Mathematics, Year 9, Long Term Plan

Week/ Lesson	Term	Topic	Knowledge	Skills **Complex activity:**
1 Lesson	Autumn T1	RETEACH WEEK Year 8 - Unit 1 - Number		
Unit 1 Lesson 1		Indices and Standard Form Unit 1.1 Indices	● Recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions); use conventional notation for priority of operations, including brackets, powers, roots and reciprocals ● Use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5; estimate powers and roots of any given positive number ● Calculate with roots, and with integer and fractional indices ● Calculate with and interpret standard form A × 10n, where 1 ≤ A < 10 and n is an integer .	● Calculate combinations of indices and brackets, including nested brackets ● Use index laws to simplify expressions
Lessons 2+3		Unit 1.2 Calculations and Estimates		● Calculate combinations of powers, roots, fractions and brackets ● Estimate answers to calculations
Lesson 4		Unit 1.3 More Indices		● Understand numbers written in index form that are raised to a power. ● Understand negative and zero indices. ● Use powers of 10 and their prefixes.
Lesson 5		Unit 1.4 Standard Form		● Write large and small numbers using standard form. ● Enter and read standard form numbers on a calculator. ● Order numbers written in standard form.
Lessons 6+7		Check, Strengthen and Extend		
1 Lesson		RETEACH WEEK Year 8 - Unit 8 - Calculating with fractions		

Unit 2 Lesson 1		**Expressions and Formulae** Unit 2.1 Solving Equations	● substitute numerical values into formulae and expressions, including scientific formulae ● understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors ● simplify and manipulate algebraic expressions (including those involving surds and algebraic fractions) by: ● collecting like terms ● multiplying a single term over a bracket ● taking out common factors ● expanding products of two or more binomials ● factorising quadratic expressions of the form x2 + bx + c, including the difference of two squares; factorising quadratic expressions of the form ax2 + bx + c ● simplifying expressions involving sums, products and powers, including the laws of indices ● understand and use standard mathematical formulae; rearrange formulae to change the subject ● solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation); find approximate solutions using a graph	● Write and solve equations with fractions. ● Write and solve equations with the unknown on both sides
Lesson 2		Unit 2.2 Substituting into expressions		● Use the priority of operations when substituting into algebraic expressions. ● Substitute values into expressions involving powers and roots.
Lesson 3		Unit 2.3 Writing and using Formulae		● Write and use formulae
Lesson 4		Unit 2.4 Using and rearranging formulae		● Substitute into formulae and then solve equations to find unknown values. ● Change the subject of a formula.
Lesson 5		Unit 2.5 Index laws and brackets		● Use the rules for indices for multiplying and dividing. ● Simplify expressions involving brackets. ● Factorise an expression by taking out an algebraic common factor.
Lesson 6		Unit 2.6 Expanding double brackets		● Multiply out double brackets and collect like terms.

Lessons 7+8		Check, Strengthen and Extend		
2 Lessons		END OF TERM ASSESSMENT AND FEEDBACK		
1 Lesson	**Autumn T2**	**RETEACH WEEK** Year 8 - Unit 10 - Percentages, decimals & fractions		
Unit 3 Lesson 1		**Dealing with Data** Unit 3.1 Planning a survey	● infer properties of populations or distributions from a sample, while knowing the limitations of sampling ● interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data, tables and line graphs for time series data and know their appropriate use ● interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: ● appropriate graphical representation involving discrete, continuous and grouped data, including box plots ● appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers, quartiles and inter-quartile range)	● Identify sources of primary and secondary data. ● Choose a suitable sample size and what data to collect. ● Identify factors that may affect data collection and plan to reduce bias.
Lessons 2+3		Unit 3.2 Collecting Data		● Design and use data collection sheets and tables. ● Design a good questionnaire.
Lesson 4		Unit 3.3 Calculating averages		● Find the median from a frequency table. ● Estimate the mean from a large set of grouped data.
Lessons 5+6		Unit 3.4 Displaying and analysing data		● Construct and use a line of best fit to estimate missing values. ● Identify and suggest reasons for outliers in data. ● Identify further lines of enquiry. ● Draw line graphs to represent grouped data.
Lessons 7+8		Unit 3.5 Presenting and comparing data		● Draw back-to-back stem and leaf diagrams. ● Write a report to show survey results.

			● apply statistics to describe a population	
Lessons 9+10		Check, Strengthen and Extend		
1 Lesson		RETEACH WEEK Year 9 - Unit 1 - Indices & standard form		
Unit 4 Lessons 1+2		Multiplicative Reasoning Unit 4.1 Enlargement	● round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures); use inequality notation to specify simple error intervals due to truncation or rounding ● define percentage as `number of parts per hundred¿; interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively; express one quantity as a percentage of another; compare two quantities using percentages; work with percentages greater than 100%; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics ● solve problems involving direct and inverse proportion, including graphical and algebraic representations	● Enlarge 2D shapes using a positive whole number scale factors and centre of enlargement. ● Find the centre of enlargement by drawing lines on a grid. ● Understand that the scale factor is the ratio of corresponding lengths.
Lessons 3+4		Unit 4.2 Negative and Fractional scale factors		● Enlarge 2D shapes using a negative whole number scale factors. ● Enlarge 2D shapes using a fractional scale factor.
Lesson 5		Unit 4.3 Percentage change		● Find an original value using inverse operations. ● Calculate percentage change.
Lesson 6		Unit 4.4 Compound measures		● Solve problems using compound measures. ● Solve problems using constant rates and related formulae.
Lesson 7		Unit 4.5 Direct and inverse proportion		● Solve best-buy problems. ● Solve problems involving inverse proportion

			● use compound units such as speed, rates of pay, unit pricing, density and pressure ● compare lengths, areas and volumes using ratio notation; make links to similarity (including trigonometric ratios) and scale factors ● identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional and negative scale factors)	
Lesson 8+9		Check, Strengthen and Extend		
2 Lessons		END OF TERM ASSESSMENT AND FEEDBACK		
1 Lesson	**Spring T1**	**RETEACH WEEK** Year 9 - Unit 2 - Expressions & formulae		
UNIT 5 Lesson 1		CONSTRUCTIONS 5.1 Using scales	● use scale factors, scale diagrams and maps ● 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	● Use scales on maps and diagrams. ● Draw diagrams to scale.
Lessons 2+3		5.2 Basic constructions		● Make accurate constructions using drawing equipment
Lessons 4+5		5.3 Constructing triangles		● Construct accurate triangles. ● Construct accurate nets of solids involving triangles.

			perpendicular distance from a point to a line is the shortest distance to the line ● apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles; understand and use alternate and corresponding angles on parallel lines; derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons) ● measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings	
Lessons 6+7		5.4 Using accurate scale diagrams		● Construct and draw accurate scale diagrams. ● Use scale diagrams to solve problems.
Lessons 8+9		Check, Strengthen & Extend		
1 Lesson		RETEACH WEEK Year 9 - Unit 3 - Dealing with data		
UNIT 6 Lesson 1		Sequences, inequalities, equations and proportion 6.1 nth term of arithmetic sequences	● understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors ● solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation); find approximate solutions using a graph ● translate simple situations or procedures into algebraic	● Use the nth term to generate an arithmetic sequence. ● Find and use the nth term of an arithmetic sequence.
Lesson 2		6.2 Non-linear sequences		● Recognise and continue geometric sequences. ● Recognise and continue quadratic sequences.

Lesson 3		6.3 Inequalities	expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution ● solve linear inequalities in one or two variable(s), and quadratic inequalities in one variable; represent the solution set on a number line, using set notation and on a graph ● generate terms of a sequence from either a term-to-term or a position-to-term rule	● Represent inequalities on a number line. ● Find integer values that satisfy an inequality.
Lesson 4		6.4 Solving equations		● Construct and solve equations including fractions or powers.
Lessons 5+6		6.5 Proportion		● Write formulae connecting variables in direct or inverse proportion. ● Use algebra to solve problems involving direct or inverse proportion.
Lessons 7+8		Unit 6 Check, Strengthen & Extend		
2 Lessons		END OF TERM ASSESSMENT AND FEEDBACK		
1 Lesson	Spring T2	RETEACH WEEK Year 9 - Unit 4 - Multiplicative reasoning		
Unit 7 Lessons 1+2		Circles, Pythagoras and prisms 7.1 Using scales	● apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs ● identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment	● Calculate the circumference of a circle. ● Estimate calculations involving pi (π). ● Solve problems involving the circumference of a circle
Lesson 3		7.2 Area of a circle		● Calculate the area of a circle. ● Solve problems involving the area of a circle.
Lesson 4		7.3 Pythagoras' theorem		● Find the length of an unknown side of a right-angled triangle. ● Solve problems involving right-angled triangles.

			● know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders) ● 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; surface area and volume of spheres, pyramids, cones and composite solids ● calculate arc lengths, angles and areas of sectors of circles	
1 lesson		RETEACH WEEK Year 9 - Unit 5 - Constructions		
Lesson 5		7.4 Prisms and cylinders		● Calculate the volume and surface area of a right prism. ● Calculate the volume and surface area of a cylinder. ● Convert between m^3, cm^3 and mm^3.
Lesson 6		7.5 Errors and bounds		● Find the lower and upper bounds for a measurement. ● Calculate percentage error intervals.
Lessons 7+8		Check, Strengthen & Extend		
2 Lessons		END OF TERM ASSESSMENT AND FEEDBACK		
1 Lesson	**Summer T1**	RETEACH WEEK Year 9 - Unit 6 - Sequences, inequalities, equations & proportion		
Unit 8	**(22 Lessons)**	GRAPHS 8.1 Using y = mx + c		● Draw a graph from its equation, without working out points

Lesson 1			● understand and use standard mathematical formulae; rearrange formulae to change the subject ● plot graphs of equations that correspond to straight-line graphs in the coordinate plane; use the form y = mx + c to identify parallel and perpendicular lines; find the equation of the line through two given points, or through one point with a given gradient ● identify and interpret gradients and intercepts of linear functions graphically and algebraically ● identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically and turning points by completing the square ● recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function y = 1/x ● with x ≠ 0, exponential functions =xyk for positive values of k, and the trigonometric functions (with arguments in degrees) y = sin x , y = cos x and y = tan x for angles of any size ● plot and interpret graphs (including reciprocal graphs and exponential graphs) and graphs of non-standard functions in real contexts,	● Write the equation of a line parallel to another line ● Compare graph lines using their equations
Lesson 2		8.2 More straight-line graphs		● Draw graphs with equations in the form $ax+ by = c$ ● Rearrange equations of graphs into the form $y = mx + c$
Lessons 3+4		8.3 Simultaneous equations		● Solve simultaneous equations by drawing graphs ● Solve problems using simultaneous equations
Lessons 5+6		8.4 Graphs of quadratic functions		• Draw graphs with quadratic equations in the form $y = x2$ • Interpret graphs of quadratic functions
Lesson 7		8.5 More non-linear graphs		● Draw and interpret graphs showing inverse proportion ● Draw and interpret non-linear graphs

			to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration ● solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula; find approximate solutions using a graph ● solve two simultaneous equations in two variables (linear/linear or linear/quadratic) algebraically; find approximate solutions using a graph	
Lessons 8+9		Unit 8 Check, Strengthen & Extend		
1 Lesson		RETEACH WEEK Year 9 - Unit 1 - Indices & Standard form		
Unit 9 Lessons 1+2		PROBABILITY 9.1 Mutually exclusive events	● 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	● Identify mutually exclusive outcomes and events ● Work out the probabilities of mutually exclusive outcomes and events
Lessons 3+4		9.2 Experimental and theoretical probability		● Calculate estimates of probability from experiments ● Decide whether a dice or spinner is unbiased
Lesson 5		9.3 Sample space diagrams		● List all the possible outcomes of one or two events in a sample space diagram ● Decide if a game is fair

Lesson 6		9.4 Two-way tables	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 ● understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size ● enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams ● construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities ● calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions ● calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams.	● Show all the possible outcomes of two events in a two-way table ● Calculate probabilities from two-way tables
Lesson 7		9.5 Venn diagrams		● Draw Venn diagrams ● Calculate probabilities from Venn diagrams
Lessons 8+9		Unit 9 Check, Strengthen & Extend		

2 Lessons		END OF TERM ASSESSMENT AND FEEDBACK		
1 Lesson	**Summer T2**	**RETEACH WEEK** Year 9 - Unit 3 - Dealing with data		
Unit 10 Lesson 1		10.1 Congruent and similar shapes	● use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS) ● apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' Theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs ● identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection ● apply the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures ● know the formulae for: Pythagoras' theorem, $a^2 + b^2 = c^2$, and the trigonometric ratios, $\sin\theta$ = opposite/hypotenuse, $\cos\theta$ = adjacent/hypotenuse and $\tan\theta$ = opposite/adjacent; apply them to find angles and lengths in right-angled triangles and, where possible, general triangles in two and three dimensional figures	● Use congruent shapes to solve problems about triangles and other polygons ● Work out whether shapes are similar, congruent or neither
Lessons 2+3		10.2 Ratios in triangles		● Solve problems involving similar triangles
Lessons 4+5		10.3 The tangent ratio		● Use conventions for naming the sides of a right-angled triangle ● Work out the tangent ratio of any angle ● Use the tangent ratio to work out an unknown side of a right-angled triangle

			● know the exact values of sinθ and cosθ for θ = 0^0, 30^0, 45^0 , 60^0 and 90^0; know the exact value of tanθ for θ = 0^0, 30^0, 45^0 and 60^0	
1 Lesson		RETEACH WEEK Year 9 - Unit 7 - Circles, Pythagoras & prisms		
Lessons 6+7		10.4 The sine ratio		● Work out the sine ratio of any angle ● Use the sine ratio to work out an unknown side of a right-angled triangle
Lessons 8+9		10.5 The cosine ratio		● Work out the cosine ratio of any angle ● Use the cosine ratio to work out an unknown side of a right-angled triangle
Lessons 10+11		10.6 Using trigonometry to find angles		● Use the trigonometric ratios to work out an unknown angle in a right-angled triangle
Lessons 12+13		Check, Strengthen & Extend		
2 Lessons		END OF TERM ASSESSMENT AND FEEDBACK		