Mathematics Year 9 Higher 2019-2020

Term	1		2			3	4	5	6
Topic	**Number**	**Geometry 1**	**Algebra 1**	**Ratio**	**Algebra 2**	**Geometry 2**	**Algebra 3**	**Statistics**	**Revision and Problem Solving**
Detail	Investigate and use indices to calculate with powers and roots. Explore the links between ordinary numbers and standard form. Calculate with standard form using scientific contexts. Estimate calculations by rounding to a sepcific degree of accuracy. Use the limits of accuracy to write error intervals as inequalities. Apply upper and lower	Create and interpret plans and elevlations of 3D shapes and objects. Construct a variety of 2D shapes using a ruler, protractor and pair of compasses. Construct line and angle bisectors. Investigate loci and how they are applied in context using the appropriate constructions. **Students will need pencil, ruler, rubber, protractor,**	Expand and factorise expressions up to and including quadratic expressions. Create an expression or a formula for specific situations. Understand and recognise direct and inverse proportion.	Understand the difference between congruent and similar shapes. Calculate with similar shapes to identify the lengths of unknown sides. Know and use the relationships between compound measures especially in a scientific context.	Understand and predict terms in Fibonacci sequences. Find and use nth terms of a linear sequence. Use quadratic sequences to predict further terms. Solve and represent inequalities using a number line.	Explore, investigate and apply Pythagoras' Theorem to contexts. Recall and use the area and circumference of a circle. Apply knowledge of circles to areas and perimeters of sectors. Recognise and prove congruency in triangles.	Plot and interpret graphs of linear, quadratic, cubic and reciprocal functions. Solve simultaneous equations both algebraically, graphically and in context. Find and interpret the equation of a straight line by finding a gradient and using coordinates. Find the nth term of a quadratic sequence.	Represent and interpret data in a variety of forms. Use and calculate with probability tree diagrams as an alternative to listing outcomes. Construct and interpret time series graph. Use probability to make predictions.	Problem Solving, consolidation revision of this year's topics as per any subject knowledge gap shown in the end of year assessments.
Grade 8-9	Applying upper and lower bounds						Find the nth term of a quadratic sequence.		Revision and problem solving as appropriate from end of year assessment
Grade 6-7									Revision and problem solving as appropriate from end of year assessment
Grade 5	Write error intervals using inequalities.	Understand the meaning of locus (loci), find the locus of points a fixed distance from a point or from a line. Identify when a perpendicular or angle bisector is needed to solve a loci problem.	Factorise a quadratic expression in the form x^2 + bx + c. Factorise a quadratic expression in the form x^2 ± bx ± c. Explain, reason and prove using expanding and factorising. Create an expression or formula to describe a situation using expansion or factorisation. Know the features of an expression or formula that represents direct proportion. Know the features of an expression or formula that represents inverse proportion.		Identify quadratic sequences and find the first and second differences of a quadratic sequence and find the next 3 terms in a quadratic sequence.	Find the arc length of a sector - include leaving in terms of π. Calculate the area of a sector given a radius or diameter - include leaving in terms of π. Calculate the angle of a sector when the arc length and radius/diameter are known - include when given in terms of π. Identify and prove congruent triangles (SSS, SAS, ASA, RHS). Use known facts such as angle facts, similarity, congruency and properties of quadrilaterals to create simple geometric proofs. Explain why the base angles in an isosceles triangle must be equal.	Find the equation of a line given its graph. Identify and interpret gradients and intercepts algebraically. Rearrange equations of a straight line into the form y = mx + c to find the gradient and intercepts. Use the form y = mx + c to identify parallel lines. Find the equation of a line through one point with a given gradient. Find the equation of a line through two points. Interpret the gradient of a straight line as a rate of change e.g. use mobile phone contracts, electricity bills, etc. Plot graphs of cubic and reciprocal functions - make use of scientic examples where possible. Plot and interpret graphs of non-standard functions in real contexts including finding approximate solutions to problems involving simple kinematic problems. Solve simultaneous equations algebraically - no manipulation. Solve simultaneous equations algebraically - with manipulation of one	Use probability tree diagrams to calculate probabilities of dependent combined events. Use probability to make predictions. Revision on problem solving quesions when using a calculator.	Revision and problem solving as appropriate from end of year assessment.
Grade 4	Identify upper and lower bounds.	Constructing triangles using a pair of compasses. Choose techniques to construct 2D shapes or other complex shapes. Construct a perpendicular bisector of a line segment and a perpendicular to a line from a point. Construct angle bisectors.	Expand and simplify the addition or subtraction of two of more brackets. Multiply two linear expressions of the form (x+a)(x-b). Multiply two linear expressions of the form (x ± a)(x ± b). Expand the expression (x ± a)^2. Simplify an expression involving x^2 by collectiing like terms - use area of 2D shapes and algebra or proof of identities.	Know the meanings of congruent and similar relating to shapes. Identify and find missing lengths in similar shapes. Calculate with speed, distance and time - use scientific problems where possible. Calculate with density, mass and volume - use scientific problems where possible. Calculate with pressure, force and area - use scientific problems where possible. Convert between units of density, speed and pressure.	Recognise Fibonacci numbers/sequence and generate Fibonacci type sequences. Substitute numbers in written rules and nth terms of quadratic sequences - include how to do this on a calculator using the table function. Understand and choose the correct inequality for a particular situation, represent inequalities on a number line and identify integers that satisfy the inequality include when there are two inequalities. Use a formal method to solve an inequality (unknown on one side) and show the range of values on a number line Use a formal method to solve an inequality (unknown on both sides) and show the range of values on a number line. Use a formal method to solve an inequality involving brackets and show the range of values on a number line. Reason and proof using inequalities.	Solve problems involving prisms and surface area. Investigate right angle triangle to identify Pythagoras' Theorem. Use Pythagoras' Theorem to calculate the hypotenuse of a right-angled triangle. Use Pythagoras' Theorem to calculate one of the shorter side of a right-angled triangle. Problem solving with Pythagoras' Theorem - identify which side is being found. Solving problem with Pythagoras' theorem - such as finding the area of a triangle given the side lengths. Extend with Pythagoras' Theorem and Circles - include proof of whether a triangle has a right angle. Explain why the base angles in an isosceles triangle must be equal. Explain the connections between Pythagorean triples.	Solve linear equations - unknown on both sides. Create a linear equation and solve - use situations involving perimeter, area, angles. Understand the concept of simultaneous equations - understand there are an infinite number of solutions to the equation ax + by = c (a ≠ 0, b ≠ 0) due to graphical representation. Find approximate solutions to simultaneous equations using a graph.	Understand how probability tree diagrams can be used as an alternative to listing outcomes by sample space diagrams or writing combinations. Use probability tree diagrams to calculate probabilities of independent combined events. Construct graphs of time series. Interpret graphs of time series.	Revision and problem solving as appropriate from end of year assessment.
Grade 2-3	Calculate with positive indices and roots using written methods. Use a calculator to evaluate numerical expressions involving powers and roots. Convert numbers from standard form. Convert numbers into standard form. Convert 'near miss' into standard form e.g. 23 x 10^4 Add/Subtract numbers written in standard form - using real life and/or scientific contexts. Multiply/divide numbers in standard form -using real life and/or scientific contexts. Use and interpret standard form on a scientific calculator. Understand the difference between rounding and truncating. Round to a specific number of decimal places or significant figures. Revision of methods of arithmetic such as long multiplication and division.	Constructing triangles using a protractor. Construct a shape from its plans and elevations. Construct the plan and elevations of a given shape.	Expand one bracket by multiplication. Factorise a linear expression. Identify the differences between direct and inverse proportion. Recognise direct proportion and the features of its graph in a situation. Recognise inverse proportion and the features of its graph in a situation		Find the nth terms of linear sequences including pictorial representations. Use the nth term of a linear sequence to find the sequence.	Know the vocabulary of circles, calculate the circumference of a circle - include leaving in terms of π. Find the area of a circle - include leaving in terms of π. Find the surface area of a prism including cylinders - include leaving in terms of π.	Plot straight line graphs. Identify and interpret gradients and intercepts from a graph. Plot graphs of quadratic functions - also using the table function on a Casio scientific calculator. Solve linear equations - unknown on one side. Revise arithmetic with decimals and fractions.	Revise probability - using the probability scale, mutually exclusive events add to 1. List outcomes using a sample space diagram. Construct and interpret frequency diagrams and frequency polygons. Interpret a scatter diagram using the understanding of correlation. Plot a scatter diagram and construct a line of best fit - make use of scientific examples.	Revision and problem solving as appropriate from end of year assessment.

Keywords	Power, root, index, indices, standard form, inequality, truncate, round, minimum, maximum, interval, decimal	Compasses, arc, line segment, perpendicular, bisect, perpendicular bisector, locus, loci, plan, elevation	inequality, identity, equivalent, equation, formula, formulae, expression, expand, linear, quadratic, direct proportion,	multiplier, linear, congruent, congruence, similar, similarity, compound unit, density, population density, pressure	term, term-to-term rule, position-to-term rule, nth term, generate, linear, quadratic, first (second) difference, Fibonacci number,	circle, Pi, radius, diameter, chord, circumference, arc, tangent, sector, segment, prism, cylinder, cross-section, hypotenuse, Pythagoras' Theorem, congruent, congruence, similar (shapes), similarity,	Function, equation, quadratic, cubic, reciprocal, gradient, y-intercept, x-intercept, root, sketch, plot, kinematic, speed, distance, time, acceleration, deceleration, linear, non-linear, parabola, asymptote, rate of change, equation, simultaneous equation, variable, manipulate, eliminate, solve,	outcome, equally likely outcomes, event, independent event, dependent event, tree diagrams, theoretical probability, experimental probability, random, bias, inbiased, fair, relative frequency, enumerate, set, categorical data, discrete data,	

Resource Links	KM: Maths to Infinity: Standard form KM: Maths to Infinity: Indices KM: Investigate 'Narcissistic Numbers' NRICH: Power mad! NRICH: A question of scale The scale of the universe animation	KM: Construction instruction KM: Construction challenges KM: Napoleonic challenge KM: Circumcentre etcetera KM: Locus hocus pocus KM: The perpendicular bisector KM: Topple KM: Gilbert goat KM: An elevated position KM: Solid problems (plans and elevations) KM: Isometric interpretation (plans and elevations)	KM: Stick on the Maths: Multiplying linear expressions KM: Maths to Infinity: Brackets KM: Maths to Infinity: Quadratics NRICH: Pair Products NRICH: Multiplication Square NRICH: Why 24? KM: Graphing proportion NRICH: In proportion	NRICH: Ratios and diluti NRICH: Similar rectangle NRICH: Fit for photocopy NRICH: Tennis NRICH: How big?	KM: Forming Fibonacci equations KM: Mathematician of the Month: Fibonacci KM: Leonardo de Pisa KM: Fibonacci solver. Students can be challenged to create one KM: Sequence plotting. A grid for plotting nth term KM: Maths to Infinity: Sequences NRICH: Fibs KM: Stick on the Maths: Inequalities KM: Convinced?: Inequalities in one variable NRICH: Inequalities	KM: The language of circles KM: One old Greek (geometrical derivation of Pythagoras' theorem. This is explored further in the next KM: Stick on the Maths: Pythagoras' Theorem KM: Stick on the Maths: Right Prisms NRICH: Curvy Areas NRICH: Changing Areas, Changing Volumes KM: Geometrical proof KM: Shape work: Triangles to thirds, 4x4 square, Squares, Congruent triangles KM: Daniel Gumb's cave KM: Pythagorean triples KM: Stick on the Maths: Congruence and similarity NRICH: Tilted squares NRICH: What's possible?	KM: Screenshot challenge KM: Stick on the Maths: Quadratic and cubic functions KM: Stick on the Maths: Algebraic Graphs KM: Stick on the Maths: Quadratic and cubic functions NRICH: Diamond Collector NRICH: Fill me up NRICH: What's that graph? NRICH: Speed-time at the Olympics NRICH: Exploring Quadratic Mappings NRICH: Minus One Two Three KM: Stick on the Maths ALG2: Simultaneous linear equations NRICH: What's it worth? NRICH: Warmsnug Double Glazing NRICH: Arithmagons	KM: Stick on the Maths: Tree diagrams KM: Stick on the Maths: Relative frequency KM: The drawing pin experiment KM: Stick on the Maths HD2: Frequency polygons a	
Career Opportunities	Why Maths is Important Jobs that involve Maths	Roller coaster engineering	Robotics	Astronaut	Artist who uses Maths Nursing Fashion Designer	Forensic Science Maths and Movies App Creator	Ecological Modelling Store Manager Mechanical Engineering	Surveyor Structural design Sustainability within Construction Design	Geographic Information Systems