

Key Stage 3 Long Term PlanningYear 9Faculty Area: Mathematics

	isoning with Algebra		
Knowledge	<u>Straight Line Graphs (2 weeks)</u>	Forming and Solving Equations (2 weeks)	Testing Conjectures (2 weeks)
Rationale	This block builds on Year 8 content where students plotted simple straight-line graphs. They now study $y = mx + c$ as the general form of the equation of a straight line, interpreting m and c in abstract and real-life contexts, and reducing to this form in simple cases. This will be explored further in the next block when students rearrange formulae. If time allows, students will also consider inverse relationships and perpendicular lines.	Students revisit and extend their knowledge of forming and solving linear equations and inequalities, including those related to different parts of the mathematics curriculum. They also explore rearranging formulae, seeing how this links to solving equations and reinforcing their understanding of the difference between equations, formulae, identities and expressions. This is a good opportunity to practise non- calculator skills if appropriate.	Reasoning is encouraged throughout the scheme of learning, and this block allows time for direct teaching of this. The opportunity is taken to revisit primes, factors and multiples, which provides a wealth of opportunity to make and test simple conjectures. As well as testing given conjectures, students should be encouraged to create and test their own. An example given in the block is through looking at relationships in a 100 square; another great source of pattern is Pascal's triangle. Students also develop their algebraic skills through developing chains of reasoning and learning how to expand a pair of binomials.
National Curriculum Content Covered (Bold type Indicates NC Content Revisited from Y7/8)	 Develop algebraic and graphical fluency, including understanding linear and simple quadratic functions Recognise, sketch and produce graphs of linear and quadratic functions of one variable with appropriate scaling, using equations in <i>x</i> and <i>y</i> and the Cartesian plane Interpret mathematical relationships both algebraically and graphically Reduce a given linear equation in two variables to the standard form <i>y</i> = <i>mx</i> + c; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically Use linear and quadratic graphs to estimate values of <i>y</i> for given values of <i>x</i> and vice versa and to find approximate solutions of simultaneous linear equations Solve problems involving direct and inverse proportion, including graphical and algebraic representations Extend their understanding of the number system; make connections between number relationships and their algebraic, graphical and diagrammatic representations. 	 Move freely between different numerical, algebraic, graphical and diagrammatic representations [for example equations and graphs] Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement) understand and use standard mathematical formulae; rearrange formulae to change the subject Model situations or procedures by translating them into algebraic expressions or formulae, and by using graphs Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors Extend their understanding of the number system; make connections between number relationships and their algebraic and graphical representations. Move freely between different numerical, algebraic, graphical and diagrammatic representations. Use and interpret algebraic notation, including ab in place of a x b 3y in place of a ÷ b, brackets, coefficients written as fractions rather than decimals 	 Make and test conjectures about patterns and relationships; look for proofs or counterexamples Begin to reason deductively in geometry, number and algebra Use the concepts and vocabulary of prime numbers, factor: (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation Simplify and manipulate algebraic expressions to maintain equivalence by expanding products of two or more binomials Extend their understanding of the number system; make connections between number relationships
Connections to Other Previous National Curriculum Content in Y7/8 (Statutory)	 Move freely between different numerical, algebraic, graphical and diagrammatic representations Generate terms of a sequence from a term-to-term rule Recognise arithmetic sequences Produce graphs of linear functions of one variable Substitute numerical values into formulae and expressions, including scientific formulae Understand and use standard mathematical formulae Make connections between number relationships, and their algebraic and graphical representations 	 Recognise and use relationships between operations including inverse operations Substitute numerical values into formulae and expressions, including scientific formulae Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors Use the four operations, including formal written methods, applied to integers, both positive and negative Recognise and use relationships between operations including inverse operations 	 Simplify and manipulate algebraic expressions to maintain equivalence by: collecting like terms multiplying a single term over a bracket taking out common factors
Assessment	White Rose Maths skills checks at the end of each unit (3 during this period)		
Homework	Sparx Maths online homework		
	Mathematical key terms/vocabulary for each unit. Correct terminology used when answering questions. Read and understand written questions.		
Literacy	Mathematical key terms/vocabulary for each u	nit. Correct terminology used when answering questions. Re	ad and understand written questions.



Autumn 2 – Con	structing in 2 and 3 Dimensions		
Knowledge	Three Dimensional Shapes (3 weeks)	Constructions and Congruency (3 weeks)	
Rationale	This is the first time students have studied 3-D shapes formally at KS3, so they will need reminding about the associated vocabulary. Students could be supported using practical equipment such as cubes, squared and isometric paper. As well as surface area and volume, students will also explore plans and elevations. There is a wide variety of software available to support this and again, practical work is very useful to develop visualisation and understanding. If time allows, there is a step on investigating volumes of other 3-D shapes - as this is KS4 content this could be omitted if time is short.	This block builds on the constructions studied during Years 7 and 8 to formally look at the idea of a locus and the standard constructions using a straight edge and a pair of compasses. This is a very practical unit and it is useful to explore the loci using objects and rulers as well as the paper-based approach. Indeed 'human geometry' is a very engaging way of promoting understanding through e.g. asking students to all line up 2 m from a point or 2 m from a wall to explore the different loci formed. Congruency is also explored, again taking a practical approach to compare congruent figures of all kinds before looking at the formal aspect of identifying congruent triangles.	
National Curriculum Content Covered (Bold type Indicates NC Content Revisited from Y7/8)	 Use language and properties precisely to analyse numbers, algebraic expressions, 2-D and 3-D shapes Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3-D Derive and apply formulae to calculate and solve problems involving: perimeter and area of triangles, parallelograms, trapezia, volume of cuboids (including cubes) and other prisms {including cylinders) 	 Draw and measure line segments and angles in geometric figures, including interpreting scale drawings Derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line 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 Use the standard conventions for labelling the sides and angles of triangle ABC, and know and use the criteria for congruence of triangles 	
Connections to Other Previous National Curriculum Content in Y7/8 (Statutory)	 Begin to reason deductively in geometry including using geometrical constructions Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies Substitute numerical values into formulae and expressions, including scientific formulae Understand and use standard mathematical formulae Use language and properties precisely to analyse 2-D shapes Select and use appropriate calculation strategies to solve increasingly complex problems Use formal written methods, applied to positive integers and decimals Use a calculator and other technologies to calculate results accurately and then interpret them appropriately 	Identify and construct triangles	
Assessment	White Rose Maths skills checks at the end of each unit (2 during this period)		
Homework		nline homework	
Literacy	Mathematical key terms/vocabulary for each unit. Correct terminology	used when answering questions. Read and understand written questions.	
CIAG			



Spring 1 – Reasoning with Number			
Knowledge	Numbers (2 weeks)	Using Percentages (2 weeks)	Maths and Money (2 weeks)
Rationale	Students will develop their knowledge of the number system to include rational/real number and, if time allows, also look at simple surds. The block provides plenty of opportunity for students to revisit and practice their number skills both with and without a calculator as necessary. Standard form, calculating with fractions/directed number and HCF/LCM are also revisited.	Building on their revision of fractions in the last block, students relate these to fractions and decimals, extending their learning in Year 8. Students will look at 'reverse' percentage problems. If time allows, repeated percentage change may be covered, but this is repeated in Y10. Both calculator and non-calculator methods are encouraged, with the use of decimal multipliers again key.	Students practise their number skills in various financial contexts in this block. The language of financial mathematics already introduced in Years 7 and 8 is further developed. Simple ideas of tax and wages are introduced, and the percentages studied in the last block are applied in various contexts including simple and compound interest.
National Curriculum Content Covered (Bold type Indicates NC Content Revisited from Y7/8)	improper fractions, and mixed numbers, all both positive	 Define percentage as 'number of parts per hundred', interpret percentage changes as a fraction or a decimal, interpret these multiplicatively, express one quantity as a percentage of another, compare two quantities using percentages, and work with percentages greater than 100% Interpret fractions and percentages as operators Solve problems involving percentage change including: percentage increase/decrease; original value problems and simple interest in financial mathematics 	 Solve problems involving percentage change, including: percentage increase, decrease and original value problems and simple interest in financial mathematics Select and use appropriate calculation strategies to solve increasingly complex problems Interpret when the structure of a numerical problem requires additive, multiplicative or proportional reasoning Develop their use of formal mathematical knowledge to interpret and solve problems, including in financial mathematics
Connections to Other Previous National Curriculum Content in Y7/8 (Statutory)	 Use formal written methods, applied to positive integers and decimals Select and use appropriate calculation strategies to solve increasingly complex problems Recognise and use relationships between operations including inverse operations Use a calculator and other technologies to calculate results accurately and then interpret them appropriately Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals 	 Move freely between different numerical representations [for example, equivalent fractions, fractions/decimals/ percentages] Extend their understanding of the number system; make connections between number relationships Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions Use standard units of mass, length, time, money and other measures, including with decimal quantities 	 Understand and use place value for decimals, measures and integers of any size Work with percentages greater than 100% Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions Consolidate their numerical and mathematical capability from key stage 2 and extend their understanding of the number system and place value to include decimals, fractions, powers and roots Use standard units of mass, length, time, money and other measures, including with decimal quantities
Assessment	White Rose Maths skills checks at the end of each unit (3 during this period)		
Homework		Sparx Maths online homework	
Literacy		terminology used when answering questions. Read and und	erstand written questions.
CIAG	WHY MATHS When will I ever need this? - <u>https://youtu.be/RiPIOcmpPil</u>		



<mark>Spring 2 –</mark>	Reasoning with Geometry		
Knowledge	Deduction (2 weeks)	Rotation and Translation (2 weeks)	Pythagoras Theorem (2 weeks)
Rationale	In this block students revise and extend their knowledge of angles rules and properties of shapes, applying them to increasingly complex problems. The block also builds on the ideas of the earlier Testing Conjectures block looking at deduction in a geometric rather than algebraic or numerical contexts. Students also revise the constructions covered in Year 8 and look more deeply at how and why these work.	Building on their study of line symmetry and refection in Year 8, students now look at rotational symmetry and rotation. They then move on to study translations, which are described in vector form. Students compare the different effects of the transformations studied so far, noticing that the objects and images are congruent.	Students revise squares and square roots before moving on to investigate the relationship between the sides of a right- angled triangle. The converse of the theorem is emphasised so that students are aware that if the sides of a triangle satisfy the rule $a^2 + b^2 = c^2$ then the triangle must be right-angled. Students explore using the theorem in a variety of contexts, including on coordinate axes and, if time allows, using 3-D shapes. There is an opportunity to revisit this learning in the next block when students explore similarity in right-angled triangles as an introduction to trigonometry.
National Curriculum Content Covered (Bold type Indicates NC Content Revisited from Y7/8)	 Derive and use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle); recognise and use the perpendicular distance from a point to a line as the shortest distance to the line 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 Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles Understand and use the relationship between parallel lines and alternate and corresponding angles 	 Identify properties of, and describe the results of, translations, rotations and reflections applied to given figures 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 Develop their mathematical knowledge, in part through solving problems and evaluating the outcomes, including multi-step problems 	 Use Pythagoras' Theorem to solve problems involving right- angled triangles Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs Interpret mathematical relationships both algebraically and geometrically Begin to reason deductively in geometry, number and algebra, including using geometrical constructions Begin to model situations mathematical representations
Connections to Other Previous National Curriculum Content in Y7/8 (Statutory)	 Use the standard conventions for labelling sides and angles Select and use appropriate calculation strategies to solve increasingly complex problems Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures [for example, equal lengths and angles] using appropriate language and technologies 	 Use the standard conventions for labelling sides and angles Use language and properties precisely to analyse 2-D shapes 	 Use and interpret algebraic notation Substitute numerical values into formulae and expressions, including scientific formulae Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions Select and use appropriate calculation strategies to solve increasingly complex problems Use square and square roots Use a calculator and other technologies to calculate results accurately and then interpret them appropriately
Assessment	White Rose Maths skills checks at the end of each unit (3 during this period)		
Homework		Sparx Maths online homework	
Literacy	Mathematical key terms/vocabulary for eac		Read and understand written questions.
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<mark>Summer 1 –</mark>	Reasoning with Proportion		
Knowledge	Enlargement and Similarity (2 weeks)	Solving Ratio and Proportion Problems (2 weeks)	Rates (2 weeks)
Rationale	Students develop their knowledge of transformations to include enlargement, learning the mathematical meaning of the word similar. You can link back to other transformations as necessary. If appropriate, students can move on to negative scales factors. All students should experience finding unknown sides in similar shapes and this can be extended to formal similar triangles problems and trigonometry in the 30/60/90 triangle. General trigonometry is introduced at the start of Year 10.	Building on students' experience in previous years, here they solve all types of ratio problems and make the links with direct proportion and graphs. Students formally study inverse proportion for the first time and, if time allows, they also look at graphs of inverse relationships. If appropriate, students could also look at more complex problems involving algebra. Students also revisit 'best buys' comparing unit pricing from earlier in the year with alternative methods such as using scaling.	Students develop their knowledge of inverse relationships to explore speed, distance and time in detail. They also look at graphs and the link between the speed/distance/time formulae and density/mass/volume. Students go on to explore other compound units including exploring flow problems such as how long it will take to fill/empty tanks of different shapes at different rates. If time allows, students can also look at converting compound units such as m/s to km/h. You could also include metric and imperial conversions here if desired.
National	 Construct similar shapes by enlargement, with and without 	• Divide a given quantity into two parts in a given part:	• Use compound units such as speed, unit pricing and density to
Curriculum Content Covered (Bold type Indicates NC Content Revisited from Y7/8)	 coordinate grids Use scale factors, scale diagrams and maps Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction Use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles 	 part or part: whole ratio; express the division of a quantity into two parts as a ratio Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction Solve problems involving direct and inverse proportion, including graphical and algebraic representations Use compound units such as speed, unit pricing and density to solve problems Use ratio notation, including reduction to simplest form Relate language of ratios and the associated calculations to the arithmetic of fractions and to linear functions 	solve problems • Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction • Change freely between related standard units [for example time, length, area, volume/capacity, mass]
Connections to	• Use formal written methods, applied to positive integers	• Use formal written methods, applied to positive integers	Select and use appropriate calculation strategies to solve
Other Previous National Curriculum Content in Y7/8 (Statutory)	 and decimals Recognise and use relationships between operations including inverse operations Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions Round numbers to an appropriate degree of accuracy Use the standard conventions for labelling sides and angles Select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems; interpret their solution in the context of the given problem 	 and decimals Recognise and use relationships between operations including inverse operations Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions Round numbers to an appropriate degree of accuracy Select and use appropriate calculation strategies to solve increasingly complex problems Use a calculator and other technologies to calculate results accurately and then interpret them appropriately Substitute numerical values into formulae and expressions, including scientific formulae Change freely between related standard units (time, length, area, volume/capacity, mass) Select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems; interpret their solution in the context of the given problem 	 increasingly complex problems Use formal written methods, applied to positive integers and decimals Use a calculator and other technologies to calculate results accurately and then interpret them appropriately Substitute numerical values into formulae and expressions, including scientific formulae Recognise and use relationships between operations including inverse operations Use standard units of mass, length, time, money and other measures, including with decimal quantities Select appropriate concepts, methods and techniques to apply to unfamiliar and non-routine problems; interpret their solution in the context of the given problem
Assessment	their solution in the context of the given problem White Rose Maths skills checks at the end of each unit (3 during this period)		
Homework	Win	Sparx Maths online homework	
Literacy	Mathematical key terms/vocabulary for eac	•	ns. Read and understand written questions.
CIAG	WHY MATHS Where will maths take you? - <u>https://youtu.be/c0JjgoAO_wE</u>		



	epresentations and Revision		
Knowledge	Probability (2 weeks)	Algebraic Representation (1 week)	Revision (3 Weeks)
Rationale	In this block students build on their learning in Year 7 and 8 to calculate the probabilities of single and combined events. A key focus is the introduction of the idea of independent events and the use of the multiplication rule for these. Students also look at a variety of diagrams that support probability such as sample space diagrams, Venn diagrams and two-way tables. Tree diagrams, considering both with and without replacement, can be covered if time allows.	Students extend their knowledge of graphs to look at interpretation and creation of different types of graphs. The first non-linear graph explored is the quadratic graph, where students are encouraged to look at the symmetry of the curve and read off x/y values. They also explore reciprocal and exponential graphs. Although students need to be able to plot curves and practising this is important, they can also use graphing software to explore the general forms of the curves as this will save a lot of time and be more accurate. Students' knowledge of straight-line graphs is extended by looking at graphical inequalities, and these are also represented as number lines. If time allows, solution of simultaneous equations by graphical methods can be included.	The last three weeks of the summer term are unassigned in order to allow time to review or to deepen knowledge of any areas of the KS3 curriculum that students would benefit from as they prepare to transition to KS4. You may wish to include: • Handling Data - there is no explicit data coverage in Year 9, so you could revise the learning of Year 7 and 8, possibly through projects, and include the Y8 Higher steps around mean averages from a frequency table • Sequences - there is no new sequence content in Year 9. If your class did not cover finding the rule for the nth term of a linear sequence, you could do this here. • Error intervals • Trigonometry - you could develop the brief introduction to trigonometry in Summer Block 1 to study this in more detail, but please note this is covered in depth in the first block of our Year 10 scheme of learning.
National Curriculum Content Covered (Bold type Indicates NC Content Revisited from Y7/8)	 Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, equally and unequally likely outcomes, using appropriate language and the 0-1 probability scale Understand that the probabilities of all possible outcomes sum to 1 Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams Generate theoretical sample spaces for single and combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities Explore what can and cannot be inferred in statistical and probabilistic settings and begin to express their arguments formally. 	 Recognise, sketch and produce graphs of quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane Use quadratic graphs to estimate values of y for given values of x and vice versa Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs Use linear graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors Move freely between different numerical, algebraic, graphical and diagrammatic representations. Use and interpret algebraic notation, including ab in place of a x b 3y in place of a + b, brackets, coefficients written as fractions rather than decimals 	• National Curriculum content covered depends on your choices.
Connections to Other Previous National Curriculum Content in Y7/8 (Statutory)	 Appreciate the infinite nature of the sets of integers, real and rational numbers Use common factors to simplify fractions; use common multiples to express fractions in the same denomination Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts Solve problems involving addition, subtraction, multiplication and division Identify common factors, common multiples and prime numbers Use the four operations, including formal written methods, applied to integers, decimals, proper and improper fractions, and mixed numbers, all both positive and negative 	 Use the symbols =, ≠, <, >, ≤, ≥ Move freely between different numerical, algebraic, graphical and diagrammatic representations Develop algebraic and graphical fluency, including understanding linear (and simple quadratic) functions Make connections between number relationships, and their algebraic and graphical representations Substitute numerical values into formulae and expressions Recognise, sketch and produce graphs of linear functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane 	- National Curriculum content covered depends on your choices.
Assessment	5	l te Rose Maths skills checks at the end of each unit (2 during this pe	riod)
Assessment	Sparx Maths online homework		
Homework			
Homework Literacy	Mathematical key terms/vocabulary for each		Read and understand written questions.