

## Mathematics Department – Curriculum Outline

### Year 7

2016-17	Unit	What will I do?	How will I be assessed?
Term 1	<b>Number</b> Place Value	Understand and use place value for decimals, measures and integers of any size. Order positive and negative integers, use the number line as a model for ordering of the real numbers; use the symbols =, ≠, <, >, ≤, ≥ Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures] Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation $a < x \leq b$	
	<b>Number</b> Addition and Subtraction	Use formal written methods for addition and subtraction of integers and decimals. Recognise and use relationships between addition and subtraction including inverse operations. Calculate and solve problems involving perimeter.	Week beg. 17 <sup>th</sup> October 2016 Half term 1 FCAT Assessment 1 hour
	<b>Number</b> Multiplication and Division	Multiply and divide by 10, 100 and 1000 Use formal written methods for multiplication and division of integers and decimals. Recognise and use relationships between operations including inverse operations. Understand the order of operations. Use the concepts and vocabulary of prime numbers, factors (or	

		<p>divisors), common factors and highest common factor (HCF). 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. Calculate and solve problems involving area of rectangles, triangles and parallelograms. Calculate the mean of a set of discrete data.</p>	<p>Week beg. 12<sup>th</sup> December 2016 Mastery Term 1 Assessment 1 hour</p>
Term 2	<b>Number</b> Fractions 1	<p>Identify and use equivalent fractions.</p> <p>Compare and order fractions; use the symbols =, ≠, &lt;, &gt;, ≤, ≥</p> <p>Convert between mixed numbers and improper fractions.</p> <p>Simplify fractions.</p> <p>Use the concepts and vocabulary of multiples and lowest common multiple (LCM).</p> <p>Add and subtract any fraction</p> <ul style="list-style-type: none"> <li>• Fractions with the same denominator.</li> <li>• Fractions with a denominator that is a multiple of the other.</li> <li>• Fractions with different denominators</li> </ul> <p>Convert between fractions and decimals</p> <ul style="list-style-type: none"> <li>• Tenths, hundredths, thousandths</li> <li>• Associating a fraction with division to convert any fraction to a decimal.</li> </ul> <p>Find a fraction of an amount.</p>	
	<b>Statistics 1</b>	Understand the data handling cycle.	

		<p>Collect, organise and interpret data.</p> <ul style="list-style-type: none"> <li>• Tally charts</li> <li>• Median, mode and range</li> </ul> <p>Draw and interpret bar charts, pictograms and line graphs.</p>	
	<b>Number</b> Negative numbers	Use the four operations with negative numbers.	<p>Mid-year exam Week beg. 13<sup>th</sup> &amp; 20<sup>th</sup> March 2017 Mastery Term 2 Assessment 1 hour</p>
Term 3	<b>Algebra1</b>	<p>Introduction to algebra Understand that a letter represents a variable. Understand the difference between an expression, equation, formula, term, function and identity.</p> <p>Pupils should be taught to: use and interpret algebraic notation, including: ab in place of <math>a \times b</math> 3y in place of <math>y + y + y</math> and <math>3 \times y</math> <math>a^2</math> in place of <math>a \times a</math> <math>a^3</math> in place of <math>a \times a \times a</math> <math>a^2b</math> in place of <math>a \times a \times b</math> <math>\frac{a}{b}</math> in place of <math>a \div b</math> coefficients written as fractions rather than as decimals brackets</p> <p>Substitute numerical values into formulae and expressions, including scientific formulae. Simplify and manipulate algebraic expressions to maintain equivalence by collecting like terms.</p> <p>Use algebraic methods to solve simple linear equations in one variable where the unknown</p>	<p>Week beg. 5<sup>th</sup> June 2017 Half term FCAT Assessment 1 hour</p>

		appears on one side of the equation.	
	<b>Geometry</b> Lines and Angles	<p>Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles, regular polygons, and other polygons that are reflectively and rotationally symmetric.</p> <p>Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies</p> <p>Use a protractor to measure and draw angles.</p> <p>Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles.</p> <p>Derive and use the sum of angles in a triangle and a quadrilateral.</p> <p>Draw and interpret pie charts.</p>	<p>Week beg. 10<sup>th</sup> July 2017</p> <p>Mastery Term 3 Assessment</p> <p>1 hour</p>

## Mathematics Department – Curriculum Outline

### Year 8

2016-17	Unit	What will I do?	How will I be assessed?
Term 1	Unit 1 Calculation	Apply the four operations, including formal written methods, to integers, decimals and simple fractions, and mixed numbers (including negatives) Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals Calculate exactly with fractions Round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures) Use terminating decimals and their corresponding fractions	
	Unit 2 Geometry	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) Interpret plans and elevations of 3D shapes Calculate perimeters of 2D shapes, including circles Calculate areas of circles and composite shapes Know and apply formulae to calculate volume of right prisms (including cylinders)	Week beg. 17 <sup>th</sup> October Cycle 1 Assessment 1 hour
	Unit 3 Proportion	Identify and work with fractions in ratio problems Express the division of a quantity into two parts as a ratio; apply ratio to real contexts and problems	

		<p>Express a multiplicative relationship between two quantities as a ratio or a fraction</p> <p>Understand and use proportion as equality of ratios</p> <p>Relate ratios to fractions and to linear functions</p> <p>Compare lengths, areas and volumes using ratio notation</p>	
	Unit 4 Probability	<p>Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one</p> <p>Enumerate sets and combinations of sets systematically, using tables, grids and Venn diagrams</p> <p>Construct theoretical possibility spaces for combined experiments with equally likely outcomes and use these to calculate theoretical probabilities</p>	
Term 2	Unit 5 Algebra	<p>Use and interpret algebraic notation, including: <math>a^2b</math> in place of <math>a \times a \times b</math>, coefficients written as fractions rather than as decimals</p> <p>Substitute numerical values into scientific formulae</p> <p>Simplify and manipulate algebraic expressions by factorising and simplifying expressions involving sums, products and powers, including the laws of indices</p>	<p>Week beg. 16<sup>th</sup> Jan</p> <p>Cycle 2 Assessment</p> <p>1 hour</p>
	Unit 6 Graphs	<p>Plot graphs of equations that correspond to straight-line graphs</p> <p>Identify and interpret gradients and intercepts of linear functions graphically and algebraically</p> <p>Recognise, sketch and interpret graphs of linear functions and quadratic functions</p> <p>Plot and interpret graphs and graphs of non-standard functions in real contexts, to find</p>	

		approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration	
	Unit 7 Geometry	Use scale factors, scale diagrams and maps Measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings Identify, describe and construct similar shapes, including on coordinate axes, by considering enlargement	
	Unit 8 Statistics	Apply statistics to describe a population Use and interpret scatter graphs Recognise correlation Interpret, analyse and compare the distributions of data sets involving discrete, continuous and grouped data Interpret and compare the distributions of data sets using median, mean, mode and modal class, and spread (range, including understanding outliers)	Weeks beg. 13/3/17 and 20/3/17 Mid - Year Exams
Term 3	Unit 9 Algebra	Solve linear equations with the unknown on both sides of the equation Find approximate solutions to linear equations using a graph Rearrange formulae to change the subject	
	Unit 10 Proportion	Change freely between compound units (e.g. speed, rates of pay, prices) in numerical contexts Use compound units such as speed, rates of pay, unit pricing) Work with percentages greater than 100%	

		<p>Solve problems involving percentage change, including original value problems, and simple interest including in financial mathematics</p> <p>Solve problems involving direct and inverse proportion, including graphical and algebraic representations</p> <p>Interpret fractions and percentages as operators</p>	
	<p>Unit 11 Calculation</p>	<p>Understand and use the concepts and vocabulary of inequalities and factors</p> <p>Use the concepts and vocabulary of prime numbers, highest common factor, lowest common multiple, prime factorisation (using index notation)</p> <p>Calculate with and interpret standard form <math>A \times 10^n</math>, where <math>1 \leq A &lt; 10</math> and <math>n</math> is an integer</p> <p>Apply systematic listing strategies</p>	<p>Week beg. 5/6/17</p> <p>Cycle 4 Assessment</p> <p>1 hour</p>
	<p>Unit 12 Algebra</p>	<p>Generate terms of a sequence from either a term-to-term or a position-to-term rule</p> <p>Find the <math>n</math>th term of linear sequences.</p>	

## Mathematics Department – Curriculum Outline

### Year 9 FOUNDATION

2016-17	Unit	What will I do?	How will I be assessed?
Term 1	Unit 1a Integers and Place Value	<p>Use and order positive and negative numbers (integers).</p> <p>Order integers, decimals, use the symbols <math>&lt;</math>, <math>&gt;</math> and understand the <math>\neq</math> symbol.</p> <p>Add and subtract positive and negative numbers (integers).</p> <p>Recall all multiplication facts to <math>10 \times 10</math>, and use them to derive quickly the corresponding division facts.</p> <p>Multiply or divide any number by powers of 10.</p> <p>Multiply and divide positive and negative numbers (integers).</p> <p>Use brackets and the hierarchy of operations (not including powers).</p> <p>Round numbers to a given power of 10.</p> <p>Check answers by rounding and using inverse operations.</p>	
	Unit 1b Decimals	<p>Use decimal notation and place value; Identify the value of digits in a decimal or whole number.</p> <p>Compare and order decimal numbers using the symbols <math>&lt;</math>, <math>&gt;</math></p> <p>Understand the <math>\neq</math> symbol (not equal);</p> <p>Write decimal numbers of millions, e.g. <math>2\,300\,000 = 2.3</math> million</p> <p>Add, subtract, multiply and divide decimals, including calculations involving money.</p> <p>Multiply or divide by any number between 0 and 1</p> <p>Round to the nearest integer.</p> <p>Round to a given number of decimal places.</p> <p>Round to any given number of significant figures.</p> <p>Estimate answers to calculations by rounding numbers to 1 significant figure.</p>	

		Use one calculation to find the answer to another.	
	Unit 1c Indices, Powers and Roots	<p>Find squares and cubes.</p> <p>Recall integer squares up to <math>10 \times 10</math> and the corresponding square roots.</p> <p>Understand the difference between positive and negative square roots.</p> <p>Recall the cubes of 1, 2, 3, 4, 5 and 10</p> <p>Use index notation for squares and cubes</p> <p>Recognise powers of 2, 3, 4, 5</p> <p>Evaluate expressions involving squares, cubes and roots.</p> <p>Add, subtract, multiply and divide numbers in index form.</p> <p>Cancel to simplify a calculation.</p> <p>Use index notation for powers of 10, including negative powers.</p> <p>Use the laws of indices to multiply and divide numbers written in index notation.</p> <p>Use the square, cube and power keys on a calculator.</p> <p>Use brackets and the hierarchy of operations with powers inside the brackets, or raising brackets to powers.</p> <p>Use calculators for all calculations: positive and negative numbers, brackets, powers and roots, four operations.</p>	
	Unit 1d Factors, Multiples and Primes	<p>List all three-digit numbers that can be made from three given integers.</p> <p>Recognise odd and even numbers;</p> <p>Identify factors, multiples and prime numbers.</p> <p>Recognise two-digit prime numbers;</p> <p>List all factors of a number and list multiples systematically.</p> <p>Find the prime factor decomposition of positive integers and write as a product using index notation.</p>	Week beg. 17/10/16 Cycle 1 Assessment

		<p>Find common factors and common multiples of two numbers.</p> <p>Find the LCM and HCF of two numbers, by listing, Venn diagrams and using prime factors: include finding LCM and HCF given the prime factorisation of two numbers.</p> <p>Understand that the prime factor decomposition of a positive integer is unique – whichever factor pair you start with – and that every number can be written as a product of two factors.</p> <p>Solve simple problems using HCF, LCM and prime numbers.</p>	
	<p>Unit 2a Algebra – the basics</p>	<p>Use notation and symbols correctly.</p> <p>Write an expression.</p> <p>Select an expression/equation/formula/identity from a list.</p> <p>Manipulate and simplify algebraic expressions by collecting ‘like’ terms.</p> <p>Multiply together two simple algebraic expressions, e.g. <math>2a \times 3b</math></p> <p>Simplify expressions by cancelling, e.g. <math>\frac{4x}{2} = 2x</math></p> <p>Use index notation when multiplying or dividing algebraic terms.</p> <p>Use index laws in algebra.</p> <p>Use index notation in algebra.</p> <p>Understand the <math>\neq</math> symbol and introduce the identity <math>\equiv</math> sign.</p>	
	<p>Unit 2b Expanding and factorising single brackets</p>	<p>Multiply a single number term over a bracket.</p> <p>Write and simplify expressions using squares and cubes.</p> <p>Simplify expressions involving brackets, i.e. expand the brackets, then add/subtract.</p> <p>Argue mathematically to show algebraic expressions are equivalent.</p> <p>Recognise factors of algebraic terms involving single brackets.</p>	

		Factorise algebraic expressions by taking out common factors.	
	Unit 2c Expressions and substitution into formulae	Write expressions to solve problems representing a situation. Substitute numbers in simple algebraic expressions. Substitute numbers into expressions involving brackets and powers. Substitute positive and negative numbers into expressions. Derive a simple formula, including those with squares, cubes and roots. Substitute numbers into a word formula. Substitute numbers into a formula.	
Term 2	Unit 3a Tables	Use suitable data collection techniques (data to be integer and decimal values). Design and use data-collection sheets for grouped, discrete and continuous data, use inequalities for grouped data, and introduce $\leq$ and $\geq$ signs. Interpret and discuss the data; Sort, classify and tabulate data, both discrete and continuous quantitative data, and qualitative data. Construct tables for time-series data; Extract data from lists and tables. Use correct notation for time, 12- and 24-hour clock. Work out time taken for a journey from a timetable. Design and use two-way tables for discrete and grouped data. Use information provided to complete a two-way table. Calculate the total frequency from a frequency table. Read off frequency values from a table. Find greatest and least values from a frequency table.	Week beg. 16/01/17 Cycle 2 Assessment

		<p>Identify the mode from a frequency table.</p> <p>Identify the modal class from a grouped frequency table.</p>	
	<p><b>Unit 3b</b> Charts and graphs</p>	<p>Plotting coordinates in first quadrant and read graph scales in multiples.</p> <p>Produce and interpret data for Pictograms, composite bar charts, dual/comparative bar charts for categorical and ungrouped discrete data, bar-line charts, vertical line charts, line graphs, line graphs for time-series data, histograms with equal class intervals.</p> <p>stem and leaf (including back-to-back).</p> <p>Calculate total population from a bar chart or table.</p> <p>Find greatest and least values from a bar chart or table.</p> <p>Find the mode from a stem and leaf diagram;</p> <p>Identify the mode from a bar chart.</p> <p>Recognise simple patterns, characteristics, relationships in bar charts and line graphs.</p>	
	<p><b>Unit 3c</b> Pie Charts</p>	<p>Draw circles and arcs to a given radius.</p> <p>Know the angle facts related to circles</p> <p>Measure and draw angles, to the nearest degree.</p> <p>Interpret tables; represent data in tables and charts.</p> <p>Know which charts to use for different types of data sets.</p> <p>Construct pie charts for categorical data and discrete/continuous numerical data.</p> <p>Find the mode and the total frequency from a pie chart.</p>	
	<p><b>Unit 3d</b> Scatter Graphs</p>	<p>Draw scatter graphs.</p> <p>Interpret points on a scatter graph.</p>	

		<p>Identify outliers and ignore them on scatter graphs.</p> <p>Draw the line of best fit on a scatter diagram by eye, and understand what it represents.</p> <p>Distinguish between positive, negative and no correlation using lines of best fit.</p> <p>Use a line of best fit to predict values of a variable given values of the other variable.</p> <p>Interpret scatter graphs in terms of the relationship between two variables.</p> <p>Interpret correlation in terms of the problem.</p>	
	<p><b>Unit 4a</b> <b>Fractions</b></p>	<p>Use diagrams to find equivalent fractions or compare fractions.</p> <p>Express a given number as a fraction of another, using very simple numbers, some cancelling, and where the fraction is both <math>&lt; 1</math> and <math>&gt; 1</math></p> <p>Write a fraction in its simplest form and find equivalent fractions.</p> <p>Order fractions, by using a common denominator.</p> <p>Compare fractions, use inequality signs, compare unit fractions.</p> <p>Convert between mixed numbers and improper fractions.</p> <p>Add and subtract fractions.</p> <p>Multiply and divide fractions.</p>	
	<p><b>Unit 4b</b> <b>Fractions, decimals and percentages</b></p>	<p>Recall the fraction-to-decimal conversion.</p> <p>Convert between fractions and decimals.</p> <p>Convert a fraction to a decimal to make a calculation easier.</p> <p>Recognise recurring decimals and convert fractions such as <math>\frac{3}{7}</math>, <math>\frac{1}{3}</math> and <math>\frac{2}{3}</math> into recurring decimals.</p>	

		<p>Compare and order fractions, decimals and integers, using inequality signs.</p> <p>Express a given number as a percentage of another number.</p> <p>Convert between fractions, decimals and percentages.</p> <p>Order fractions, decimals and percentages, including use of inequality signs.</p>	
	<p>Unit 4c Percentages</p>	<p>Express a given number as a percentage of another number.</p> <p>Find a percentage of a quantity without a calculator: 50%, 25% and multiples of 10% and 5%.</p> <p>Find a percentage of a quantity or measurement.</p> <p>Calculate amount of percentage increase or decrease.</p> <p>Use percentages to solve problems, including comparisons of two quantities using percentages.</p> <p>Percentages over 100%;</p> <p>Use percentages in real-life situations: Price after VAT (not price before VAT). Value of profit or loss.</p> <p>Simple interest.</p> <p>Income tax calculations.</p> <p>Find a percentage of a quantity, including using a multiplier.</p> <p>Use a multiplier to increase or decrease by a percentage in any scenario where percentages are used.</p> <p>Understand the multiplicative nature of percentages as operators.</p>	<p>Weeks beg. 13/3/17 and 20/3/17 Mid - Year Exams</p>
<p>Term 3</p>	<p>Unit 5a Equations</p>	<p>Select an expression, equation, formula or identity from a list.</p> <p>Write expressions and set up simple equations.</p> <p>Use function machines.</p> <p>Solve simple equations.</p> <p>Solve linear equations, with integer coefficients, in which the unknown</p>	

		<p>appears on either side or on both sides of the equation.</p> <p>Solve linear equations which contain brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution.</p> <p>Solve linear equations in one unknown, with integer or fractional coefficients.</p> <p>Rearrange simple equations.</p> <p>Substitute into a formula, and solve the resulting equation.</p> <p>Find an approximate solution to a linear equation using a graph.</p> <p>Solve angle or perimeter problems using algebra.</p> <p>Write an equation to solve a word problem.</p>	
	<b>Unit 5b Inequalities</b>	<p>Show inequalities on number lines.</p> <p>Write down whole number values that satisfy an inequality.</p> <p>Solve an inequality such as <math>-3 &lt; 2x + 1 &lt; 7</math> and show the solution set on a number line.</p> <p>Solve two inequalities in <math>x</math>, find the solution sets and compare them to see which value of <math>x</math> satisfies both.</p> <p>Use the correct notation to show inclusive and exclusive inequalities.</p> <p>Construct inequalities to represent a set shown on a number line.</p> <p>Solve simple linear inequalities in one variable, and represent the solution set on a number line.</p> <p>Round answers to a given degree of accuracy</p> <p>Use inequality notation to specify simple error intervals due to truncation or rounding.</p>	
	<b>Unit 5c Sequences</b>	<p>Recognise sequences of odd and even numbers, and other sequences including Fibonacci sequences.</p>	

		<p>Use function machines to find terms of a sequence.</p> <p>Write the term-to-term definition of a sequence in words.</p> <p>Find a specific term in the sequence using position-to-term or term-to-term rules.</p> <p>Generate arithmetic sequences of numbers, triangular number, square and cube integers and sequences derived from diagrams.</p> <p>Recognise such sequences from diagrams and draw the next term in a pattern sequence.</p> <p>Find the next term in a sequence, including negative values.</p> <p>Find the <math>n</math>th term of a linear sequence.</p> <p>Find the <math>n</math>th term of an arithmetic sequence.</p> <p>Use the <math>n</math>th term of an arithmetic sequence to generate terms.</p> <p>Use the <math>n</math>th term of an arithmetic sequence to decide if a given number is a term in the sequence, or find the first term over a certain number.</p> <p>Continue a geometric progression and find the term-to-term rule, including negatives, fraction and decimal terms.</p> <p>Continue a quadratic sequence and use the <math>n</math>th term to generate terms.</p> <p>Distinguish between arithmetic and geometric sequences.</p>	
	<p>Unit 6a Properties of shapes, parallel lines and angle facts</p>	<p>Estimate sizes of angles.</p> <p>Measure angles.</p> <p>Use angle notation correctly</p> <p>Know that there are <math>360^\circ</math> in a full turn, <math>180^\circ</math> in a half turn and <math>90^\circ</math> in a quarter turn.</p> <p>Identify a line perpendicular to a given line.</p> <p>Identify parallel lines.</p> <p>Recall the properties and definitions of special types of quadrilaterals, including symmetry properties.</p>	<p>Week beg. 5/6/17 Cycle 4 Assessment</p>

		<p>Given some information about a shape on coordinate axes, complete the shape.</p> <p>Classify quadrilaterals by their geometric properties.</p> <p>Use the fact that angle sum of a quadrilateral is <math>360^\circ</math>.</p> <p>Use geometrical language appropriately and give reasons for angle calculations.</p> <p>Recall and use properties of angles at a point, angles at a point on a straight line, right angles, and vertically opposite angles.</p> <p>Distinguish between scalene, equilateral, isosceles and right-angled triangles.</p> <p>Derive and use the sum of angles in a triangle.</p> <p>Find a missing angle in a triangle, using the angle sum of a triangle is <math>180^\circ</math>.</p> <p>Understand and use the angle properties of triangles, use the symmetry property of isosceles triangle to show that base angles are equal.</p> <p>Show step-by-step deduction when solving problems.</p> <p>Understand and use the angle properties of intersecting lines.</p> <p>Understand a proof that the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices.</p> <p>Find missing angles using properties of corresponding and alternate angles.</p> <p>Understand and use the angle properties of parallel lines.</p>	
	<p><b>Unit 6b</b>  <b>Interior and exterior angles of polygons</b></p>	<p>Recognise and name pentagons, hexagons, heptagons, octagons and decagons.</p> <p>Understand 'regular' and 'irregular' as applied to polygons.</p>	

		<p>Use the sum of angles of irregular polygons.</p> <p>Calculate and use the sums of the interior angles of polygons.</p> <p>Calculate and use the angles of regular polygons.</p> <p>Use the sum of the interior angles of an <math>n</math>-sided polygon.</p> <p>Use the sum of the exterior angles of any polygon is <math>360^\circ</math>.</p> <p>Use the sum of the interior angle and the exterior angle is <math>180^\circ</math>.</p> <p>Identify shapes which are congruent (by eye).</p> <p>Explain why some polygons fit together and others do not.</p>	
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## Mathematics Department – Curriculum Outline

### Year 9 HIGHER

2016-17	Unit	What will I do?	How will I be assessed?
Term 1	Unit 1a Calculations, checking and rounding	<p>Add, subtract, multiply and divide decimals and whole numbers.</p> <p>Multiply or divide by any number between 0 and 1;</p> <p>Put digits in the correct place in a decimal calculation and use one calculation to find the answer to another;</p> <p>Use the product rule for counting (i.e. if there are <math>m</math> ways of doing one task and for each of these, there are <math>n</math> ways of doing another task, then the total number of ways the two tasks can be done is <math>m \times n</math> ways);</p> <p>Round numbers to the nearest 10, 100, 1000;</p> <p>Round to the nearest integer, to a given number of decimal places and to a given number of significant figures;</p> <p>Estimate answers to one- or two-step calculations, including use of rounding numbers and formal estimation to 1 significant figure: mainly whole numbers and then decimals.</p>	
	Unit 1b Indices, roots, reciprocals and hierarchy of operations	<p>Use index notation for integer powers of 10, including negative powers;</p> <p>Recognise powers of 2, 3, 4, 5;</p> <p>Use the square, cube and power keys on a calculator and estimate powers and roots of any given positive number, by considering the values it must lie between, e.g. the square root of 42 must be between 6 and 7;</p> <p>Find the value of calculations using indices including positive, fractional and negative indices;</p> <p>Recall that <math>n^0 = 1</math> and <math>n^{-1} = \frac{1}{n}</math> for positive integers <math>n</math> as well as, <math>n^{\frac{1}{2}} = \sqrt{n}</math></p>	

		<p>and <math>n^{\frac{1}{3}} = \sqrt[3]{n}</math> for any positive number <math>n</math>;</p> <p>Understand that the inverse operation of raising a positive number to a power <math>n</math> is raising the result of this operation to the power <math>\frac{1}{n}</math>;</p> <p>Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, fractional and negative powers, and powers of a power;</p> <p>Solve problems using index laws;</p> <p>Use brackets and the hierarchy of operations up to and including with powers and roots inside the brackets, or raising brackets to powers or taking roots of brackets;</p> <p>Use an extended range of calculator functions, including <math>+</math>, <math>-</math>, <math>\times</math>, <math>\div</math>, <math>x^2</math>, <math>\sqrt{x}</math>, memory, <math>x^y</math>, <math>x^{\frac{1}{y}}</math>, brackets;</p> <p>Use calculators for all calculations: positive and negative numbers, brackets, powers and roots, four operations.</p>	
	<p><b>Unit 1c</b>  <b>Factors, multiples and primes.</b></p>	<p>Identify factors, multiples and prime numbers;</p> <p>Find the prime factor decomposition of positive integers – write as a product using index notation;</p> <p>Find common factors and common multiples of two numbers;</p> <p>Find the LCM and HCF of two numbers, by listing, Venn diagrams and using prime factors – include finding LCM and HCF given the prime factorisation of two numbers;</p> <p>Solve problems using HCF and LCM, and prime numbers;</p> <p>Understand that the prime factor decomposition of a positive integer is</p>	

		unique, whichever factor pair you start with, and that every number can be written as a product of prime factors.	
	Unit 1d Standard form and surds	Convert large and small numbers into standard form and vice versa; Add and subtract numbers in standard form; Multiply and divide numbers in standard form; Interpret a calculator display using standard form and know how to enter numbers in standard form; Understand surd notation Simplify surd expressions involving squares (e.g. $\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$ ).	Week beg. 17/10/16 Cycle 1 Assessment
	Unit 2a Algebra – the basics	Use algebraic notation and symbols correctly; Write an expression; Know the difference between a term, expression, equation, formula and an identity; Manipulate an expression by collecting like terms; Substitute positive and negative numbers into expressions such as $3x + 4$ and $2x^3$ and then into expressions involving brackets and powers; Substitute numbers into formulae from mathematics and other subject using simple linear formulae, e.g. $l \times w$ , $v = u + at$ ; Simplify expressions by cancelling, e.g. $\frac{4x}{2} = 2x$ Use instances of index laws for positive integer powers; Use index notation (positive powers) when multiplying or dividing algebraic terms;	

		<p>Use instances of index laws, including use of zero, fractional and negative powers;</p> <p>Multiply a single term over a bracket;</p> <p>Recognise factors of algebraic terms involving single brackets and simplify expressions by factorising, including subsequently collecting like terms;</p> <p>Expand the product of two linear expressions, i.e. double brackets working up to negatives in both brackets and also similar to <math>(2x + 3y)(3x - y)</math>;</p> <p>Know that squaring a linear expression is the same as expanding double brackets;</p> <p>Factorise quadratic expressions of the form <math>ax^2 + bx + c</math>;</p> <p>Factorise quadratic expressions using the difference of two squares.</p>	
	<p>Unit 2b Setting up, solving and rearranging equations</p>	<p>Set up simple equations from word problems and derive simple formulae;</p> <p>Understand the <math>\neq</math> symbol (not equal), e.g. <math>6x + 4 \neq 3(x + 2)</math>, and introduce identity <math>\equiv</math> sign;</p> <p>Solve linear equations, with integer coefficients, in which the unknown appears on either side or on both sides of the equation;</p> <p>Solve linear equations which contain brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution;</p> <p>Solve linear equations in one unknown, with integer or fractional coefficients;</p> <p>Set up and solve linear equations to solve to solve a problem;</p> <p>Derive a formula and set up simple equations from word problems, then solve these equations, interpreting the solution in the context of the problem;</p>	

		<p>Substitute positive and negative numbers into a formula, solve the resulting equation including brackets, powers or standard form;</p> <p>Use and substitute formulae from mathematics and other subjects, including the kinematics formulae <math>v = u + at</math>, <math>v^2 - u^2 = 2as</math>, and <math>s = ut + \frac{1}{2} at^2</math>;</p> <p>Change the subject of a simple formula, i.e. linear one-step, such as <math>x = 4y</math>;</p> <p>Change the subject of a formula, including cases where the subject is on both sides of the original formula, or involving fractions and small powers of the subject;</p> <p>Simple proofs and use of <math>\equiv</math> in “show that” style questions; know the difference between an equation and an identity;</p> <p>Use iteration to find approximate solutions to equations, for simple equations in the first instance, then quadratic and cubic equations.</p>	
	<p>Unit 2c Sequences</p>	<p>Recognise simple sequences including at the most basic level odd, even, triangular, square and cube numbers and Fibonacci-type sequences (including those involving numbers in standard form or index form);</p> <p>Generate sequences of numbers, squared integers and sequences derived from diagrams;</p> <p>Describe in words a term-to-term sequence and identify which terms cannot be in a sequence;</p> <p>Generate specific terms in a sequence using the position-to-term rule and term-to-term rule;</p> <p>Find and use (to generate terms) the <math>n</math>th term of an arithmetic sequence;</p> <p>Use the <math>n</math>th term of an arithmetic sequence to decide if a given number is a term in the sequence, or find the</p>	

		<p>first term above or below a given number;</p> <p>Identify which terms cannot be in a sequence by finding the <math>n</math>th term;</p> <p>Continue a quadratic sequence and use the <math>n</math>th term to generate terms;</p> <p>Find the <math>n</math>th term of quadratic sequences;</p> <p>Distinguish between arithmetic and geometric sequences;</p> <p>Use finite/infinite and ascending/descending to describe sequences;</p> <p>Recognise and use simple geometric progressions (<math>rn</math> where <math>n</math> is an integer, and <math>r</math> is a rational number <math>&gt; 0</math> or a surd);</p> <p>Continue geometric progression and find term to term rule, including negative, fraction and decimal terms;</p> <p>Solve problems involving sequences from real life situations.</p>	
Term 2	Unit 3a Averages and range	<p>Design and use two-way tables for discrete and grouped data;</p> <p>Use information provided to complete a two-way table;</p> <p>Sort, classify and tabulate data and discrete or continuous quantitative data;</p> <p>Calculate mean and range, find median and mode from small data set;</p> <p>Use a spreadsheet to calculate mean and range, and find median and mode;</p> <p>Recognise the advantages and disadvantages between measures of average;</p> <p>Construct and interpret stem and leaf diagrams (including back-to-back diagrams):</p> <ul style="list-style-type: none"> <li>find the mode, median, range, as well as the greatest and least values from stem and leaf diagrams, and compare two distributions from stem</li> </ul>	Week beg. 16/01/17 Cycle 2 Assessment

		<p>and leaf diagrams (mode, median, range);</p> <p>Calculate the mean, mode, median and range from a frequency table (discrete data);</p> <p>Construct and interpret grouped frequency tables for continuous data:</p> <ul style="list-style-type: none"> <li>• for grouped data, find the interval which contains the median and the modal class;</li> <li>• estimate the mean with grouped data;</li> </ul> <p>Understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values.</p>	
	<p><b>Unit 3b</b>  <b>Representing and interpreting data</b></p>	<p>Know which charts to use for different types of data sets;</p> <p>Produce and interpret composite bar charts;</p> <p>Produce and interpret comparative and dual bar charts;</p> <p>Produce and interpret pie charts:</p> <ul style="list-style-type: none"> <li>• find the mode and the frequency represented by each sector;</li> <li>• compare data from pie charts that represent different-sized samples;</li> </ul> <p>Produce and interpret frequency polygons for grouped data:</p> <ul style="list-style-type: none"> <li>• from frequency polygons, read off frequency values, compare distributions, calculate total population, mean, estimate greatest and least possible values (and range);</li> </ul> <p>Produce frequency diagrams for grouped discrete data:</p> <ul style="list-style-type: none"> <li>• read off frequency values, calculate total population, find greatest and least values;</li> </ul>	

		<p>Produce histograms with equal class intervals:</p> <ul style="list-style-type: none"> <li>estimate the median from a histogram with equal class width or any other information, such as the number of people in a given interval;</li> </ul> <p>Produce line graphs:</p> <ul style="list-style-type: none"> <li>read off frequency values, calculate total population, find greatest and least values;</li> </ul> <p>Construct and interpret time-series graphs, comment on trends;</p> <p>Compare the mean and range of two distributions, or median or mode as appropriate;</p> <p>Recognise simple patterns, characteristics relationships in bar charts, line graphs and frequency polygons.</p>	
	<p>Unit 3c Scatter graphs</p>	<p>Draw and interpret scatter graphs;</p> <p>Interpret scatter graphs in terms of the relationship between two variables;</p> <p>Draw lines of best fit by eye, understanding what these represent;</p> <p>Identify outliers and ignore them on scatter graphs;</p> <p>Use a line of best fit, or otherwise, to predict values of a variable given values of the other variable;</p> <p>Distinguish between positive, negative and zero correlation using lines of best fit, and interpret correlation in terms of the problem;</p> <p>Understand that correlation does not imply causality, and appreciate that correlation is a measure of the strength of the association between two variables and that zero correlation does not necessarily imply 'no relationship' but merely 'no linear correlation';</p>	

		<p>Explain an isolated point on a scatter graph;</p> <p>Use the line of best fit make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing.</p>	
	<p><b>Unit 4a</b> <b>Fractions</b></p>	<p>Express a given number as a fraction of another;</p> <p>Find equivalent fractions and compare the size of fractions;</p> <p>Write a fraction in its simplest form, including using it to simplify a calculation,</p> <p>e.g. <math>50 \div 20 = \frac{50}{20} = \frac{5}{2} = 2.5</math>;</p> <p>Find a fraction of a quantity or measurement, including within a context;</p> <p>Convert a fraction to a decimal to make a calculation easier;</p> <p>Convert between mixed numbers and improper fractions;</p> <p>Add, subtract, multiply and divide fractions;</p> <p>Multiply and divide fractions, including mixed numbers and whole numbers and vice versa;</p> <p>Add and subtract fractions, including mixed numbers;</p> <p>Understand and use unit fractions as multiplicative inverses;</p> <p>By writing the denominator in terms of its prime factors, decide whether fractions can be converted to recurring or terminating decimals;</p> <p>Convert a fraction to a recurring decimal;</p> <p>Convert a recurring decimal to a fraction;</p> <p>Find the reciprocal of an integer, decimal or fraction.</p>	
	<p><b>Unit 4b</b> <b>Percentages</b></p>	<p>Convert between fractions, decimals and percentages;</p>	

		<p>Express a given number as a percentage of another number;</p> <p>Express one quantity as a percentage of another where the percentage is greater than 100%</p> <p>Find a percentage of a quantity;</p> <p>Find the new amount after a percentage increase or decrease;</p> <p>Work out a percentage increase or decrease, including: simple interest, income tax calculations, value of profit or loss, percentage profit or loss;</p> <p>Compare two quantities using percentages, including a range of calculations and contexts such as those involving time or money;</p> <p>Find a percentage of a quantity using a multiplier;</p> <p>Use a multiplier to increase or decrease by a percentage in any scenario where percentages are used;</p> <p>Find the original amount given the final amount after a percentage increase or decrease (reverse percentages), including VAT;</p> <p>Use calculators for reverse percentage calculations by doing an appropriate division;</p> <p>Use percentages in real-life situations, including percentages greater than 100%;</p> <p>Describe percentage increase or decrease with fractions, e.g. 150% increase means <math>2\frac{1}{2}</math> times as big;</p> <p>Understand that fractions are more accurate in calculations than rounded percentage or decimal equivalents, and choose fractions, decimals or percentages appropriately for calculations.</p>	
	<p>Unit 4c Ratio and proportion</p>	<p>Express the division of a quantity into a number parts as a ratio;</p>	<p>Weeks beg. 13/3/17 and 20/3/17 Mid - Year Exams</p>

		<p>Write ratios in form <math>1 : m</math> or <math>m : 1</math> and to describe a situation;</p> <p>Write ratios in their simplest form, including three-part ratios;</p> <p>Divide a given quantity into two or more parts in a given part : part or part : whole ratio;</p> <p>Use a ratio to find one quantity when the other is known;</p> <p>Write a ratio as a fraction;</p> <p>Write a ratio as a linear function;</p> <p>Identify direct proportion from a table of values, by comparing ratios of values;</p> <p>Use a ratio to compare a scale model to real-life object;</p> <p>Use a ratio to convert between measures and currencies, e.g. <math>\text{£}1.00 = \text{€}1.36</math>;</p> <p>Scale up recipes;</p> <p>Convert between currencies.</p>	
Term 3	Unit 5a Polygons, angles and parallel lines	<p>Classify quadrilaterals by their geometric properties and distinguish between scalene, isosceles and equilateral triangles;</p> <p>Understand 'regular' and 'irregular' as applied to polygons;</p> <p>Understand the proof that the angle sum of a triangle is <math>180^\circ</math>, and derive and use the sum of angles in a triangle;</p> <p>Use symmetry property of an isosceles triangle to show that base angles are equal;</p> <p>Find missing angles in a triangle using the angle sum in a triangle AND the properties of an isosceles triangle;</p> <p>Understand a proof of, and use the fact that, the exterior angle of a triangle is equal to the sum of the interior angles at the other two vertices;</p> <p>Explain why the angle sum of a quadrilateral is <math>360^\circ</math>;</p>	

		<p>Understand and use the angle properties of quadrilaterals and the fact that the angle sum of a quadrilateral is <math>360^\circ</math>;</p> <p>Understand and use the angle properties of parallel lines and find missing angles using the properties of corresponding and alternate angles, giving reasons;</p> <p>Use the angle sums of irregular polygons;</p> <p>Calculate and use the sums of the interior angles of polygons; use the sum of angles in a triangle and use the angle sum in any polygon to derive the properties of regular polygons;</p> <p>Use the sum of the exterior angles of any polygon is <math>360^\circ</math>;</p> <p>Use the sum of the interior angles of an n-sided polygon;</p> <p>Use the sum of the interior angle and the exterior angle is <math>180^\circ</math>;</p> <p>Find the size of each interior angle, or the size of each exterior angle, or the number of sides of a regular polygon, and use the sum of angles of irregular polygons;</p> <p>Calculate the angles of regular polygons and use these to solve problems;</p> <p>Use the side/angle properties of compound shapes made up of triangles, lines and quadrilaterals, including solving angle and symmetry problems for shapes in the first quadrant, more complex problems and using algebra;</p> <p>Use angle facts to demonstrate how shapes would 'fit together', and work out interior angles of shapes in a pattern.</p>	
	Unit 5b	Understand, recall and use Pythagoras' Theorem in 2D;	

	<p>Pythagoras' Theorem and Trigonometry</p>	<p>Given three sides of a triangle, justify if it is right-angled or not;          Calculate the length of the hypotenuse in a right-angled triangle (including decimal lengths and a range of units);          Find the length of a shorter side in a right-angled triangle;          Calculate the length of a line segment <math>AB</math> given pairs of points;          Give an answer to the use of Pythagoras' Theorem in surd form;          Understand, use and recall the trigonometric ratios sine, cosine and tan, and apply them to find angles and lengths in general triangles in 2D figures;          Use the trigonometric ratios to solve 2D problems;          Find angles of elevation and depression;          Know the exact values of <math>\sin \vartheta</math> and <math>\cos \vartheta</math> for <math>\vartheta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math>; know the exact value of <math>\tan \vartheta</math> for <math>\vartheta = 0^\circ, 30^\circ, 45^\circ</math> and <math>60^\circ</math>.</p>	
	<p>Unit 6a          Graphs: the basics and real-life graphs</p>	<p>Identify and plot points in all four quadrants;          Draw and interpret straight-line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills, fixed charge and cost per item;          Draw distance–time and velocity–time graphs;          Use graphs to calculate various measures (of individual sections), including: unit price (gradient), average speed, distance, time, acceleration; including using enclosed areas by counting squares or using areas of trapezia, rectangles and triangles;          Find the coordinates of the midpoint of a line segment with a diagram given and coordinates;</p>	

		<p>Find the coordinates of the midpoint of a line segment from coordinates;</p> <p>Calculate the length of a line segment given the coordinates of the end points;</p> <p>Find the coordinates of points identified by geometrical information.</p> <p>Find the equation of the line through two given points.</p>	
	<p>Unit 6b Linear graphs and coordinate geometry</p>	<p>Plot and draw graphs of <math>y = a</math>, <math>x = a</math>, <math>y = x</math> and <math>y = -x</math>, drawing and recognising lines parallel to axes, plus <math>y = x</math> and <math>y = -x</math>;</p> <p>Identify and interpret the gradient of a line segment;</p> <p>Recognise that equations of the form <math>y = mx + c</math> correspond to straight-line graphs in the coordinate plane;</p> <p>Identify and interpret the gradient and <math>y</math>-intercept of a linear graph given by equations of the form <math>y = mx + c</math>;</p> <p>Find the equation of a straight line from a graph in the form <math>y = mx + c</math>;</p> <p>Plot and draw graphs of straight lines of the form <math>y = mx + c</math> with and without a table of values;</p> <p>Sketch a graph of a linear function, using the gradient and <math>y</math>-intercept (i.e. without a table of values);</p> <p>Find the equation of the line through one point with a given gradient;</p> <p>Identify and interpret gradient from an equation <math>ax + by = c</math>;</p> <p>Find the equation of a straight line from a graph in the form <math>ax + by = c</math>;</p> <p>Plot and draw graphs of straight lines in the form <math>ax + by = c</math>;</p> <p>Interpret and analyse information presented in a range of linear graphs:</p> <ul style="list-style-type: none"> <li>• use gradients to interpret how one variable changes in relation to another;</li> </ul>	<p>Week beg. 5/6/17 Cycle 4 Assessment</p>

		<ul style="list-style-type: none"> <li>• find approximate solutions to a linear equation from a graph;</li> <li>• identify direct proportion from a graph;</li> <li>• find the equation of a line of best fit (scatter graphs) to model the relationship between quantities;</li> </ul> <p>Explore the gradients of parallel lines and lines perpendicular to each other; Interpret and analyse a straight-line graph and generate equations of lines parallel and perpendicular to the given line;</p> <p>Select and use the fact that when <math>y = mx + c</math> is the equation of a straight line, then the gradient of a line parallel to it will have a gradient of <math>m</math> and a line perpendicular to this line will have a gradient of <math>-\frac{1}{m}</math>.</p>	
	<p>Unit 6c Quadratic, cubic and other graphs</p>	<p>Recognise a linear, quadratic, cubic, reciprocal and circle graph from its shape;</p> <p>Generate points and plot graphs of simple quadratic functions, then more general quadratic functions;</p> <p>Find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function;</p> <p>Interpret graphs of quadratic functions from real-life problems;</p> <p>Draw graphs of simple cubic functions using tables of values;</p> <p>Interpret graphs of simple cubic functions, including finding solutions to cubic equations;</p> <p>Draw graphs of the reciprocal function <math>y = \frac{1}{x}</math> with <math>x \neq 0</math> using tables of values;</p>	

		Draw circles, centre the origin, equation $x^2 + y^2 = r^2$ .	
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## Mathematics Department – Curriculum Outline

### Year 10 FOUNDATION

2016-17	Unit	What will I do?	How will I be assessed?
Term 1	Unit 7a Statistics and sampling	<p>Specify the problem and plan an investigation, decide what data to collect and what statistical analysis is needed.</p> <p>Recognise types of data: primary secondary, quantitative and qualitative.</p> <p>Identify which primary data they need to collect and in what format, including grouped data.</p> <p>Collect data from a variety of suitable primary and secondary sources.</p> <p>Understand how sources of data may be biased.</p> <p>Explain why a sample may not be representative of a whole population.</p> <p>Understand sample and population.</p>	
	Unit 7b The Averages	<p>Calculate the mean, mode, median and range for discrete data.</p> <p>Interpret and find a range of averages as follows:</p> <p>median, mean and range from a (discrete) frequency table;</p> <p>range, modal class, interval containing the median, and estimate of the mean from a grouped data frequency table;</p> <p>mode and range from a bar chart;</p> <p>median, mode and range from stem and leaf diagrams;</p> <p>mean from a bar chart.</p> <p>Understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values.</p> <p>Compare the mean, median, mode and range (as appropriate) of two distributions using bar charts, dual</p>	

		<p>bar charts, pictograms and back-to-back stem and leaf.</p> <p>Recognise the advantages and disadvantages between measures of average.</p>	
	<p><b>Unit 8a</b> Perimeter and Area</p>	<p>Indicate given values on a scale, including decimal value.</p> <p>Know that measurements using real numbers depend upon the choice of unit.</p> <p>Convert between units of measure within one system, including time.</p> <p>Convert between metric units.</p> <p>Measure shapes to find perimeters and areas using a range of scales.</p> <p>Find the perimeter of rectangles, triangles, parallelograms and trapezia. Find the perimeter of compound shapes.</p> <p>Recall and use the formulae for the area of a triangle and rectangle.</p> <p>Find the area of a trapezium and recall the formula.</p> <p>Find the area of a parallelogram.</p> <p>Calculate areas and perimeters of compound shapes made from triangles and rectangles.</p> <p>Estimate surface areas by rounding measurements to 1 significant figure.</p> <p>Find the surface area of a prism.</p> <p>Find surface area using rectangles and triangles.</p> <p>Convert between metric area measures.</p>	
	<p><b>Unit 8b</b> 3D forms and volume</p>	<p>Identify and name common solids: cube, cuboid, cylinder, prism, pyramid, sphere and cone.</p> <p>Sketch nets of cuboids and prisms.</p> <p>Recall and use the formula for the volume of a cuboid.</p> <p>Find the volume of a prism, including a triangular prism, cube and cuboid.</p>	<p>Week beg.17<sup>th</sup> Oct. Cycle 1 Assessment 1 hour</p>

		<p>Calculate volumes of right prisms and shapes made from cubes and cuboids.</p> <p>Estimate volumes by rounding measurements to 1 significant figure.</p> <p>Convert between metric volume measures.</p> <p>Convert between metric measures of volume and capacity e.g. <math>1\text{ml} = 1\text{cm}^3</math>.</p>	
	<p>Unit 9a Real-life graphs</p>	<p>Use input/output diagrams.</p> <p>Use axes and coordinates to specify points in all four quadrants in 2D.</p> <p>Identify points with given coordinates and coordinates of a given point in all four quadrants.</p> <p>Find the coordinates of points identified by geometrical information in 2D (all four quadrants).</p> <p>Find the coordinates of the midpoint of a line segment.</p> <p>Draw, label and scale axes.</p> <p>Read values from straight-line graphs for real-life situations.</p> <p>Draw straight line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills graphs, fixed charge and cost per unit.</p> <p>Draw distance–time graphs and velocity–time graphs.</p> <p>Work out time intervals for graph scales.</p> <p>Interpret distance–time graphs, and calculate: the speed of individual sections, total distance and total time.</p> <p>Interpret information presented in a range of linear and non-linear graphs.</p> <p>Interpret graphs with negative values on axes.</p> <p>Find the gradient of a straight line from real-life graphs.</p> <p>Interpret gradient as the rate of change in distance–time and speed–time graphs, graphs of containers</p>	

		filling and emptying, and unit price graphs.	
	Unit 9b Straight line graphs	<p>Use function machines to find coordinates (i.e. given the input <math>x</math>, find the output <math>y</math>).</p> <p>Plot and draw graphs of <math>y = a</math>, <math>x = a</math>, <math>y = x</math> and <math>y = -x</math>;</p> <p>Recognise straight-line graphs parallel to the axes.</p> <p>Recognise that equations of the form <math>y = mx + c</math> correspond to straight-line graphs in the coordinate plane.</p> <p>Plot and draw graphs of straight lines of the form <math>y = mx + c</math> using a table of values.</p> <p>Sketch a graph of a linear function, using the gradient and <math>y</math>-intercept.</p> <p>Identify and interpret gradient from an equation <math>y = mx + c</math>.</p> <p>Identify parallel lines from their equations.</p> <p>Plot and draw graphs of straight lines in the form <math>ax + by = c</math></p> <p>Find the equation of a straight line from a graph.</p> <p>Find the equation of the line through one point with a given gradient.</p> <p>Find approximate solutions to a linear equation from a graph.</p>	
Term 2	Unit 10a Transformations 1: translations, rotations and reflections	<p>Identify congruent shapes by eye.</p> <p>Understand clockwise and anticlockwise.</p> <p>Understand that rotations are specified by a centre, an angle and a direction of rotation.</p> <p>Find the centre of rotation, angle and direction of rotation and describe rotations.</p> <p>Describe a rotation fully using the angle, direction of turn, and centre.</p> <p>Rotate a shape about the origin or any other point on a coordinate grid.</p>	

		<p>Draw the position of a shape after rotation about a centre (not on a coordinate grid).</p> <p>Identify correct rotations from a choice of diagrams.</p> <p>Understand that translations are specified by a distance and direction using a vector.</p> <p>Translate a given shape by a vector.</p> <p>Describe and transform 2D shapes using single translations on a coordinate grid.</p> <p>Use column vectors to describe translations.</p> <p>Understand that distances and angles are preserved under rotations and translations, so that any figure is congruent under either of these transformations.</p>	
	<p><b>Unit 10b</b>  <b>Transformations</b>  <b>2: enlargements</b>  <b>and</b>  <b>combinations</b></p>	<p>Understand that reflections are specified by a mirror line.</p> <p>Identify correct reflections from a choice of diagrams.</p> <p>Understand that reflections are specified by a mirror line.</p> <p>Identify the equation of a line of symmetry.</p> <p>Transform 2D shapes using single reflections (including those not on coordinate grids) with vertical, horizontal and diagonal mirror lines.</p> <p>Describe reflections on a coordinate grid.</p> <p>Scale a shape on a grid (without a centre specified).</p> <p>Understand that an enlargement is specified by a centre and a scale factor.</p> <p>Enlarge a given shape using (0, 0) as the centre of enlargement, and enlarge shapes with a centre other than (0, 0).</p> <p>Find the centre of enlargement by drawing.</p>	<p>Week beg. 6/2/17 and 13/2/17</p> <p>Mock 1</p>

		<p>Describe and transform 2D shapes using enlargements by:</p> <ul style="list-style-type: none"> <li>• a positive integer scale factor;</li> <li>• a fractional scale factor.</li> </ul> <p>Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides, simple integer scale factors, or simple fractions.</p> <p>Understand that distances and angles are preserved under reflections, so that any figure is congruent under this transformation.</p> <p>Understand that similar shapes are enlargements of each other and angles are preserved – define similar in this unit.</p>	
	<p>Unit 11a Ratio</p>	<p>Understand and express the division of a quantity into a number of parts as a ratio.</p> <p>Write ratios in their simplest form.</p> <p>Write/interpret a ratio to describe a situation.</p> <p>Share a quantity in a given ratio including three-part ratios.</p> <p>Solve a ratio problem in context.</p> <p>Use a ratio to find one quantity when the other is known.</p> <p>Use a ratio to compare a scale model to a real-life object.</p> <p>Use a ratio to convert between measures and currencies.</p> <p>Problems involving mixing, e.g. paint colours, cement and drawn conclusions.</p> <p>Compare ratios.</p> <p>Write ratios in form <math>1 : m</math> or <math>m : 1</math></p> <p>Write a ratio as a fraction.</p> <p>Write a ratio as a linear function.</p> <p>Write lengths, areas and volumes of two shapes as ratios in simplest form.</p> <p>Express a multiplicative relationship between two quantities as a ratio or a fraction.</p>	

	<p><b>Unit 11b Proportion</b></p>	<p>Understand and use proportion as equality of ratios.</p> <p>Solve word problems involving direct and inverse proportion.</p> <p>Work out which product is the better buy.</p> <p>Scale up recipes.</p> <p>Convert between currencies.</p> <p>Solve proportion problems using the unitary method.</p> <p>Recognise when values are in direct proportion by reference to the graph form.</p> <p>Understand inverse proportion: as <math>x</math> increases, <math>y</math> decreases (inverse graphs done in later unit).</p> <p>Recognise when values are in direct proportion by reference to the graph form.</p> <p>Understand direct proportion and the relationship <math>y = kx</math>.</p>	
<p><b>Term 3</b></p>	<p><b>Unit 12 Pythagoras' Theorem and Trigonometry</b></p>	<p>Understand, recall and use Pythagoras' Theorem in 2D, including leaving answers in surd form.</p> <p>Given 3 sides of a triangle, justify if it is right-angled or not.</p> <p>Calculate the length of the hypotenuse in a right-angled triangle, including decimal lengths and a range of units.</p> <p>Find the length of a shorter side in a right-angled triangle.</p> <p>Apply Pythagoras' Theorem with a triangle drawn on a coordinate grid.</p> <p>Calculate the length of a line segment AB given pairs of points.</p> <p>Understand, use and recall the trigonometric ratios sine, cosine and tan, and apply them to find angles and lengths in general triangles in 2D figures.</p> <p>Use the trigonometric ratios to solve 2D problems.</p>	

		<p>Find angles of elevation and depression.</p> <p>Round answers to appropriate degree of accuracy, either to a given number of significant figures or decimal places, or make a sensible decision on rounding in context of question.</p> <p>Know the exact values of <math>\sin \vartheta</math> and <math>\cos \vartheta</math> for <math>\vartheta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math>; know the exact value of <math>\tan \vartheta</math> for <math>\vartheta = 0^\circ, 30^\circ, 45^\circ</math> and <math>60^\circ</math>.</p>	
	<p>Unit 13a Probability 1</p>	<p>Distinguish between events which are impossible, unlikely, even chance, likely, and certain to occur.</p> <p>Mark events and/or probabilities on a probability scale of 0 to 1.</p> <p>Write probabilities in words or fractions, decimals and percentages.</p> <p>Find the probability of an event happening using theoretical probability.</p> <p>Use theoretical models to include outcomes using dice, spinners &amp; coins.</p> <p>List all outcomes for single events systematically.</p> <p>Work out probabilities from frequency tables.</p> <p>Work out probabilities from two-way tables.</p> <p>Record outcomes of probability experiments in tables.</p> <p>Add simple probabilities.</p> <p>Identify different mutually exclusive outcomes and know that the sum of the probabilities of all outcomes is 1.</p> <p>Using <math>1 - p</math> as the probability of an event not occurring where <math>p</math> is the probability of the event occurring.</p> <p>Find a missing probability from a list or table including algebraic terms.</p>	<p>Week beg. 8/5/17, 15/5/17 and 22/5/17 Mock 2</p>
	<p>Unit 13b Probability 2</p>	<p>Find the probability of an event happening using relative frequency.</p>	

		<p>Estimate the number of times an event will occur, given the probability and the number of trials – for both experimental and theoretical probabilities.</p> <p>List all outcomes for combined events systematically.</p> <p>Use and draw sample space diagrams.</p> <p>Work out probabilities from Venn diagrams to represent real-life situations and also ‘abstract’ sets of numbers/values.</p> <p>Use union and intersection notation.</p> <p>Compare experimental data and theoretical probabilities.</p> <p>Compare relative frequencies from samples of different sizes.</p> <p>Find the probability of successive events, such as several throws of a single dice.</p> <p>Use tree diagrams to calculate the probability of two independent events.</p> <p>Use tree diagrams to calculate the probability of two dependent events.</p>	
	<p>Unit 14 Multiplicative reasoning</p>	<p>Understand and use compound measures: density, pressure, speed</p> <p>Convert between metric speed measures.</p> <p>Read values in km/h and mph from a speedometer.</p> <p>Calculate average speed, distance, time – in miles per hour as well as metric measures.</p> <p>Use kinematics formulae to calculate speed, acceleration (with formula provided and variables defined in the question).</p> <p>Change d/t in m/s to a formula in km/h.</p> <p>Express a given number as a percentage of another number in more complex situations.</p> <p>Calculate percentage profit or loss.</p>	

		<p>Make calculations involving repeated percentage change, not using the formula.</p> <p>Find the original amount given the final amount after a percentage increase or decrease.</p> <p>Use compound interest.</p> <p>Use a variety of measures in ratio and proportion problems:</p> <ul style="list-style-type: none"> <li>• currency conversion;</li> <li>• rates of pay;</li> <li>• best value;</li> </ul> <p>Set up, solve and interpret the answers in growth and decay problems.</p> <p>Understand that <math>X</math> is inversely proportional to <math>Y</math> is equivalent to <math>X</math> is proportional to <math>\frac{1}{Y}</math></p> <p>Interpret equations that describe direct and inverse proportion.</p>	
	<p>Unit 15a Plans and elevations</p>	<p>Understand clockwise and anticlockwise.</p> <p>Draw circles and arcs to a given radius or given the diameter.</p> <p>Measure and draw lines, to the nearest mm.</p> <p>Measure and draw angles, to the nearest degree.</p> <p>Know and use compass directions.</p> <p>Draw sketches of 3D solids.</p> <p>Know the terms face, edge and vertex.</p> <p>Identify and sketch planes of symmetry of 3D solids.</p> <p>Make accurate drawings of triangles and other 2D shapes using a ruler and a protractor.</p> <p>Construct diagrams of everyday 2D situations involving rectangles, triangles, perpendicular and parallel lines.</p>	

		<p>Understand and draw front and side elevations and plans of shapes made from simple solids.</p> <p>Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid.</p>	
	<p>Unit 15b Constructions, loci and bearings</p>	<p>Understand congruence, as two shapes that are the same size and shape.</p> <p>Visually identify shapes which are congruent.</p> <p>Use straight edge and a pair of compasses to do standard constructions.</p> <p>Understand, from the experience of constructing them, that triangles satisfying SSS, SAS, ASA and RHS are unique, but SSA triangles are not.</p> <p>Construct the perpendicular bisector of a given line.</p> <p>Construct the perpendicular from a point to a line.</p> <p>Construct the bisector of a given angle.</p> <p>Construct angles of <math>90^\circ</math>, <math>45^\circ</math></p> <p>Draw and construct diagrams from given instructions, including the following:</p> <ul style="list-style-type: none"> <li>• a region bounded by a circle and an intersecting line;</li> <li>• a given distance from a point and a given distance from a line;</li> <li>• equal distances from two points or two line segments;</li> <li>• regions may be defined by 'nearer to' or 'greater than';</li> </ul> <p>Find and describe regions satisfying a combination of loci.</p> <p>Use constructions to solve loci problems (2D only).</p> <p>Use and interpret maps and scale drawings.</p>	

		<p>Estimate lengths using a scale diagram.</p> <p>Make an accurate scale drawing from a diagram.</p> <p>Use three-figure bearings to specify direction.</p> <p>Mark on a diagram the position of point <i>B</i> given its bearing from point <i>A</i>;</p> <p>Give a bearing between the points on a map or scaled plan.</p> <p>Given the bearing of a point <i>A</i> from point <i>B</i>, work out the bearing of <i>B</i> from <i>A</i>.</p> <p>Use accurate drawing to solve bearings problems.</p> <p>Solve locus problems including bearings.</p>	
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## Mathematics Department – Curriculum Outline

### Year 10 HIGHER

2016-17	Unit	What will I do?	How will I be assessed?
Term 1	Unit 7a Perimeter, area and circles	<p>Recall and use the formulae for the area of a triangle, rectangle, trapezium and parallelogram using a variety of metric measures;</p> <p>Calculate the area of compound shapes made from triangles, rectangles, trapezia and parallelograms using a variety of metric measures;</p> <p>Find the perimeter of a rectangle, trapezium and parallelogram using a variety of metric measures;</p> <p>Calculate the perimeter of compound shapes made from triangles and rectangles;</p> <p>Estimate area and perimeter by rounding measurements to 1 significant figure to check reasonableness of answers.</p> <p>Recall the definition of a circle and name and draw parts of a circle;</p> <p>Recall and use formulae for the circumference of a circle and the area enclosed by a circle (using circumference = <math>2\pi r = \pi d</math> and area of a circle = <math>\pi r^2</math>) using a variety of metric measures;</p> <p>Use <math>\pi \approx 3.142</math> or use the <math>\pi</math> button on a calculator;</p> <p>Calculate perimeters and areas of composite shapes made from circles and parts of circles (including semicircles, quarter-circles, combinations of these and also incorporating other polygons);</p> <p>Calculate arc lengths, angles and areas of sectors of circles;</p> <p>Find radius or diameter, given area or circumference of circles in a variety of metric measures;</p>	

		<p>Give answers to an appropriate degree of accuracy or in terms of <math>\pi</math>;          Form equations involving more complex shapes and solve these equations.</p>	
	<p>Unit 7b          3D forms and volume,          cylinders, cones and spheres</p>	<p>Find the surface area of prisms using the formulae for triangles and rectangles, and other (simple) shapes with and without a diagram;          Draw sketches of 3D solids;          Identify planes of symmetry of 3D solids, and sketch planes of symmetry;          Recall and use the formula for the volume of a cuboid or prism made from composite 3D solids using a variety of metric measures;          Convert between metric volume measures;          Convert between metric measures of volume and capacity, e.g. 1 ml = 1 cm<sup>3</sup>;          Use volume to solve problems;          Estimating surface area, perimeter and volume by rounding measurements to 1 significant figure to check reasonableness of answers.          Use <math>\pi \approx 3.142</math> or use the <math>\pi</math> button on a calculator;          Find the volume and surface area of a cylinder;          Recall and use the formula for volume of pyramid;          Find the surface area of a pyramid;          Use the formulae for volume and surface area of spheres and cones;          Solve problems involving more complex shapes and solids, including segments of circles and frustums of cones;          Find the surface area and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders;</p>	<p>Week beg.17<sup>th</sup> Oct.          Cycle 1 Assessment          1 hour</p>

		<p>Give answers to an appropriate degree of accuracy or in terms of <math>\pi</math>;</p> <p>Form equations involving more complex shapes and solve these equations.</p>	
	<p>Unit 7c Accuracy and bounds</p>	<p>Calculate the upper and lower bounds of numbers given to varying degrees of accuracy;</p> <p>Calculate the upper and lower bounds of an expression involving the four operations;</p> <p>Find the upper and lower bounds in real-life situations using measurements given to appropriate degrees of accuracy;</p> <p>Find the upper and lower bounds of calculations involving perimeters, areas and volumes of 2D and 3D shapes;</p> <p>Calculate the upper and lower bounds of calculations, particularly when working with measurements;</p> <p>Use inequality notation to specify an error interval due to truncation or rounding.</p>	
	<p>Unit 8a Transformations</p>	<p>Distinguish properties that are preserved under particular transformations;</p> <p>Recognise and describe rotations – know that they are specified by a centre and an angle;</p> <p>Rotate 2D shapes using the origin or any other point (not necessarily on a coordinate grid);</p> <p>Identify the equation of a line of symmetry;</p> <p>Recognise and describe reflections on a coordinate grid – know to include the mirror line as a simple algebraic</p>	

		<p>equation, <math>x = a</math>, <math>y = a</math>, <math>y = x</math>, <math>y = -x</math> and lines not parallel to the axes;</p> <p>Reflect 2D shapes using specified mirror lines including lines parallel to the axes and also <math>y = x</math> and <math>y = -x</math>;</p> <p>Recognise and describe single translations using column vectors on a coordinate grid;</p> <p>Translate a given shape by a vector;</p> <p>Understand the effect of one translation followed by another, in terms of column vectors (to introduce vectors in a concrete way);</p> <p>Enlarge a shape on a grid without a centre specified;</p> <p>Describe and transform 2D shapes using enlargements by a positive integer, positive fractional, and negative scale factor;</p> <p>Know that an enlargement on a grid is specified by a centre and a scale factor;</p> <p>Identify the scale factor of an enlargement of a shape;</p> <p>Enlarge a given shape using a given centre as the centre of enlargement by counting distances from centre, and find the centre of enlargement by drawing;</p> <p>Find areas after enlargement and compare with before enlargement, to deduce multiplicative relationship (area scale factor); given the areas of two shapes, one an enlargement of the other, find the scale factor of the enlargement (whole number values only);</p>	
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		<p>Use congruence to show that translations, rotations and reflections preserve length and angle, so that any figure is congruent to its image under any of these transformations;</p> <p>Describe and transform 2D shapes using combined rotations, reflections, translations, or enlargements;</p> <p>Describe the changes and invariance achieved by combinations of rotations, reflections and translations.</p>	
	<p><b>Unit 8b</b>  <b>Constructions,</b>  <b>loci and</b>  <b>bearings</b></p>	<p>Understand and draw front and side elevations and plans of shapes made from simple solids;</p> <p>Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid;</p> <p>Use and interpret maps and scale drawings, using a variety of scales and units;</p> <p>Read and construct scale drawings, drawing lines and shapes to scale;</p> <p>Estimate lengths using a scale diagram;</p> <p>Understand, draw and measure bearings;</p> <p>Calculate bearings and solve bearings problems, including on scaled maps, and find/mark and measure bearings</p> <p>Use the standard ruler and compass constructions:</p> <ul style="list-style-type: none"> <li>• bisect a given angle;</li> <li>• construct a perpendicular to a given line from/at a given point;</li> <li>• construct angles of <math>90^\circ</math>, <math>45^\circ</math>;</li> <li>• perpendicular bisector of a line segment;</li> </ul> <p>Construct:</p> <ul style="list-style-type: none"> <li>• a region bounded by a circle and an intersecting line;</li> </ul>	

		<ul style="list-style-type: none"> <li>• a given distance from a point and a given distance from a line;</li> <li>• equal distances from two points or two line segments;</li> <li>• regions which may be defined by 'nearer to' or 'greater than';</li> </ul> <p>Find and describe regions satisfying a combination of loci, including in 3D;  Use constructions to solve loci problems including with bearings;  Know that the perpendicular distance from a point to a line is the shortest distance to the line.</p>	
	<p>Unit 9a  Solving simultaneous and quadratic equations</p>	<p>Factorise quadratic expressions in the form <math>ax^2 + bx + c</math>;  Solve quadratic equations by factorisation and completing the square;  Solve quadratic equations that need rearranging;  Set up and solve quadratic equations;  Solve quadratic equations by using the quadratic formula;  Find the exact solutions of two simultaneous equations in two unknowns;  Use elimination or substitution to solve simultaneous equations;  Solve exactly, by elimination of an unknown, two simultaneous equations in two unknowns:</p> <ul style="list-style-type: none"> <li>• linear / linear, including where both need multiplying;</li> <li>• linear / quadratic;</li> <li>• linear / <math>x^2 + y^2 = r^2</math>;</li> </ul> <p>Set up and solve a pair of simultaneous equations in two variables for each of the above scenarios, including to represent a situation;</p>	

		Interpret the solution in the context of the problem.	
Term 2	Unit 9b Inequalities	<p>Show inequalities on number lines;</p> <p>Write down whole number values that satisfy an inequality;</p> <p>Solve simple linear inequalities in one variable, and represent the solution set on a number line;</p> <p>Solve two linear inequalities in <math>x</math>, find the solution sets and compare them to see which value of <math>x</math> satisfies both</p> <p>solve linear inequalities in two variables algebraically;</p> <p>Use the correct notation to show inclusive and exclusive inequalities.</p>	
	Unit 10 Probability	<p>Write probabilities using fractions, percentages or decimals;</p> <p>Understand and use experimental and theoretical measures of probability, including relative frequency to include outcomes using dice, spinners, coins, etc;</p> <p>Estimate the number of times an event will occur, given the probability and the number of trials;</p> <p>Find the probability of successive events, such as several throws of a single dice;</p> <p>List all outcomes for single events, and combined events, systematically;</p> <p>Draw sample space diagrams and use them for adding simple probabilities;</p> <p>Know that the sum of the probabilities of all outcomes is 1;</p> <p>Use <math>1 - p</math> as the probability of an event not occurring where <math>p</math> is the probability of the event occurring;</p> <p>Work out probabilities from Venn diagrams to represent real-life situations and also 'abstract' sets of numbers/values;</p> <p>Use union and intersection notation;</p>	Week beg. 6/2/17 and 13/2/17 Mock 1

		<p>Find a missing probability from a list or two-way table, including algebraic terms;</p> <p>Understand conditional probabilities and decide if two events are independent;</p> <p>Draw a probability tree diagram based on given information, and use this to find probability and expected number of outcome;</p> <p>Understand selection with or without replacement;</p> <p>Calculate the probability of independent and dependent combined events;</p> <p>Use a two-way table to calculate conditional probability;</p> <p>Use a tree diagram to calculate conditional probability;</p> <p>Use a Venn diagram to calculate conditional probability;</p> <p>Compare experimental data and theoretical probabilities;</p> <p>Compare relative frequencies from samples of different sizes.</p>	
	<p><b>Unit 11</b> <b>Multiplicative reasoning</b></p>	<p>Express a multiplicative relationship between two quantities as a ratio or a fraction, e.g. when <math>A:B</math> are in the ratio 3:5, <math>A</math> is <math>\frac{3}{5}B</math>. When <math>4a = 7b</math>, then <math>a = \frac{7b}{4}</math> or <math>a:b</math> is 7:4;</p> <p>Solve proportion problems using the unitary method;</p> <p>Work out which product offers best value and consider rates of pay;</p> <p>Work out the multiplier for repeated proportional change as a single decimal number;</p> <p>Represent repeated proportional change using a multiplier raised to a power, use this to solve problems involving compound interest and depreciation;</p>	

		<p>Understand and use compound measures and:</p> <ul style="list-style-type: none"> <li>• convert between metric speed measures;</li> <li>• convert between density measures;</li> <li>• convert between pressure measures;</li> </ul> <p>Use kinematics formulae from the formulae sheet to calculate speed, acceleration, etc (with variables defined in the question);</p> <p>Calculate an unknown quantity from quantities that vary in direct or inverse proportion;</p> <p>Recognise when values are in direct proportion by reference to the graph form, and use a graph to find the value of <math>k</math> in <math>y = kx</math>;</p> <p>Set up and use equations to solve word and other problems involving direct proportion (this is covered in more detail in unit 19);</p> <p>Relate algebraic solutions to graphical representation of the equations;</p> <p>Recognise when values are in inverse proportion by reference to the graph form;</p> <p>Set up and use equations to solve word and other problems involving inverse proportion, and relate algebraic solutions to graphical representation of the equations.</p>	
	<p>Unit 12 Similarity and congruence in 2D and 3D</p>	<p>Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments, and to verify standard ruler and pair of compasses constructions;</p> <p>Solve angle problems by first proving congruence;</p> <p>Understand similarity of triangles and of other plane shapes, and use this to make geometric inferences;</p>	

		<p>Prove that two shapes are similar by showing that all corresponding angles are equal in size and/or lengths of sides are in the same ratio/one is an enlargement of the other, giving the scale factor;</p> <p>Use formal geometric proof for the similarity of two given triangles;</p> <p>Understand the effect of enlargement on angles, perimeter, area and volume of shapes and solids;</p> <p>Identify the scale factor of an enlargement of a similar shape as the ratio of the lengths of two corresponding sides, using integer or fraction scale factors;</p> <p>Write the lengths, areas and volumes of two shapes as ratios in their simplest form;</p> <p>Find missing lengths, areas and volumes in similar 3D solids;</p> <p>Know the relationships between linear, area and volume scale factors of mathematically similar shapes and solids;</p> <p>Use the relationship between enlargement and areas and volumes of simple shapes and solids;</p> <p>Solve problems involving frustums of cones where you have to find missing lengths first using similar triangles.</p>	
Term 3	Graphs of trigonometric functions	<p>Recognise, sketch and interpret graphs of the trigonometric functions <math>y = \sin x</math>, <math>y = \cos x</math> and <math>y = \tan x</math> for angles of any size.</p> <p>Know the exact values of <math>\sin \vartheta</math> and <math>\cos \vartheta</math> for <math>\vartheta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math> and exact value of <math>\tan \vartheta</math> for <math>\vartheta = 0^\circ, 30^\circ, 45^\circ</math> and <math>60^\circ</math> and find them from graphs.</p> <p>Apply to the graph of <math>y = f(x)</math> the transformations <math>y = -f(x)</math>, <math>y = f(-x)</math> for sine, cosine and tan functions <math>f(x)</math>.</p>	

		<p>Apply to the graph of <math>y = f(x)</math> the transformations <math>y = f(x) + a</math>, <math>y = f(x + a)</math></p> <p>for sine, cosine and tan functions <math>f(x)</math>.</p>	
	<p>Unit 13b Trigonometry and further trigonometry</p>	<p>Know and apply <math>\text{Area} = \frac{1}{2} ab \sin C</math> to calculate the area, sides or angles of any triangle.</p> <p>Know the sine and cosine rules, and use to solve 2D problems (including involving bearings).</p> <p>Use the sine and cosine rules to solve 3D problems.</p> <p>Understand the language of planes, and recognise the diagonals of a cuboid.</p> <p>Solve geometrical problems on coordinate axes.</p> <p>Understand, recall and use trigonometric relationships and Pythagoras' Theorem in right-angled triangles, and use these to solve problems in 3D configurations.</p> <p>Calculate the length of a diagonal of a cuboid.</p> <p>Find the angle between a line and a plane.</p>	<p>Week beg. 8/5/17, 15/5/17 and 22/5/17 Mock 2</p>
	<p>Unit 14a Collecting data</p>	<p>Specify the problem and plan:</p> <ul style="list-style-type: none"> <li>• decide what data to collect and what analysis is needed;</li> <li>• understand primary and secondary data sources;</li> <li>• consider fairness;</li> </ul> <p>Understand what is meant by a sample and a population;</p> <p>Understand how different sample sizes may affect the reliability of conclusions drawn;</p> <p>Identify possible sources of bias and plan to minimise it;</p> <p>Write questions to eliminate bias, and understand how the timing and</p>	

		location of a survey can ensure a sample is representative.	
	Unit 14b Cumulative frequency, box plots and histograms	<p>Use statistics found in all graphs/charts in this unit to describe a population;</p> <p>Know the appropriate uses of cumulative frequency diagrams;</p> <p>Construct and interpret cumulative frequency tables;</p> <p>Construct and interpret cumulative frequency graphs/diagrams and from the graph:</p> <ul style="list-style-type: none"> <li>• estimate frequency greater/less than a given value;</li> <li>• find the median and quartile values and interquartile range;</li> </ul> <p>Compare the mean and range of two distributions, or median and interquartile range, as appropriate;</p> <p>Interpret box plots to find median, quartiles, range and interquartile range and draw conclusions;</p> <p>Produce box plots from raw data and when given quartiles, median and identify any outliers;</p> <p>Know the appropriate uses of histograms;</p> <p>Construct and interpret histograms from class intervals with unequal width;</p> <p>Use and understand frequency density;</p> <p>From histograms:</p> <ul style="list-style-type: none"> <li>• complete a grouped frequency table;</li> <li>• understand and define frequency density;</li> </ul> <p>Estimate the mean from a histogram;</p> <p>Estimate the median from a histogram with unequal class widths or any other information from a</p>	

		<p>histogram, such as the number of people in a given interval.</p>	
	<p>Unit 15 Quadratics, expanding more than two brackets, sketching graphs, graphs of circles, cubes and quadratics</p>	<p>Sketch a graph of a quadratic function, by factorising or by using the formula, identifying roots, <math>y</math>-intercept and turning point by completing the square; Be able to identify from a graph if a quadratic equation has any real roots; Find approximate solutions to quadratic equations using a graph; Expand the product of more than two linear expressions; Sketch a graph of a quadratic function and a linear function, identifying intersection points; Sketch graphs of simple cubic functions, given as three linear expressions; Solve simultaneous equations graphically:</p> <ul style="list-style-type: none"> <li>• find approximate solutions to simultaneous equations formed from one linear function and one quadratic function using a graphical approach;</li> <li>• find graphically the intersection points of a given straight line with a circle;</li> <li>• solve simultaneous equations representing a real-life situation graphically, and interpret the solution in the context of the problem;</li> </ul> <p>Solve quadratic inequalities in one variable, by factorising and sketching the graph to find critical values; Represent the solution set for inequalities using set notation, i.e. curly brackets and 'is an element of' notation;</p>	

		<ul style="list-style-type: none"> <li>for problems identifying the solutions to two different inequalities, show this as the intersection of the two solution sets, i.e. solution of <math>x^2 - 3x - 10 &lt; 0</math> as <math>\{x: -3 &lt; x &lt; 5\}</math>;</li> </ul> <p>Solve linear inequalities in two variables graphically;</p> <p>Show the solution set of several inequalities in two variables on a graph;</p> <p>Use iteration with simple converging sequences.</p>	
	<p>Unit 16a Circle Theorems</p>	<p>Recall the definition of a circle and identify (name) and draw parts of a circle, including sector, tangent, chord, segment;</p> <p>Prove and use the facts that:</p> <ul style="list-style-type: none"> <li>the angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference;</li> <li>the angle in a semicircle is a right angle;</li> <li>the perpendicular from the centre of a circle to a chord bisects the chord;</li> <li>angles in the same segment are equal;</li> <li>alternate segment theorem;</li> <li>opposite angles of a cyclic quadrilateral sum to <math>180^\circ</math>;</li> </ul> <p>Understand and use the fact that the tangent at any point on a circle is perpendicular to the radius at that point;</p> <p>Find and give reasons for missing angles on diagrams using:</p> <ul style="list-style-type: none"> <li>circle theorems;</li> <li>isosceles triangles (radius properties) in circles;</li> </ul>	

		<ul style="list-style-type: none"><li>• the fact that the angle between a tangent and radius is <math>90^\circ</math>;</li><li>• the fact that tangents from an external point are equal in length.</li></ul>	
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## Mathematics Department – Curriculum Outline

### Year 11 FOUNDATION

2016-17	Unit	What will I do?	How will I be assessed?
Term 1	Unit 29 Interpreting Graphs	Construct and interpret graphs in real-world contexts Interpret the gradient of a straight-line graph as a rate of change	
	Unit 30 Vector Geometry	Represent vectors as a diagram or a column vector Add and subtract vectors Multiply vectors by a scalar Recognise parallel vectors	
	Unit 31 Transformations in a plane	Carry out, identify and describe reflections Carry out, identify and describe translations using 2D vectors Carry out, identify and describe rotations	
	Unit 32 Constructions and loci	Use ruler, protractor and pair of compasses to accurately construct angles and shapes Accurately copy diagrams using a ruler and a pair of compasses Construct the perpendicular bisector of a line Construct the perpendicular at a given point on a line Construct a perpendicular from a given point to a line Bisect an angle Use constructions to solve loci problems Apply appropriate constructions and loci knowledge to a variety of problems including those set in context	Mock 1 October 2016
	Unit 33 Similarity	Know what is meant by the phrase 'mathematically similar' Determine when two objects are mathematically similar Know what is meant by a 'mathematical enlargement' Enlarge a shape given a positive rational scale factor Know what the centre of enlargement is Enlarge a shape given a scale factor and centre of enlargement	

		<p>Determine a given centre of enlargement and scale factor from a diagram</p> <p>Determine similar polygons</p>	
	<p>Unit 34 Congruence</p>	<p>Know what it means for two objects to be congruent</p> <p>Know the conditions for which congruence for a pair of triangle is then implied:</p> <ul style="list-style-type: none"> <li>○ SSS – three sides are the same in both triangles</li> <li>○ ASA – two angles and one side length are the same in both triangles</li> <li>○ SAS – two sides and the angle between them are the same in both triangle</li> </ul> <p>RHS – the hypotenuse and another side of a right-angled triangle are the same in both triangles</p> <p>Apply the conditions for congruency to a variety of situations</p>	
	<p>Unit 35 Pythagoras' Theorem</p>	<p>Derive Pythagoras' theorem and use it to find the length of the hypotenuse in any right-angled triangle</p> <p>Know and use Pythagoras' theorem to find any missing length in a right-angled triangle</p> <p>Use Pythagoras' theorem to show whether a triangle is right-angled or not</p> <p>Apply Pythagoras' theorem to 2D problems</p> <p>Link Pythagoras' theorem to real-life skills for industry</p>	
	<p>Unit 36 Trigonometry</p>	<p>Use the trigonometric ratios given by the sine, cosine and tangent functions to find unknown lengths and angles in 2D right-angled triangles</p> <p>Know the exact ratios given by sine and cosine of 0, 30, 45, 60 and 90 degrees and the exact ratios given by the tangent function for 0, 30, 45 and 60 degrees</p> <p>Know the difference between an angle of depression and an angle of elevation</p> <p>Identify when the trigonometric ratios must be used instead of Pythagoras' theorem to solve 2D problems relating to right-angled triangles, including contextual problems</p>	

	<p><b>Unit 37</b>  <b>Graphs of other functions and equations</b></p>	<p>Work fluently with equations of straight-line graphs  Identify and plot graphs of quadratic functions i.e. parabolas  Find roots of quadratic equations from the x-intercept of the parabola of the quadratic equation that defines the graph  Know the features of graphs of quadratic equations  Sketch parabolas  Work fluently with cubic polynomials and their graphs  Sketch cubic graphs  Work fluently to calculate reciprocals of numbers and plot functions involving reciprocals  Identify hyperbolas and match them to their equations  Plot and sketch graphs from given functions  Recognise linear, quadratic and reciprocal graphs</p>	
	<p><b>Unit 38</b>  <b>Growth and decay</b></p>	<p>Calculate with simple growth, such as simple interest rates  Calculate with compound growth, such as compound interest rates  Solve word problems using simple and/or compound growth  Calculate with simple decay  Calculate with compound decay, such as depreciation  Solve word problems using simple and/or compound decay</p>	<p>Mock 2  January/February 2017</p>
Term 2	Exam preparation and revision		
Term 3	Exam preparation and revision		<p>Final GCSE examinations  May/June 2017</p>

## Mathematics Department – Curriculum Outline

### Year 11 HIGHER

2016-17	Unit	What will I do?	How will I be assessed?
Term 1	Unit 33 Transformations	Carry out, identify and describe reflections Carry out, identify and describe translations using 2D vectors Carry out, identify and describe rotations Find the centre of rotation by construction Carry out, identify and describe combined transformations	
	Unit 34 Constructions and loci	Use ruler, protractor and pair of compasses to accurately construct angles and shapes Accurately copy diagrams using rulers and a pair of compasses only Construct the perpendicular bisector of a line Construct the perpendicular at a given point on a line Construct a perpendicular from a given point to a line Bisect an angle Use constructions to solve loci problems Apply appropriate constructions and loci knowledge to a variety of problems including those set in context	
	Unit 35 Similarity	Know what is meant by the phrase 'mathematically similar' Determine when two objects are mathematically similar Know what is meant by a 'mathematical enlargement' Enlarge a shape given a positive rational scale factor Know what the centre of enlargement is Enlarge a shape given a scale factor and centre of enlargement	

		<p>Determine a given centre of enlargement and scale factor from a diagram</p> <p>Enlarge a shape given a negative rational scale factor</p> <p>Determine similar polygons</p> <p>Determine similar 3D shapes</p> <p>Know the relationship between lengths, areas and volumes of similar shapes</p>	
	<p>Unit 36 Congruence</p>	<p>Know what it means for two objects to be congruent</p> <p>Know the conditions for which congruence for a pair of triangle is then implied:</p> <ul style="list-style-type: none"> <li>○ SSS – three sides are the same in both triangles</li> <li>○ ASA – two angles and one side length are the same in both triangles</li> <li>○ SAS – two sides and the angle between them are the same in both triangle</li> </ul> <p>RHS – the hypotenuse and another side of a right-angled triangle are the same in both triangles</p> <p>Apply the conditions for congruency to a variety of situations</p>	<p>Mock 1 October 2016</p>
	<p>Unit 37 Pythagoras' Theorem</p>	<p>Know and use Pythagoras' theorem to find any missing length in a right-angled triangle</p> <p>Use Pythagoras' theorem to show whether a triangle is right-angled or not</p> <p>Apply Pythagoras' theorem to 2D problems</p> <p>Apply Pythagoras' theorem to 3D problems</p> <p>Link Pythagoras' theorem to real-life skills for industry</p>	
	<p>Unit 38 Trigonometry</p>	<p>Use the trigonometric ratios given by the sine, cosine and tangent functions to find unknown lengths and angles in 2D right-angled triangles</p> <p>Know the exact ratios given by sine and cosine of 0, 30, 45, 60 and 90 degrees and the exact ratios given by</p>	

		<p>the tangent function for 0, 30, 45 and 60 degrees</p> <p>Use the sine, cosine and area rules to solve problems relating to unknown sides, angles and areas in non-right-angled triangles</p> <p>Know the difference between an angle of depression and an angle of elevation</p> <p>Identify when the trigonometric ratios must be used instead of Pythagoras' theorem to solve 2D problems relating to right-angled triangles, including contextual problems</p>	
	<p>Unit 39 Graphs of other functions and equations</p>	<p>Work fluently with equations of straight-line graphs</p> <p>Identify and plot graphs of quadratic functions i.e. parabolas Find roots of quadratic equations from the <math>x</math>-intercept of the parabola of the quadratic equation that defines the graph</p> <p>Know the features of graphs of quadratic equations</p> <p>Sketch parabolas</p> <p>Work fluently with cubic polynomials and their graphs</p> <p>Sketch cubic graphs</p> <p>Work fluently to calculate reciprocals of numbers and plot functions involving reciprocals Identify hyperbolas and match them to their equations</p> <p>Plot and sketch graphs from given functions</p> <p>Recognise linear, quadratic and reciprocal graphs</p> <p>Identify and plot exponential graphs</p> <p>Identify and plot trigonometric graphs</p> <p>Represent a circle given its centre on the origin and radius <math>r</math> by a function</p> <p>Identify equations of circles from their graphs</p>	
Term 2	<p>Unit 40 Growth and decay</p>	<p>Calculate with simple growth, such as simple interest rates</p> <p>Calculate with compound growth, such as compound interest rates</p>	

		<p>Solve word problems using simple and/or compound growth</p> <p>Use the formula <math>y = a(1 + r)^n</math> for compound growth</p> <p>Calculate with simple decay</p> <p>Calculate with compound decay, such as depreciation</p> <p>Solve word problems using simple and/or compound decay</p> <p>Use the formula <math>y = a(1 - r)^n</math> for compound decay</p>	
	<p>Unit 41 Transformation of curves</p>	<p>Know the features of a quadratic function (parabola): axis of symmetry, roots and vertex, and identify these features from the sketch of a quadratic</p> <p>Sketch vertical translations of quadratic functions</p> <p>Sketch horizontal translations of quadratic functions</p> <p>Sketch quadratic functions that have been translated in both the horizontal and vertical directions</p> <p>Know the effect translations have on the axis of symmetry and vertex of a quadratic</p> <p>Use graph sketching to identify the effect of multiplying <math>f(x)</math> by <math>-1</math></p> <p>Use algebraic manipulation skills to identify the features above and sketch any quadratic of the form <math>y = ax^2 + bx + c</math></p> <p>Identify reflections and translations in the graphical representations of trigonometric functions</p> <p>Sketch a transformed trigonometric curve for a given domain</p> <p>Sketch translations and reflections of cubic, reciprocal and exponential functions</p> <p>Apply transformations learnt in this chapter to a variety of problems including identifying the effect of a transformation on a feature of a graph and finding the equation of a function once a transformation has been applied</p>	<p>Mock 2 January/February 2017</p>
	Exam preparation and revision		

Term 3	Exam preparation and revision	Final GCSE examinations May/June 2017
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