KS3 Long Term Curriculum Plan: Mathematics - Year 9 Higher

Curriculum Aim: The national curriculum for mathematics aims to ensure that all pupils: - become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.   - reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language   - can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.
Link to prior learning: See KS2 National Curriculum for Mathematics
Rationale of sequencing: In mathematics, students follow a spiral curriculum that allows them to study requisite skills before moving onto more complex concepts. Students will revisit topics in subsequent years and build on prior knowledge and connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. Decisions about progression should be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content in preparation for key stage 4.   In the Autumn term, students start recapping their key number skills and move to the study of more complex areas such as financial maths with simple and compound interest. Students then move onto the module on sequences and explore more complex sequences such as quadratic and geometric sequences. Students then study ratio and proportion and followed by geometry before moving onto algebra. In this module students look at expanding triple brackets for the first time and factorising quadratic expressions which builds on the algebra work studied in years 7 and 8. Students finish the year with geometry and are introduced to Pythagoras and trigonometry for the first time.

Term	Focus / Topic	Knowledge & Skills (from NC/Programmes of Study)	Assessment
Autumn 1	Module 1 - Number Skills Module 2 - Statistics Module 3 - Sequences	Students should be able to: - Define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100%. - Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics - Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures]. - Describe simple mathematical relationships between two variables (bivariate data) in observational and experimental contexts and illustrate using scatter graphs. - Describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers) - Substitute numerical values into formulae and expressions. - Generate terms of a sequence from either a term-to-term or a position-to-term rule - Recognise arithmetic sequences and find the nth term - Recognise geometric sequences and appreciate other sequences that arise.	Half-term assessment on all topics covered since the start of year 9.

		Students should be able to:	
Autumn 2	Module 3 - Sequences Module 4 - Ratio & Proportion	Students should be able to: ● Substitute numerical values into formulae and expressions. ● Generate terms of a sequence from either a term-to-term or a position-to-term rule ● Recognise arithmetic sequences and find the nth term ● Recognise geometric sequences and appreciate other sequences that arise. ● Express one quantity as a fraction of another, where the fraction is less than 1 and greater than 1 ● Use ratio notation, including reduction to simplest form ● Use compound units such as speed, unit pricing and density to solve problems	Year 9 assessment week
Spring 1	Module 5 - Angles & Transformations Module 6 - Constructions & Loci	Students should be able to: ● Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures ● Describe translations as 2D vectors ● Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons ● Interpret and use bearings ● Use scale factors, scale diagrams and maps ● Derive and 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); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line ● Draw and measure line segments and angles in geometric figures, including interpreting scale drawings ● Construct and interpret plans and elevations of 3D shapes	Half-term assessment on all topics covered since the start of year 9.

Spring 2	Module 7 – Algebraic manipulation
	
	Module 8 - Linear Graphs
		Students should be able to:
		● Substitute numerical values into formulae and expressions, including scientific formulae
		● Simplify and manipulate algebraic expressions to maintain equivalence 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 $x^2 + bx + c$, including the difference of two squares; {**factorising quadratic expressions of the form $ax^2 + bx + c$**}
		● Understand and use standard mathematical formulae; rearrange formulae to change the subject
		● Reduce a given linear equation in two variables to the standard form y = mx + c; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically
		● Recognise, sketch and produce graphs of linear functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane
		● Use linear graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations
		● Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs
		● Interpret mathematical relationships both algebraically and graphically
			Year 9 assessment week

		Students should be able to:	Half-term assessment on all topics covered since the start of year 9.
Summer 1	Module 9 - Length, area & volume Module 10 - Right-angled triangles	- Calculate arc lengths, angles and areas of sectors of circles - Derive and apply formulae to calculate and solve problems involving: volume and surface area of cuboids (including cubes) and other prisms (including cylinders) - Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides. - Identify and construct congruent triangles, and construct similar shapes by enlargement, with and without coordinate grids. - Change freely between related standard units [for example time, length, area, volume/capacity, mass] - Apply Pythagoras' Theorem and trigonometric ratios to find angles and lengths in right-angled triangles {and, where possible, general triangles} in two {and three} dimensional figures	
Summer 2	Revision End of year exams Recapping and re-teaching	Students should be able to: - Revise all year 9 topics for the end of year assessments - Following on from the assessments teachers will re-teach gaps from the weak areas in the assessments - This will be personalised based on each class and their results analysis from the end of year exams	End of year assessment on all topics covered since the start of year 9.

Further Information

The exam board used for Mathematics is **Edexcel** - http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics2015.html

Sparx Maths - https://sparxmaths.com/ (All students have individual logins and passwords to support with classwork, homework and revision)

Equipment - All students must attend lessons with pens (including a green pen), pencil, long ruler, rubber, protractor, pair of compasses, scientific calculator, exercise book and home learning book.

KS3 Long Term Curriculum Plan: Mathematics - Year 9 Foundation

Curriculum Aim: The national curriculum for mathematics aims to ensure that all pupils:
- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.

- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

Link to prior learning: See KS2 National Curriculum for Mathematics

Rationale of sequencing: In mathematics, students follow a spiral curriculum that allows them to study requisite skills before moving onto more complex concepts. Students will revisit topics in subsequent years and build on prior knowledge and connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. Decisions about progression should be based on the security of pupils' understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content in preparation for key stage 4.

In the Autumn term, students start by recapping their key number skills and this is then extended further with the topic on upper and lower bounds. Students then build on the topics studied in year 7 and 8 on representing data in the module on statistics. In the Spring term, students explore angles and number further. This is followed by a couple of modules on algebra which look at double brackets and more complex formulae, this links to the next unit on linear graphs which build on the concept of substitution and equations using y =mx + c. Finally, students finish the year with a module on ratio and proportion where students also explore compound measures and the applications of ratio and proportion.

	Focus / Topic	Knowledge & Skills (from NC/Programmes of Study)	Assessment
Autumn 1	Module 1 - Number Skills Module 2 - Percentages Module 3 - Statistics	Students should be able to: ● Understand and use place value for decimals, measures and integers of any size ● Order positive and negative integers, decimals and fractions; use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥ ● Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative ● Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation a<x≤b ● Use a calculator and other technologies to calculate results accurately and then interpret them appropriately ● Define percentage as 'number of parts per hundred', interpret percentages and percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100% ● solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics ● describe, interpret and compare observed distributions of a single variable through: appropriate graphical representation involving discrete, continuous and grouped data; and appropriate measures of central tendency (mean, mode, median) and spread (range, consideration of outliers) ● Construct and interpret appropriate tables, charts, and diagrams, including frequency tables, bar charts, pie charts, and pictograms for categorical data, and vertical line (or bar) charts for ungrouped and grouped numerical data	Half-term assessment on all topics covered since the start of year 9.

		Students should be able to:	
Autumn 2	Module 4 – Angles	Students should be able to: ● Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles ● Understand and use the relationship between parallel lines and alternate and corresponding angles ● Derive and use the sum of angles in a triangle and use it to deduce the angle sum in any polygon, and to derive properties of regular polygons	Year 9 assessment week
Spring 1	Module 5 - Number properties Module 6 - Decimals & Fractions	Students should be able to: ● Use the concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property ● Use integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5 and distinguish between exact representations of roots and their decimal approximations	Half-term assessment on all topics covered since the start of year 9.
Spring 2	Module 7 - Expressions & Formulae Module 8- Linear Graphs	Students should be able to: ● substitute numerical values into formulae and expressions, including scientific formulae ● understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors ● simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms, ● multiplying a single term over a bracket, taking out common factors, expanding products of two or more binomials ● rearrange formulae to change the subject ● model situations or procedures by translating them into algebraic expressions or formulae and by using graphs ● use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement) ● recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane ● interpret mathematical relationships both algebraically and graphically ● reduce a given linear equation in two variables to the standard form $y = mx + c$; ● calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically ● use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations ● find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs ● generate terms of a sequence from either a term-to-term or a position-to-term rule ● recognise arithmetic sequences and find the nth term ● recognise geometric sequences and appreciate other sequences that arise.	Year 9 assessment week

Summer 1	Module 9 - Ratio, speed & proportion	Students should be able to: ● use ratio notation, including reduction to simplest form ● divide a given quantity into two parts in a given part:part or part:whole ratio; ● express the division of a quantity into two parts as a ratio ● 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 and to linear functions ● solve problems involving direct and inverse proportion, including graphical and algebraic representations ● use compound units such as speed, unit pricing and density to solve problems.	Half-term assessment on all topics covered since the start of year 9.
Summer 2	Revision End of year exams Recapping and re-teaching	Students should be able to: ● Revise all year 9 topics for the end of year assessments ● Following on from the assessments teachers will re-teach gaps from the weak areas in the assessments ● This will be personalised based on each class and their results analysis from the end of year exams	End of year assessment on all topics covered since the start of year 9.

Further Information

The exam board used for Mathematics is **Edexcel** - http://qualifications.pearson.com/en/qualifications/edexcel-gcses/mathematics2015.html

Sparx Maths - https://sparxmaths.com/ (All students have individual logins and passwords to support with classwork, homework and revision)

Equipment - All students must attend lessons with pens (including a green pen), pencil, long ruler, rubber, protractor, pair of compasses, scientific calculator, exercise book and home learning book.