calculate conditional probability. Compare relative frequency and theoretical probabilities from different sample sizes.
Algebra	<ul style="list-style-type: none"> Plot coordinates in all four quadrants. Identify expressions, terms, equations and formulae. Multiply terms including single brackets by a positive integer. Calculate term-to-term rule and continue a sequence. Generate sequence from patterns. Show inequalities on a number line. Give numbers that satisfy inequalities. Calculate the input and output of function machine (positive integers only). 	<ul style="list-style-type: none"> Expand, factorise and simplify a single bracket. Substitute positive and negative integers into expressions and formula. Calculate input and output from function machines, including negatives. Generate a sequence from the n^{th} term. Calculate the n^{th} term. Know the first five triangular numbers and to be able to continue the sequence. Calculate the mid-point of a line on a coordinate grid. Solve problems involving shapes on coordinates grid. Plot equations of line in form $y = mx + c$ and identify the gradient. 	<ul style="list-style-type: none"> Expand and simplify brackets including with negative numbers (eg. $3(x+4) - (x+5)$) Construct and solve linear equations, including unknowns on both sides Construct, use and rearrange simple formulae Plot and solve inequalities on a number line. Solve simultaneous equations graphically. Identify and continue the Fibonacci sequence. Add and subtract simple algebraic fractions. Plot quadratic functions with and without a calculator. 	<ul style="list-style-type: none"> Construct and solve linear equations that involve fractions and fractional answers. Construct and solve linear inequalities. Expanded and factorise single and double brackets, including difference of two squares. Substitute fractional and negative values into expressions. Rearrange formula and use to solve problems. Calculate the equation of a line in the form $y = mx + c$. 	<ul style="list-style-type: none"> Use iterative process to generate sequences. Use iterative methods to calculate solutions. Multiply three binomials. Identify linear, quadratic, cubic, reciprocal and exponential graphs. Solve quadratics graphically and by factorising. Solve and simplify algebraic fractions. Construct and solve simultaneous equations. Calculate the equation of a linear function given two coordinates.

Ratio and Proportion	<ul style="list-style-type: none"> • Solve proportion problems using unitary method. • Compare products to work out best buy using simple proportion. • Calculate speed, distance and time given situations. • Solve ratio problems involving recipes. 	<ul style="list-style-type: none"> • Convert between miles and kilometres. • Convert between imperial units and currencies when conversions are given. • Share amount in a given ratio • Use ratio to compare scale drawing to real life. • Use equivalent fractions/decimals and percentages to compare proportions. • Express a number as a percentage of another. 	<ul style="list-style-type: none"> • Calculate density, mass and volume, speed, time and distance. • Calculate the linear scale factor of similar shapes. • Use proportional reasoning to compare proportions. • Compare two ratios. • Calculate the percentage increase and decrease. 	<ul style="list-style-type: none"> • Calculate the dimensions in similar shapes. • Calculate compound interest and depreciation after 2 - 5 years. • Write, simplify and divide a ratio given situations. • Interpret and solve best buy deals. 	<ul style="list-style-type: none"> • Calculate reverse and compound percentages. • Construct and solve equations involving direct and inverse proportion. • Use kinematics formulae to calculate speed and acceleration from worded and graphical situations.
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