

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Reasoning with Algebra						Constructing in 2 and 3 Dimensions					
	Straight line graphs		Forming and solving equations		Testing conjectures		Three-dimensional shapes			Constructions and congruency		
Spring	Reasoning with Number						Reasoning with Geometry					
	Numbers		Using percentages		Maths and money		Deduction		Rotation and translation		Pythagoras' Theorem	
Summer	Reasoning with Proportion						Representations and Revision					
	Enlargement and similarity		Solving ratio & proportion problems		Rates		Probability		Algebraic representation		Revision	

Autumn 1: Reasoning with Algebra

Weeks 1 and 2: Straight line graphs

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. Higher strand students will also consider inverse relationships and perpendicular lines.

National Curriculum content covered includes:

- 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 x and y and the Cartesian plane
- interpret mathematical relationships both algebraically and graphically
- reduce a given linear equation in two variables to the standard form $y = mx + c$; calculate and interpret gradients and intercepts of graphs of such linear equations numerically, graphically and algebraically
- use linear and quadratic graphs to estimate values of y for given values of x and vice versa and to find approximate solutions of simultaneous linear equations
- solve problems involving direct and inverse proportion, including graphical and algebraic representations

Weeks 3 and 4: Equations and inequalities

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.

National Curriculum content covered includes:

- 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

Weeks 5 and 6: Testing conjectures

Reasoning is encouraged throughout the White Rose Maths 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 patterns is Pascal's triangle. Students also develop their algebraic skills through developing chains of reasoning and learning how to expand a pair of binomials, which Higher strand students met in Y8

National Curriculum content covered includes:

- 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, factors (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

Autumn 2: Constructions in 2 and 3 Dimensions

Weeks 1 to 3: Three-dimensional shapes

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 by the use of 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. For students following the Higher strand, 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.

National Curriculum content covered includes:

- 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)

Weeks 4 to 6: Constructions and Congruency

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 includes:

- 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

Spring 1: Reasoning with Number

Weeks 1 and 2: Numbers

Students will develop their knowledge of the number system to include rational and real numbers, with the higher strand also looking at simple surds. The block provides plenty of opportunity for students to revisit and practise their number skills both with and without a calculator as necessary. Standard form and HCF/LCM are also revisited.

National Curriculum content covered includes:

- 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 concepts and vocabulary of prime numbers, factors (or divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property
- interpret and compare numbers in standard form $A \times 10^n$, $1 \leq n < 10$ where n is a positive or negative integer or zero
- appreciate the infinite nature of the sets of integers, real and rational numbers.

Weeks 3 and 4: Using Percentages

Building on their revision of fractions in the last block, students relate these to fractions and decimals, extending their learning in Year 8. All students will look at 'reverse' percentage problems with higher attainers stretched by looking at repeated percentage change. Both calculator and non-calculator methods are encouraged, with the use of decimal multipliers again key.

National Curriculum content covered includes:

- 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 and original value problems and simple interest in financial mathematics

Weeks 5 and 6: Maths and Money

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 includes:

- 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

Spring 2: Reasoning with Geometry

Weeks 1 and 2: Deduction

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 and numerical contexts. Students also revise the constructions covered in Year 8 and look more deeply at how and why these work.

National Curriculum content covered includes:

- 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

Weeks 3 and 4: Rotation and Translation

Building on their study of line symmetry and reflection in Year 8, students now look at rotational symmetry and rotation. They then move on to study translations, which are described in vector form. They compare the different effects of the transformations studied so far, noticing that the objects and images are congruent.

National Curriculum content covered includes:

- 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

Weeks 5 and 6: Pythagoras' Theorem

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 context, including on coordinate axes, and a higher step is included using 3-D shapes. There is an opportunity to revisit the learning in the next block when students explore similarity in right-angled triangles as an introduction to trigonometry.

National Curriculum content covered includes:

- 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 mathematically and express the results using a range of formal mathematical representations

Summer 1 : Reasoning with Proportion

Weeks 1 and 2: Enlargement and Similarity

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 scale 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.

National Curriculum content covered includes:

- construct similar shapes by enlargement, with and without 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

Weeks 3 and 4: Ratio and Proportion

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 following the Higher strand 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.

National Curriculum content covered includes:

- divide a given quantity into two parts in a given part : part or part : whole ratio; express the division of a quantity into two parts as a ratio
- understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction
- 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

Weeks 5 and 6: Rates

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. Students following the Higher strand will 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 Curriculum content covered includes:

- use compound units such as speed, unit pricing and density to 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]

Summer 2 : Representations and Revision

Weeks 1 and 2: Probability

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, are included as Higher steps.

National Curriculum content covered includes:

- 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

Week 3: Algebraic representation

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 inequalities graphically, and these are also represented as number lines. In addition, solution of simultaneous equations by graphical methods is also included as a Higher step.

National Curriculum content covered includes:

- 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

Weeks 4 to 6: Revision

The last three weeks of the summer term are unassigned in order to allow you time to review any areas of the KS3 curriculum that you feel your students would benefit from as they prepare to transition to KS4, or to deepen their knowledge of an area if appropriate.

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 the Higher step for finding the rule for the n th term of a linear sequence, you could do this here.
- Error intervals – also only covered as a Higher step in Y8
- 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 depends on your choices.