

Key Stage 3 Mathematics Scheme of Learning Route Map



Number



Algebra



Ratio, proportion
and rates of change



Geometry and
Measures



Probability



Statistics

Key Stage 3 Mathematics Route Map

Year 7

SEPTEMBER				OCTOBER				NOVEMBER	
Wk1 Working with whole numbers	Wk2 Measuring	Wk3 Coordinates and translations	Wk4 Moving past the point	Wk5 Using Census data at school	Wk6 Assessment and review	Wk7 Holiday	Wk8 Folding and turning shapes	Wk9 Parts of a whole	Wk10 Parts of a whole
NOVEMBER		DECEMBER				JANUARY			
Wk11 Parts of a whole (continued)	Wk12 Generalising using letters	Wk13 A survey about us	Wk14 Assessment and review	Wk15 Negative numbers	Wk16 Holiday	Wk17 Holiday	Wk18 Exploring sequences	Wk19 Angle facts	Wk20 Percentages
JANUARY	FEBRUARY				MARCH				
Wk21 Assessment and review	Wk22 Percentages (Continued)	Wk23 Introducing probability	Wk24 Angles	Wk25 Holiday	Wk26 Exact or just accurate?	Wk27 Exact or just accurate?	Wk28 Area and perimeter	Wk29 Area and perimeter	Wk30 Assessment and review
APRIL				MAY				JUNE	
Wk31 Real life graphs	Wk32 Holiday	Wk33 Holiday	Wk34 Fractions	Wk35 Sequences	Wk36 About calculation	Wk37 About calculation	Wk38 Properties of shape	Wk39 Holiday	Wk40 Using letters
JUNE			JULY						
Wk41 Assessment and review	Wk42 Forming shapes	Wk43 Algebra	Wk44 Calculating	Wk45 Calculating	Wk46 Measures				

Key Stage 3 Mathematics Route Map - Year 8

SEPTEMBER				OCTOBER				NOVEMBER	
<u>Wk1</u> Manipulating Algebra	<u>Wk2</u> Probability	<u>Wk3</u> Proportion	<u>Wk4</u> Angles	<u>Wk5</u> Sequences	<u>Wk6</u> Indices	<u>Wk7</u> Assessment and review	<u>Wk8</u> Holiday	<u>Wk9</u> Two dimensions and beyond	<u>Wk10</u> Equations
NOVEMBER		DECEMBER				JANUARY			
<u>Wk11</u> A statistical survey	<u>Wk12</u> Percentages	<u>Wk13</u> Assessment and review	<u>Wk14</u> Three dimensions	<u>Wk15</u> Graphs	<u>Wk16</u> Holiday	<u>Wk17</u> Holiday	<u>Wk18</u> Brackets in algebra	<u>Wk19</u> Doing a survey	<u>Wk20</u> Measuring shapes
JANUARY	FEBRUARY				MARCH				
<u>Wk21</u> Assessment and review	<u>Wk22</u> Decimals	<u>Wk23</u> Measures with shapes	<u>Wk24</u> More on equations	<u>Wk25</u> Holiday	<u>Wk26</u> Percentages	<u>Wk27</u> Transformations	<u>Wk28</u> A statistical survey	<u>Wk29</u> Powers	<u>Wk30</u> Assessment and review
APRIL				MAY				JUNE	
<u>Wk31</u> Sequences and graphs	<u>Wk32</u> Holiday	<u>Wk33</u> Holiday	<u>Wk34</u> Sequences and graphs	<u>Wk35</u> Dimensions	<u>Wk36</u> Parts of a whole	<u>Wk37</u> Functions of equations	<u>Wk38</u> Accuracy	<u>Wk39</u> Holiday	<u>Wk40</u> Probability
JUNE			JULY						
<u>Wk41</u> Assessment and review	<u>Wk42</u> Constructions	<u>Wk43</u> Ratio and proportion	<u>Wk44</u> Harder algebra	<u>Wk45</u> Using transformations	<u>Wk46</u> Using transformations				

Working with whole numbers

			H	H/F	F
N1 Calculating	N1.1 Adding and subtracting whole numbers	Use addition and subtraction, including formal written methods, applied to positive integers upto numbers in the millions. Emphasis on relating this to real life situation and problem solving (where is the maths?).			X
	N1.2 Multiplying whole numbers	Use multiplication, including formal written methods, applied to positive integers upto numbers in the thousands. Pupils should be able to check if their answers are realistic and should be incorporated to problem solving wherever possible.	X	X	X
N2 Using our number system	N2.1 Whole numbers	Understand and use place value for integers of any size, for example what does the 3 in 4326 represent ? Read, write and order positive integers up to 1000, special attention should be taken to spelling. Pupils should also have an idea of scale. Use the symbols =, ≠, <, >, ≤, ≥			X
	N2.2 Writing and ordering decimals	Understand and use place value for decimals Order decimals. Use the number line as a model for ordering of the real numbers.		X	X
	N2.3 Multiplying and dividing by powers of 10	Understand and use place value for decimals.	X	X	
N3 Accuracy	N3.1 Rounding to the nearest 10 or 100	Round numbers and measures.			X
	N3.2 Rounding larger numbers	Round numbers and measures	X	X	
N7 Number properties	N7.1 Multiples	Use the concepts and vocabulary of multiples.			X
	N7.2 Factors, primes and powers	Use the concepts and vocabulary of prime numbers and factors (or divisors) Use integer powers and associated real root. Recognise powers of 2, 3, 4, 5 "Distinguish between exact representations of roots and their decimal equivalents"	X	X	

Additional notes	Links
<p>A careful choice of activities will identify misconceptions for some, check mastery for others and broaden and deepen understanding for all students. It is important to use this topic to secure a firm foundation of understanding and confidence in Number for later work and that may mean spending longer than the allotted time. It should identify the areas for intervention for those at risk of falling behind and making sure the prior learning is in place for all students. Students on the pathway towards Foundation GCSE should be given the opportunity to try the units on the other pathways. They will meet them again on the Foundation GCSE pathway but it presents an opportunity for them to move to the</p>	<p>Wisweb - Number card, Arrow chains, Barney, Hit the safe</p> <p>Bowland - Magic sum puzzle, Cats and Kittens</p> <p>Thinking through mathematics - Adding two digit numbers</p> <p>Nrich - Summing consecutive numbers</p>

Measuring



			H	H/F	F
GM1 Units and scales	GM1.1 Length	<ul style="list-style-type: none"> Understand and use place value when using units of length Use standard units of length, including with decimal quantities Change freely between related standard units Draw and measure line segments 			X
	GM1.2 Mass	<ul style="list-style-type: none"> Understand and use place value when using units of mass Use standard units of mass, including with decimal quantities Change freely between related standard units 			X
	GM1.3 Time	<ul style="list-style-type: none"> Use standard units of time Change freely between related standard units 			X
	GM1.4 Volume	<ul style="list-style-type: none"> Understand and use place value when using units of volume Use standard units of volume, including with decimal quantities Change freely between related standard units 			X
	GM1.5 Interpreting Scales	<ul style="list-style-type: none"> Understand and use place value for measures 	X	X	
	GM1.6 The metric system	<ul style="list-style-type: none"> Understand and use place value for measures Use standard units of measures, including with decimal quantities Change freely between related standard units 	X	X	

Additional notes	Links
<p>Familiarity with a variety of units takes time to develop and all students will need to spend time mastering this. A wide range of activities will identify misconceptions for some, check mastery for others and broaden and deepen understanding for all students. It is important to use this topic for applying understanding and skills in Number in context. It is required for later work in Geometry and also in Number and that may mean spending longer than the allotted time. It is also important to introduce something they are unlikely to have met.</p>	<p>Bowland - Fish Dish, Hilbre Island, You Reckon ?</p> <p>Thinking through mathematics - Converting times, choosing appropriate units 1, choosing appropriate units 2</p> <p>Nrich - Rope Mat, Practice Run</p> <p>NLVM - Converting units, What time will it be</p>



Coordinates and translations

			H	H/F	F
GM5 Transformation	GM5.1 Position and Cartesian coordinates	<ul style="list-style-type: none">Work with coordinatesUse the standard notations for labelling the sides and angles of triangle ABC			X
	GM5.2 Cartesian coordinates in four quadrants	<ul style="list-style-type: none">Work with coordinates in all four quadrants	X	X	
	GM5.3 Translation	<ul style="list-style-type: none">Identify properties of, and describe the results of translations, applied to given figures	X	X	

Additional notes
<p>Co-ordinates identify a point which is at the intersection of two perpendicular gridlines. The same idea can be used to identify a square when playing 'Battleships' for example. It is important to be clear about the difference between these two uses so that when Cartesian co-ordinates are used the students know they refer to a point and not a square. Both uses help develop the notion of constraints and degrees of freedom to uniquely define a position. The convention that the distance 'across' is the first of the two co-ordinates needs to be firmly embedded. Exploring translations with all students helps them to notice 'what is the same' and 'what is different' about the movement of points and shapes. Questions involving drawing particular shapes, or completing partially drawn ones, on a Cartesian grid develop reasoning skills.</p>

Links
<p>Bowland - Point Zero.</p> <p>NLVM - Transformations - translation, Turtle Geometry, Transformations - Composition</p>



Moving past the point

			H	H/F	F
N1 Calculating	N1.3 Adding and subtracting decimals	<ul style="list-style-type: none">• Use addition and subtraction, including formal written methods, applied to positive decimals• Use standard units of money and other measures, including with decimal quantities	X	X	X
N3 Accuracy	N3.3 Rounding decimals to the nearest integer	<ul style="list-style-type: none">• Round numbers and measures	X	X	

Additional notes
A good understanding of place value should mean this is straightforward. Using images such as a number line marked in tenths and then in hundredths will build on the work on scales as well and give something concrete for students to build their understanding on in this topic. Relating the use of decimals to money and metric measures will also help make sense of it. It is still important to introduce something they are unlikely to have met.

Additional notes
Bowland – Water availability Nrich – Dickey Operations NLVM – Circle 3 Wisweb – Broken Calculator

Use Census Data at School

			H	H/F	F
SP1 Statistical measures	SP1.1 Mode, median and Range	<ul style="list-style-type: none"> Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency and spread 	X		
	SP1.2 Using Mean, Median, Mode and Range	<ul style="list-style-type: none"> Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency and spread 	X		
	SP1.3 Using Frequency Tables	<ul style="list-style-type: none"> Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency. 		X	
SP2 Statistical Diagrams	SP2.1 Using tables and charts	<ul style="list-style-type: none"> Describe, interpret and compare observed distributions of a single variable through appropriate graphical representation involving discrete data Construct and interpret appropriate tables, charts and diagrams, including frequency tables, bar charts and pictograms for categorical data 			X
	SP2.2 Stem and leaf diagrams	<ul style="list-style-type: none"> Describe, interpret and compare observed distributions of a single variable through appropriate graphical representation involving discrete data 	X		
	SP2.4 Pie charts	<ul style="list-style-type: none"> Describe, interpret and compare observed distributions of a single variable through appropriate graphical representation involving discrete data Construct and interpret appropriate tables, charts and diagrams, including pie charts for categorical data 		X	

Additional notes

Mode, median and range are new and so are stem and leaf diagrams. These are an example of an appropriate way to show data. Students may no longer have met the Handling data cycle at KS2 (Plan; Collect; Process; Discuss), and will have done less statistics. There is also a reduced emphasis on it at KS3 but it is a vital part of the mathematics curriculum. It supports other subject areas and so is an important facilitator for cross-curricular work. It requires, and develops, a good understanding of number and graphs and so helps underpin the work in these areas. Most students will use statistics and statistical ideas in their future jobs and it is a way of 'showing the point' of mathematics. Interpreting statistical measures and graphs, and choosing the appropriate measure or graph are both opportunities for students to reason. Why did you choose the median and not the mode as a representative measure? What does the graph tell you about the data set? How do you know? are all examples of questions to prompt reasoning in this topic. Actual data from the 2011 census can be found [here](#)

Additional notes

Bowland - Soft drinks, Tuck Shop, How risky is life ?, My music, Speed camera, Mystery Tours, Fashionista, Reducing road accidents, Saving a baby kangaroo

Nrich - MMM, the pet graph

Nuffield AMP - Cemetery maths, Design a table, Reaction times, Average limits

NLVM – Bar charts,

Folding and turning shapes

			H	H/F	F
GM2 Properties of shapes	GM2.1 Common shapes	<ul style="list-style-type: none"> Describe, sketch and draw using conventional terms and notations: points, lines, parallel lines, perpendicular lines, right angles and regular polygons. Know and use the meaning of congruence. Derive and illustrate properties of triangles, quadrilaterals, circles, and other plane figures using appropriate language and technologies. 			X
	GM2.2 Line symmetry	<ul style="list-style-type: none"> Describe, sketch and draw using conventional terms and notations: polygons that are reflectively symmetric. 		X	X
	GM2.4 Rotational symmetry	<ul style="list-style-type: none"> Describe, sketch and draw using conventional terms and notations: polygons that are rotationally symmetric. 	X		
GM4 Geometric construction	GM4.1 Angles in degrees	<ul style="list-style-type: none"> Draw and measure angles in geometric figures 			X
GM5 Transformation	GM5.4 Reflection	<ul style="list-style-type: none"> Identify properties of, and describe the results of reflections, applied to given figures. 		X	
	GM5.5 Rotation	<ul style="list-style-type: none"> Identify properties of, and describe the results of rotations, applied to given figures. 	X		
GM6 Three-dimensional shapes	GM6.1 Properties of 3-D shapes	<ul style="list-style-type: none"> Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3D Interpret mathematical relationships both algebraically and geometrically 	X		

	Additional notes		Additional notes
	<p>Rotational symmetry and rotation are no longer part of the KS2 curriculum. The perception of shapes and how they occupy space and fit together comes naturally to many students. For those for whom it does not it is important to spend time developing that perception. The relationship between Geometry and Art can be exploited for cross-curricular and seasonal applications.</p>		<p>Bowland - Rods and triangles, alien invasion, three of a kind, Sundials, Point zero,</p> <p>Thinking through maths - Classifying</p> <p>NLVM - Pattern blocks, Reflection, Pentominoes, Composition, Rotation, Turtle geometry</p> <p>Wisweb - Mirror, Rotating 3D shapes, 3D Object viewer, Coloring sides 1</p> <p>Nuffield AMP – Symmetry, Hide the spies</p> <p>Nrich – Estimating angles, Attractive Rotations,</p>

Parts of a whole



			H	H/F	F
N4 Fractions	N4.1 Understanding fractions	Express one quantity as a fraction of another, where the fraction is less than one and greater than one. Including: <ul style="list-style-type: none"> • Simple fractions of shapes • Simple fractions of amounts • Simple fractions of quantities • Simple equivalence • Ordering simple fractions 			X
	N4.2 Finding equivalent fractions	<ul style="list-style-type: none"> • Order fractions 		X	
	N4.3 Multiplying fractions	<ul style="list-style-type: none"> • Use multiplication, including formal written methods, applied to proper fractions • Interpret fractions as operators • Relate the language of ratios and the associated calculations to the arithmetic of fractions 	X		

	Additional notes
	Using the Developing Understanding Standards Unit tasks will address misconceptions for many students at all levels and deepen their understanding. This secures a firm foundation of understanding and confidence in this area for later work. It should also identify the areas for intervention for those at risk of falling behind. It is also important to introduce something they are unlikely to have met. This may be a problem solving task from the books or Countdown with fractions on Nrich."

	Additional notes
	<p>Standard Unit - N1, SS3</p> <p>Thinking through maths - Making sense of fractions</p> <p>NLVM - Fraction pieces, fraction bars, fractions (naming), fractions (equivalent), fractions (comparing), fractions (rectangle multiplication)</p> <p>Wisweb - Fraction bar and Percent bar</p> <p>Nrich - Fractional Triangles, Fair feast, Fractional triangles, Ben's game</p>



Generalising using letters (continued on next slide)

			H	H/F	F
N2 Using our number system	N2.4 Negative numbers	<ul style="list-style-type: none"> Order positive and negative integers 			X
A1 Starting algebra	A1.1 Making and using word formulae	<ul style="list-style-type: none"> Recognise and use relationships between operations. Substitute numerical values into formulae. Model situations or procedures by translating them into formulae. Interpret mathematical relationships algebraically. 		X	
	A1.2 Using letters	<ul style="list-style-type: none"> Use and interpret algebraic notation, including: ab in place of $a \times b$, $3y$ in place of $3 \times y$. Substitute numerical values into formulae Model situations or procedures by translating them into formulae Interpret mathematical relationships algebraically 		X	
	A1.3 Combining variables	<ul style="list-style-type: none"> Use and interpret algebraic notation, including: ab in place of $a \times b$, $3y$ in place of $y + y + y$ and $3 \times y$, a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a^2b in place of $a \times a \times b$ x/y instead of $x \div y$, coefficients written as fractions rather than as decimals Substitute numerical values into expressions Understand and use the concepts and vocabulary of expressions and terms Simplify and manipulate algebraic expressions to maintain equivalence by collecting like terms Model situations or procedures by translating them into algebraic expressions Interpret mathematical relationships algebraically 	X		
	A1.4 Working with formulae	<ul style="list-style-type: none"> Recognise and use relationships between operations, including inverse operations Substitute numerical values into formulae Rearrange formulae to change the subject Model situations or procedures by translating them into formulae Interpret mathematical relationships algebraically 	X		



A survey about us

			H	H/F	F
SP1 Statistical measures	SP1.2 Using mean, median, mode and range	<ul style="list-style-type: none"> Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency and spread. 	X		
	SP1.3 Using frequency tables	<ul style="list-style-type: none"> Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency. 		X	X
SP2 Statistical diagrams	SP2.3 Vertical line charts	<ul style="list-style-type: none"> Describe, interpret and compare observed distributions of a single variable through appropriate graphical representation involving discrete and continuous data. Construct and interpret appropriate tables, charts and diagrams, including vertical line charts for ungrouped numerical data. 		X	X
SP3 Collecting data	SP3.1 Collecting data	<ul style="list-style-type: none"> This unit has been included to enable students to appreciate the rationale for the techniques they meet in mathematics and to make better use of the statistics opportunities based on the data handling cycle that they will meet in other subjects 	X		

	Additional notes
	<p>Mode, median and range are new and so is giving attention to collecting data. Although they are not identified for all students it is worth beginning to introduce these ideas to everyone. Students may no longer have met the Handling data cycle at KS2 (Plan; Collect; Process; Discuss), and will have done less statistics. There is also a reduced emphasis on it at KS3 but it is a vital part of the mathematics curriculum. It supports other subject areas and so is an important facilitator for cross-curricular work. It requires, and develops, a good understanding of number and graphs and so helps underpin the work in these areas. Most students will use statistics and statistical ideas in their future jobs and it is a way of 'showing the point' of mathematics. This is an opportunity to carry out a statistical investigation of your choosing. This presents opportunities to make decisions and infer from results, both of which involve reasoning. The Average Pupil Project could be used at this point (on the next three slides).</p>

	Additional Links
	<p>Standards Unit - S4</p> <p>Bowland - How risky is life ?, Mystery tours, Fashionista, Counting Trees, Day out.</p> <p>NLVM – Whammy awards,</p> <p>Nrich – What's the weather like ?</p> <p>Nuffield AMP - Cemetery</p>



Negative Numbers

			H	H/F	F
N1 Calculating	N1.5 Adding and subtracting negative numbers	<ul style="list-style-type: none"> Use addition and subtraction, applied to both positive and negative numbers . 	X		
	N1.6 Multiplying and dividing negative numbers	<ul style="list-style-type: none"> Use multiplication and division, applied to both positive and negative numbers. 	X		
N2 Using our number system	N2.4 Negative numbers	<ul style="list-style-type: none"> Order positive and negative integers 		X	X

	Additional notes		Additional links
	<p>Students will have worked with negative numbers in KS2. They will have ordered them and calculated intervals across zero. They are unlikely to have used them routinely in problems involving the four operations. There are likely to be misconceptions arising from spotting, or being given, rules that are applied unthinkingly.</p>		<p>Standards unit - N2, N9</p> <p>NLVM - circle 0, circle 21, circle 99</p> <p>Nrich - Up down flying around, Consecutive negative numbers</p> <p>Wisweb – Tic Tac Go</p>



Exploring sequences

			H	H/F	F
A2 Sequences	A2.1 What is a sequence?	<ul style="list-style-type: none"> • Generate terms of a sequence from a term -to-term rule 			X
	A2.2 Generating sequences	<ul style="list-style-type: none"> • Generate terms of a sequence from a term -to-term or a position-to-term rule 	X	X	

Additional notes	Additional links
<p>All of the POS statements are in the KS2 curriculum in Year 6 although the algebraic aspect may well be new to students. Exploring sequences is about the search for pattern which underpins much of mathematics. There are many tasks in the texts and in the links for students to do this. It is also an opportunity, as suggested in the text, to do some work using spreadsheets. Reasoning is an integral part of work with sequences. Deducing rules and speculating about numbers that will eventually appear in a sequence are two examples. The behavior of the sequence as it 'approaches infinity' is worth including where appropriate."</p>	<p>Nrich – Shifting time tables, Coordinate patterns</p> <p>Wisweb – Spotting number problems, Number strips, Number strips with fractions, arrow chains</p> <p>NLVM – Pascal's triangle</p> <p>Bowland – Alien invasion, Geoboard squares</p>



Angle facts

			H	H/F	F
GM2 Properties of shape	GM2.3 Angle facts	<ul style="list-style-type: none">Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite anglesInterpret mathematical relationships both algebraically and geometrically	X	X	X

Additional notes
It is important to introduce something they are unlikely to have met since the facts will be familiar. Using the algebraic questions in the text is one way, and applying the facts in the Nrich activity Nine-pin triangles, together with the extension mentioned will engage the students in geometrical reasoning. That will also link with other angle work which will have been met at KS2. In this topic students are engaging in geometrical reasoning. Every time they solve a missing angle problem they are deducing something from a known facts. Asking them 'How do you know?' will develop their skills in this area.

Additional Links
Nrich - Nine pin triangles

Percentages



			H	H/F	F
N5 Percentages	N5.1 Understanding and using percentages	<ul style="list-style-type: none"> Define percentage as 'number of parts per hundred' Express one quantity as a percentage of another Compare two quantities using percentages 		x	x
	N5.2 Calculating percentages of quantities	<ul style="list-style-type: none"> Calculate percentages using both calculator and non calculator methods. 		x	
	N5.3 Converting between fractions, decimals and percentages	<ul style="list-style-type: none"> Order decimals and fractions Work interchangeably with terminating decimals and their corresponding fractions Interpret percentages as a fraction or a decimal, interpret these multiplicatively 	x		

	Additional notes	Additional links
	<p>Students will have met percentages at KS2 and solved problems involving working out percentages of amounts. they will have used the conversions for some simple fractions and decimals. Understanding the equivalence of percentages and fractions and decimals is important to establish at this stage and activities that develop this understanding should be included. Percentages come into many of the contextual questions that students will meet at KS4.</p> <p>Solving problems set in context involving percentages presents an opportunity for reasoning in a real life situation.</p>	<p>Standards Unit – N7 Understanding percentages to increase quantities, N1 Ordering fractions and decimals</p> <p>NLVM – Percent grid, Percentages</p> <p>Wisweb - Fractions bar and Percent Bar</p> <p>Bowlands assessments task - Bunting</p> <p>Bowlands case studies - Product wars</p> <p>Nrich - Matching fractions, decimals and percentages</p>

Introducing Probability



			H	H/F	F
SP4 Probability	SP4.1 Introduction to Probability	<ul style="list-style-type: none"> Record, describe and analyse the frequency of outcomes of simple probability using appropriate language and the 0-1 probability scale 	x	x	x
	SP4.2 Single event probability	<ul style="list-style-type: none"> Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, and equally likely outcomes using appropriate language and the 0-1 probability scale Understand that the probabilities of all possible outcomes sum to 1 Generate theoretical sample spaces for single events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities 	x		

Additional notes	Additional links
<p>Students will not have met probability at KS2.</p> <p>There are many opportunities for practical work and these should be used as an understanding of the nature of probability underpins much of statistics.</p> <p>The Nrich tasks give opportunities for exploring probability and reasoning in this context. It helps to develop understanding of randomness.</p>	<p>Standards Unit – S1 Ordering probabilities</p> <p>NLVM – Spinners, Hamlet happens</p> <p>Thinking through mathematics - Evaluating mathematical statements.</p> <p>Bowlands assessments task - Lottery</p> <p>Bowlands case studies - Mystery tours, Explorers, Football: The beautiful game</p> <p>Nrich - What does random look like ?</p>

Angles



			H	H/F	F
7GM5 Angles	GM2.5 Angles in triangles and quadrilaterals	<ul style="list-style-type: none"> Use the standard conventions for labelling the sides and angles of triangle ABC Derive and illustrate properties of triangles and quadrilaterals using appropriate language and technologies Derive and use the sum of angles in a triangle and use it to deduce the angle sum in a quadrilateral Interpret mathematical relationships both algebraically and geometrically 	x	x	x
	GM4.2 Constructions with a ruler and protractor	<ul style="list-style-type: none"> Draw and measure line segments and angles in geometric figures Identify and construct congruent triangles 	x		

Additional notes
<p>Students build on their knowledge of basic angle facts and apply them in a variety of situations.</p> <p>Practical work constructing triangles helps to develop their understanding of shape.</p> <p>All students should be able to access some of the construction work.</p> <p>Geometric reasoning is an integral part of the work in this topic.</p>

Additional links
<p>NLVM – Geoboard (Circular)</p> <p>Thinking through mathematics - Evaluating mathematical statements.</p> <p>Nuffield AMP - Money bags</p> <p>Bowlands case studies - Alien Invasion, Sundials Highway Link Design, Point Zero</p> <p>Nrich - Subtended angles, Olympic turns</p>



Exact or Just Accurate (continued on next slide)

			H	H/F	F
7N6 Exact or just accurate?	N1.4 Dividing whole numbers	Use division, including formal written methods, applied to positive integers including: <ul style="list-style-type: none"> ● grouping and sharing ● checking and using a calculator ● inverse of multiplication ● HTU by U including remainders ● mixed number answers ● division of HTU by TU with no remainder ● combine operations to solve simple word problems 		X	X
	N2.5 Using the number system effectively	Understand and use place value for decimals including: <ul style="list-style-type: none"> ● Multiplying and dividing by 0.1, 0.01, 0.001 ● Using known facts to calculate other facts 			
	N3.4 Rounding decimals	<ul style="list-style-type: none"> ● Rounding to a number or measure including decimals to two decimal places. 	X		
	N3.5 Significance	<ul style="list-style-type: none"> ● Rounding to a given number or measure to a set number of significant figures. 	X		
	N7.3 Divisibility tests	<ul style="list-style-type: none"> ● Recognise and use relationships between operations 	X		

Area and Perimeter



			H	H/F	F
GM3 Measuring shapes	GM3.1 Understanding area	<ul style="list-style-type: none"> Derive formulae to calculate and solve problems involving area 			X
	GM3.2 Finding area and perimeter	<ul style="list-style-type: none"> Derive and apply formulae to calculate and solve problems involving perimeter and area of triangles, parallelograms, trapezia Calculate and solve problems involving perimeters of composite shapes Interpret mathematical relationships both algebraically 	X		

Additional notes
<p>Students will have met these ideas at KS2. The move from linear measure to two-dimensional measure can be challenging for many students and they fall back on an instrumental understanding, remembering only what they have to do. This means essential links in their understanding of shape and measure are missing.</p> <p>It is worth spending time developing this understanding of area for all students so that they can cope with the more challenging questions on compound shapes.</p> <p>The Standards Unit and Nrich tasks give opportunities for reasoning in order to test and clarify their understanding of area and perimeter.</p>

Additional links
<p>Standards Unit SS1: Classifying shapes, SS2: Understanding perimeter and area, SS4: Evaluating statements about length and area</p> <p>NLVM – Tangrams, Turtle geometry, Geoboard</p> <p>Thinking through mathematics - Evaluating mathematical statements</p> <p>Nuffield AMP - Corner to corner, money bags</p> <p>Bowlands case studies - Mission: Rainforest,</p> <p>Bowlands Assessment tasks - Golden rectangles, Bunting</p> <p>Nrich - Changing Areas, Changing Perimeters</p> <p>Wisweb - Rectangle jigsaw</p>



Real Life Graphs

			H	H/F	F
A3 Functions and graphs	A3.1 Real life graphs	<ul style="list-style-type: none"> • Model situations or procedures by using graphs • Interpret mathematical relationships algebraically and graphically • Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs 	x	x	x

Additional notes
<p>This topic may be accessed at many levels. Some contexts will be more familiar for students.</p> <p>Distance-time graphs present difficulties for many and it is worth spending time establishing their understanding of them.</p> <p>Interpreting any graph can be difficult. Deepening understanding by justifying statements made uses the reasoning skills students will have been developing through Year 7.</p> <p>There are many tasks to continue to develop reasoning skills in the context of interpreting real life graphs. The Standards unit and Nrich tasks are worth using too.</p>

Additional links
<p>Standards Unit - A6: Interpreting distance-time graphs, N10: Developing an exam questions, A5: Interpreting distance-time graphs with a computer, A6: Interpreting distance-time graphs</p> <p>Bowland assessment tasks - Problem Page</p> <p>Wisweb - Graphs</p> <p>Bowland case studies - Alien Invasion, Keeping the Pizza Hot, Olympics: Are Women Improving Faster Than Men?</p>

Fractions



			H	H/F	F
N1 Calculating	N1.4 Dividing whole numbers	Use division, including formal written methods, applied to positive integers: <ul style="list-style-type: none"> ● Grouping and sharing ● Checking and using a calculator ● Inverse of multiplication ● HTU by U including remainders ● Mixed number answers ● Division of HTU by TU with no remainder ● Combine operations to solve simple word problems 			X
	N7.3 Divisibility tests	<ul style="list-style-type: none"> ● Recognise and use relationships between operations 		X	
N4 Fractions	N4.2 Finding equivalent fractions	<ul style="list-style-type: none"> ● Order fractions ● Calculate equivalent fractions 			X
	N4.3 Multiplying fractions	<ul style="list-style-type: none"> ● Use multiplication, including formal written methods, applied to proper fractions ● Interpret fractions as operators ● Relate the language of ratios and the associated calculations to the arithmetic of fractions 		X	X
	N4.4 Adding and subtracting fractions	<ul style="list-style-type: none"> ● Use addition and subtraction, including formal written methods, applied to proper fractions 	X	X	
	N4.5 Working with mixed numbers	<ul style="list-style-type: none"> ● Use addition, subtraction, and multiplication, including formal written methods, applied to improper fractions and mixed numbers ● Converting between mixed numbers and improper fractions 	X		
	N4.6 Dividing Fractions	<ul style="list-style-type: none"> ● Use division, including formal written methods, applied to proper fractions (to include reciprocals and mixed numbers) 	X		

Sequences



			H	H/F	F
N1 Calculating	N1.5 Adding and subtracting negative numbers	Use addition and subtraction, applied to both positive and negative numbers, including checking and using a calculator.			X
	N1.6 Multiplying and dividing negative numbers	Use addition and subtraction, applied to both positive and negative numbers, including checking and using a calculator.			X
A2 Sequences	A2.1 What is a sequence?	Generate terms of a sequence from a term -to-term rule			X
	A2.2 Generating sequences	Generate terms of a sequence from a term -to-term or a position-to-term rule, including finding rules by inspection and pattern sequences.		X	
	A2.3 Linear sequences	Generate terms of a sequence from a term -to-term or a position-to-term rule Recognise arithmetic sequences and find the nth term	X		

Additional notes

Fluency with the four operations using negative numbers is important for providing the basis for later work in algebra. Sequences provide a context for the work so that understanding can be tested and clarified. Students on all pathways can benefit from further work to develop fluency with negative numbers during this topic.

'Linear sequences' develops the link with algebra started in 'Generating sequences'.

The Nrich tasks also give opportunities for problem solving and are suitable for all students. There is an opportunity before half term to focus on problem solving in these first three topics.

About Calculation



			H	H/F	F
N1 Calculating	N1.2 Multiplying whole numbers	Use multiplication, including formal written methods, applied to positive integers, including: <ul style="list-style-type: none"> ● Multiplying by a single digit ● Combining operations to solve simple word problems ● TU by TU ● HTU by TU ● Times tables to 12 x 12 ● Checking and using a calculator 			X
	N1.7 BIDMAS	<ul style="list-style-type: none"> ● Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals ● Use integer powers 	X	X	
N2 Using our number system	N2.2 Writing and ordering Decimals	<ul style="list-style-type: none"> ● Understand and use place value for decimals ● Order decimals ● Use the number line as a model for ordering of the real numbers 			X
	N2.3 Multiplying and dividing by powers of 10	<ul style="list-style-type: none"> ● Understand and use place value for decimals 		X	X
N3 Accuracy	N3.2 Rounding larger numbers	<ul style="list-style-type: none"> ● Round numbers and measures 			X
N7 Number properties	N7.2 Factors, Primes and Powers	<ul style="list-style-type: none"> ● Use the concepts and vocabulary of prime numbers and factors (or divisors) ● Use integer powers and associated real roots ● Recognise powers of 2, 3, 4, 5 ● Distinguish between exact representations of roots and their decimal equivalents 		X	X

Properties of Shape



			H	H/F	F
GM2 Properties of shapes	GM2.3 Angle facts	<ul style="list-style-type: none"> Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles Interpret mathematical relationships both algebraically and geometrically 			X
	GM2.5 Angles in triangles and quadrilaterals	<ul style="list-style-type: none"> Use the standard conventions for labelling the sides and angles of triangle ABC Derive and illustrate properties of triangles and quadrilaterals using appropriate language and technologies Derive and use the sum of angles in a triangle and use it to deduce the angle sum in a quadrilateral Interpret mathematical relationships both algebraically and geometrically 		X	X
	GM2.6 Types of Quadrilaterals	<ul style="list-style-type: none"> Derive and illustrate properties of triangles and quadrilaterals using appropriate language and technologies Interpret mathematical relationships both algebraically and geometrically 	X	X	
	GM2.7 Angles and Parallel lines	<ul style="list-style-type: none"> Understand and use the relationship between parallel lines with alternate and corresponding angles 	X		

Additional notes

Students gradually increase the number of angle facts they can use fluently and begin to select the appropriate ones to solve a variety of problems. They should become familiar with the terminology used with parallel lines and quadrilaterals and be able to use it in explanations. Students on pathways leading to Foundation GCSE can develop their skills by accessing some of the content of the next units as this will provide opportunities to apply what they have learnt. The Nrich tasks on Logo offer an opportunity to develop reasoning skills in the next topic before half term to focus on problem solving in this topic.

Using Letters (Part 1)



			H	H/F	F
A1 Starting algebra	A1.1 Making and using word formulae	<ul style="list-style-type: none"> Recognise and use relationships between operations Substitute numerical values into formulae Model situations or procedures by translating them into formulae Interpret mathematical relationships algebraically 			X
	A1.2 Using letters (If needed to support A1.3 if required)	<ul style="list-style-type: none"> Use and interpret algebraic notation, including: ab in place of $a \times b$, $3y$ in place of $3 \times y$. Substitute numerical values into formulae Model situations or procedures by translating them into formulae Interpret mathematical relationships algebraically 		X	X
	A1.3 Combining variables	<ul style="list-style-type: none"> Use and interpret algebraic notation, including: ab in place of $a \times b$, $3y$ in place of $y + y + y$ and $3 \times y$, a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a^2b in place of $a \times a \times b$ x/y instead of $x \div y$, coefficients written as fractions rather than as decimals Substitute numerical values into expressions Understand and use the concepts and vocabulary of expressions and terms Simplify and manipulate algebraic expressions to maintain equivalence by collecting like terms Model situations or procedures by translating them into algebraic expressions Interpret mathematical relationships algebraically 		X	
	A1.5 Setting up and solving simple equations	<ul style="list-style-type: none"> Understand and use the concepts and vocabulary of equations Use algebraic methods to solve linear equations in one variable Interpret mathematical relationships algebraically 	X		



Forming Shapes (Part 1)

			H	H/F	F
GM2 Properties of shapes	GM2.4 Rotational symmetry	<ul style="list-style-type: none"> Describe, sketch and draw using conventional terms and notations: polygons that are rotationally symmetric 		X	
	GM2.6 Types of Quadrilaterals	<ul style="list-style-type: none"> Derive and illustrate properties of triangles and quadrilaterals using appropriate language and technologies Interpret mathematical relationships both algebraically and geometrically 		X	
GM4 Geometric construction	GM4.2 Constructions with a ruler and protractor	<ul style="list-style-type: none"> Draw and measure line segments and angles in geometric figures Identify and construct congruent triangles 		X	
	GM4.3 Constructing with a pair of compasses	<ul style="list-style-type: none"> Derive and use the standard ruler and compass constructions Recognise and use the perpendicular distance from a point to a line as the shortest distance to the line Identify and construct congruent triangles 	X		
GM6 Three-dimensional shapes	GM6.1 Properties of 3-D shapes	<ul style="list-style-type: none"> Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3D Interpret mathematical relationships both algebraically and geometrically 		X	X
	GM6.2 Understanding Nets	<ul style="list-style-type: none"> Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3D 	X	X	X



			H	H/F	F
A3 Functions and graphs	A3.1 Real life graphs	<ul style="list-style-type: none"> ● Model situations or procedures by using graphs ● Interpret mathematical relationships algebraically and graphically ● Find approximate solutions to contextual problems from given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs 		x	x
	A3.2 Plotting graphs of linear functions	<ul style="list-style-type: none"> ● Model situations by using graphs ● Recognise, sketch and produce graphs of linear functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane ● Interpret mathematical relationships algebraically and graphically ● Use linear graphs to estimate values of y for given values of x and vice 	x		

Additional notes

Students will have worked with real life graphs earlier in the year and made varying degrees of progress in their understanding of the various types. This understanding should be checked before moving on in this topic.

For students working towards Higher GCSE this is when graphs meet algebra with the equations of straight line graphs. Making connections between several ways of constructing graphs of linear functions helps deepen understanding in preparation for the gradient-intercept form in Year 8. Students on the other pathways should see the idea of plotting graphs of linear functions although fluency with this may be confined to simple cases or those in a real life context.

The Bowland and Nrich tasks also give opportunities for problem solving and are suitable for all students. Encouraging students to read the problem again, carefully, is a particularly helpful strategy. Asking 'What do you know?' and 'What can you work out?' encourages reflection and often is enough to get started.

Calculating



			H	H/F	F
N1 Calculating	N1.3 Adding and subtracting decimals	<ul style="list-style-type: none"> Use addition and subtraction, including formal written methods, applied to positive decimals Use standard units of money and other measures, including with decimal quantities 		X	
	N1.8 Multiplying decimals	<ul style="list-style-type: none"> Use division, including formal written methods, applied to decimals Use standard units of money and other measures, including with decimal quantities 	X		
	N1.9 Dividing decimals	<ul style="list-style-type: none"> Use division, including formal written methods, applied to decimals 	X		

Additional notes

In this topic students on the main pathway are seeking to become fluent in calculating with decimals. For all students opportunities to 'scope out' calculations and discuss different strategies should be given as this deepens understanding and develops flexibility and making connections. Asking students to explain their methods develops reasoning skills.

Challenging students to develop these skills in context (money and measurement) is important as it gives something known for them to refer to when judging whether an answer is sensible.

The Bowland and Nrich tasks also give opportunities for problem solving and are suitable for all students. Encouraging students to read the problem again, carefully, is a particularly helpful strategy. Asking 'What do you know?' and 'What can you work out?' encourages reflection and often is enough to get started. 'Draw a helpful diagram' is also useful advice.

Measures



			H	H/F	F
N3 Accuracy	N3.3 Rounding decimals to the nearest integer	<ul style="list-style-type: none"> Round numbers and measures 			X
GM1 Units and scales	GM1.5 Interpreting Scales	<ul style="list-style-type: none"> Understand and use place value for measures 		X	
	GM1.8 Bearings	<ul style="list-style-type: none"> Draw and measure line segments in geometric figures, including interpreting scale drawings Interpret mathematical relationships both algebraically and geometrically 	X	X	X
GM3 Measuring shapes	GM3.3 Circumference	<ul style="list-style-type: none"> Calculate and solve problems involving perimeters of 2-D shapes (including circles) and composite shapes Interpret mathematical relationships both algebraically and geometrically 	X		

	Additional notes
	<p>The thread here is interpreting scales and divisions that may be less than one whole one. Students on the pathway towards Higher GCSE apply their knowledge of angles to bearings and their knowledge of formulae to the perimeter of a circle. Some discussion on the value of p helps put the topic into a historical context. Students on the other pathways embed and extend their understanding of scales and decimals. They also apply their understanding of angles to bearings.</p> <p>The Bowland and Nrich tasks also give opportunities for problem solving and are suitable for all students. Encouraging students to read the problem again, carefully, is a particularly helpful strategy. Asking 'What do you know?' and 'What can you work out?' encourages reflection and often is enough to get started. 'Draw a helpful diagram' is also useful advice.</p>

Manipulating Algebra



			H	H/F	F
A1 Starting algebra	A1.3 Combining variables	<ul style="list-style-type: none"> • Use and interpret algebraic notation, including: ab in place of $a \times b$, $3y$ in place of $y + y + y$ and $3 \times y$, a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a^2b in place of $a \times a \times b$ x/y instead of $x \div y$, coefficients written as fractions rather than as decimals • Substitute numerical values into expressions • Understand and use the concepts and vocabulary of expressions and terms • Simplify and manipulate algebraic expressions to maintain equivalence by collecting like terms • Model situations or procedures by translating them into algebraic expressions • Interpret mathematical relationships algebraically 			X
	A1.5 Setting up and solving simple equations	<ul style="list-style-type: none"> • Understand and use the concepts and vocabulary of equations • Use algebraic methods to solve linear equations in one variable • Interpret mathematical relationships algebraically 		X	
	A1.6 Using brackets	<ul style="list-style-type: none"> • Use and interpret algebraic notation, including brackets • Understand and use the concepts and vocabulary of expressions, terms and factors • Simplify and manipulate algebraic expressions to maintain equivalence by multiplying a single term over a bracket and taking out common factors • Use algebraic methods to solve linear equations in one variable Interpret mathematical relationships algebraically 		X	
	A1.7 Working with more complex equations	<ul style="list-style-type: none"> • Understand and use the concepts and vocabulary of equations • Use algebraic methods to solve linear equations in one variable • Reduce a given linear equation in two variables to the standard form $y = mx+c$ 	X		
	A1.8 Solving equations with brackets	<ul style="list-style-type: none"> • Understand and use the concepts and vocabulary of equations • Use algebraic methods to solve linear equations in one variable (including all forms that require rearrangement) • Interpret mathematical relationships algebraically 	X		

Probability



			H	H/F	F
N4 Fractions	(N4.2 Finding equivalent fractions to support probability if necessary)	<ul style="list-style-type: none"> Order fractions (including writing in their simplest form) 		X	X
SP4 Probability	SP4.1 Introduction to Probability	<ul style="list-style-type: none"> Record, describe and analyse the frequency of outcomes of simple probability using appropriate language and the 0-1 probability scale 		X	X
	SP4.2 Single event probability	<ul style="list-style-type: none"> Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, and equally likely outcomes using appropriate language and the 0-1 probability scale Understand that the probabilities of all possible outcomes sum to 1 Generate theoretical sample spaces for single events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities 		X	X
	SP4.3 Combined events	<ul style="list-style-type: none"> Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams 			
Additional notes					

All students will have met the ideas in the first unit of probability in year 7. They should build on that during this topic. Practical work doing experiments is important in probability to understand the nature of random events. Students on each pathway will have the opportunity to apply some of their work on fractions and decimals in a context that is meaningful to them. There are questions that require reasoning, an essential component of problem solving, in the Skills practice A and B and Wider skills practice exercises, and problem solving in the Applying skills exercises, in Mastering Mathematics. The Bowland and Nrich tasks also give opportunities for problem solving and are suitable for all students. Encouraging students to read the problem again, carefully, is a particularly helpful strategy. Asking 'What do you know?' and 'What can you work out?' encourages reflection and often is enough to get started. 'Draw a helpful diagram' is also useful advice.

Proportion



			H	H/F	F
GM1 Units and scales	GM1.6 The metric system	<ul style="list-style-type: none"> Understand and use place value for measures Use standard units of measures, including with decimal quantities Change freely between related standard units 			x
	GM1.7 Metric-Imperial conversions	<ul style="list-style-type: none"> Understand and use place value for measures Use standard units of measures, including with decimal quantities Change freely between related standard units 			x
N2 Using our number system	N2.5 Using the number system effectively	<ul style="list-style-type: none"> Understand and use place value for decimals includes: Multiplying and dividing by 0.1, 0.01, 0.001 Using known facts to calculate other facts 		x	
N6 Ratio and proportion	N6.1 Understanding ratio notation	<ul style="list-style-type: none"> Use ratio notation, including reduction to simplest form Relate the language of ratios and the associated calculations to the arithmetic of fractions 	x	x	
	N6.2 Sharing in a given ratio	<ul style="list-style-type: none"> 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 	x		
	N6.3 Working with proportional quantities	<ul style="list-style-type: none"> Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction Solve problems involving direct proportion 	x		
Additional notes					

"The metric system and conversion between metric and Imperial measures are both excellent opportunities to explore proportion. Linking ideas about ratio and multiplicative relationships with units of measure that are familiar to students gives them a concrete reference point for the mathematics. Ratio is included in the KS2 curriculum so most students will have met it before. This topic develops their understanding and fluency in using the ideas of proportion. For many students this will require a move from additive strategies when solving word problems to multiplicative ones and this idea needs to be explored with them". There are questions that require reasoning, an essential component of