

# Key Stage 3 Mathematics Programme of Study



Strands	Elements	Year 7	Year 8	Year 9
		Learners are able to:	Learners are able to:	Learners are able to:
Developing numerical reasoning	Identify processes and connections	<ul style="list-style-type: none"> <li>transfer mathematical skills across the curriculum in a variety of contexts and everyday situations</li> <li>select, trial and evaluate a variety of possible approaches and break complex problems into a series of tasks</li> <li>prioritise and organise the relevant steps needed to complete the task or reach a solution</li> <li>choose an appropriate mental or written strategy and know when it is appropriate to use a calculator</li> <li>use a scientific calculator to carry out calculations effectively and efficiently using the available range of function keys</li> <li>identify, measure or obtain required information to complete the task <b>from a range of sources, including text</b> ▲</li> <li>identify what further information might be required and select what information is most appropriate</li> <li>select appropriate mathematics and techniques to use</li> <li>estimate and visualise size when measuring and use the correct units</li> <li><b>develop and evaluate mathematical strategies and ideas creatively</b> ❖</li> <li><b>consider connections between mathematical skills and contextualise these within extended tasks</b> ❖</li> </ul>		
	Represent and communicate	<ul style="list-style-type: none"> <li>explain results and procedures precisely using appropriate mathematical language</li> <li>refine methods of recording calculations</li> <li>use appropriate notation, symbols and units of measurement, including compound measures</li> <li>select and construct appropriate charts, diagrams and graphs with suitable scales</li> <li>interpret graphs that describe real-life situations, including those used in the media, recognising that some graphs may be misleading</li> <li><b>evaluate different forms of recording and presenting information, taking account of the context and audience</b> ❖</li> <li><b>generalise in words, and use algebra, to describe patterns that arise in numerical, spatial or practical situations</b> ❖</li> </ul>		
	Review	<ul style="list-style-type: none"> <li>select and apply appropriate checking strategies</li> <li>interpret answers within the context of the problem and consider whether answers, including calculator, analogue and digital displays, are sensible</li> <li>verify and justify results or solutions, including discussion on risk and chance where relevant</li> <li>interpret mathematical information; draw inferences from graphs, diagrams and data, including discussion on limitations of data</li> <li>draw conclusions from data and recognise that some conclusions may be misleading or uncertain</li> <li><b>justify numerical and algebraic results, making appropriate connections</b> ❖</li> <li><b>explain and justify strategies, methods, reasoning and conclusions in a variety of different ways, including orally, graphically, in writing (both in mathematical notation and without), and using appropriate digital literacy equipment</b> ❖</li> <li><b>appreciate the difference between mathematical explanation and experimental evidence; recognise inconsistencies and bias</b> ❖</li> </ul>		

## Key

Within the table, text taken from the LNF will appear as non-bold. Text that has been extended from the LNF or that is a new skill will appear as bold. The text is further identified by the following icons.

**Extended skill** ▲ **Programme of study skill** ❖

## N.B.

In order to comply with accessibility and legibility, these tables have been designed to be printed at their optimum size of A3.



		← Year 7	Year 8 →	← Year 9 →
Strands	Elements	Learners are able to:	Learners are able to:	Learners are able to:
Using number skills	Use number facts and relationships	<ul style="list-style-type: none"> <li>• read and write numbers of any size and use the four operations and the connections between them, e.g. <i>apply division as the inverse of multiplication</i></li> <li>• recognise and apply key mental facts and strategies</li> <li>• use appropriate strategies for multiplication and division, including application of known facts</li> <li>• use the terms square and square root</li> <li>• <b>express square numbers using powers</b> ❖</li> <li>• <b>identify the lowest common multiple of two or more numbers</b> ❖</li> <li>• <b>identify the highest common factor of two or more numbers</b> ❖</li> <li>• <b>identify triangular numbers</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>• recognise and apply key mental facts and strategies</li> <li>• use known facts to derive others, e.g. <i>use <math>7 \times 6</math> to derive <math>0.7 \times 6</math></i></li> <li>• use the terms cube, cube root and reciprocal</li> <li>• <b>express cube numbers using powers</b> ❖</li> <li>• <b>use the lowest common multiple and highest common factor</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>• use powers and understand the importance of powers of 10</li> <li>• <b>use known facts to derive others, including those that involve division</b> ❖</li> <li>• show awareness of the need for standard form and its representation on a calculator</li> <li>• <b>express repeated multiplications as powers, e.g. <math>7 \times 7 \times 7 \times 7 \times 7 \times 7 = 7^6</math></b> ❖</li> <li>• <b>write a number as a product of its prime factors in index form</b> ❖</li> <li>• <b>multiply, divide and use brackets with powers</b> ❖</li> </ul>
	Fractions, decimals, percentages and ratio	<ul style="list-style-type: none"> <li>• use equivalence of fractions, decimals, percentages <b>and ratio</b> to compare proportions ▲</li> <li>• recognise that some fractions are recurring decimals, e.g. <math>\frac{1}{3}</math> is <math>0.33\bar{3}</math></li> <li>• calculate percentages of quantities using non-calculator methods where appropriate</li> <li>• use ratio and proportion including map scales</li> <li>• <b>express two or more quantities as a ratio using the correct notation</b> ❖</li> <li>• <b>simplify ratio</b> ❖</li> <li>• <b>add and subtract fractions with different denominators</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>• use equivalence of fractions, decimals, percentages <b>and ratio</b> to select the most appropriate for a calculation ▲</li> <li>• simplify a calculation by using fractions in their simplest terms</li> <li>• <b>express recurring decimals using correct notation</b> ❖</li> <li>• calculate a percentage, fraction, decimal of any quantity with a calculator where appropriate</li> <li>• calculate the outcome of a given percentage increase or decrease</li> <li>• <b>simplify ratios including those given in different units</b> ❖</li> <li>• use ratio and proportion to calculate quantities, <b>including sharing in a given ratio</b> ▲</li> <li>• <b>add, subtract, multiply and divide proper fractions</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>• use equivalence of fractions, decimals, percentages <b>and ratio</b> to select the most appropriate for a calculation ▲</li> <li>• use and interpret different representations of fractions, e.g. <i>mixed numbers and improper fractions</i></li> <li>• express one quantity as a percentage of another</li> <li>• calculate a percentage increase or decrease</li> <li>• use ratio and proportion to calculate quantities, <b>including cases where the 'total' is not given</b> ▲</li> <li>• <b>calculate with different representations of fractions</b> ❖</li> </ul>

# Key Stage 3 Mathematics Programme of Study



Strands	Elements	Year 7	Year 8	Year 9
		Learners are able to:	Learners are able to:	Learners are able to:
Using number skills	Calculate using mental and written methods	<ul style="list-style-type: none"> <li>use efficient written methods to add and subtract numbers with up to 2 decimal places</li> <li>multiply and divide 3-digit by 2-digit whole numbers, extending to multiplying and dividing decimals with 1 or 2 places by single-digit whole numbers</li> <li>multiply and divide whole numbers by 0.5, 0.2, 0.1</li> <li>use the order of operations</li> <li><b>add and subtract with negative numbers using mental methods</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>use efficient written methods to add and subtract numbers with up to 2 decimal places</li> <li>use efficient methods for multiplication and division of whole numbers and decimals, including decimals such as 0.6 or 0.06</li> <li><b>multiply and divide with negative numbers using mental methods</b> ❖</li> <li>use the order of operations including brackets</li> </ul>	<ul style="list-style-type: none"> <li>use efficient written methods to add and subtract numbers and decimals of any size, including a mixture of large and small numbers with differing numbers of decimal places</li> <li>multiply and divide whole numbers and decimals</li> <li>use the order of operations including brackets and powers</li> <li><b>use the four operations in multistep calculations involving negative numbers, using mental and written methods</b> ❖</li> </ul>
	Estimate and check	<ul style="list-style-type: none"> <li>use a range of strategies to check calculations including the use of inverse operations, equivalent calculations and the rules of divisibility</li> <li>use rounding to estimate answers</li> <li>present answers to a given number of decimal places</li> </ul>	<ul style="list-style-type: none"> <li>use rounding to estimate answers to a given number of significant figures</li> <li>present answers to a given number of significant figures</li> </ul>	<ul style="list-style-type: none"> <li>make and justify estimates and approximations of calculations</li> <li>choose the appropriate degree of accuracy to present answers</li> </ul>
	Manage money	<ul style="list-style-type: none"> <li>use profit and loss in buying and selling calculations</li> <li>understand the advantages and disadvantages of using bank accounts, including bank cards</li> <li>make informed decisions relating to discounts and special offers</li> </ul>	<ul style="list-style-type: none"> <li>carry out calculations relating to VAT, saving and borrowing, <b>appreciation and depreciation</b> ▲</li> <li>appreciate the basic principles of budgeting, saving (including understanding compound interest) and borrowing</li> </ul>	<ul style="list-style-type: none"> <li>calculate using foreign money and exchange rates</li> <li>understand the risks involved in different ways of saving and investing</li> <li>describe why insurance is important and understand the impact of not being insured</li> </ul>



		Year 7	Year 8	Year 9
Strands	Elements	Learners are able to:	Learners are able to:	Learners are able to:
Using measuring skills	Length, weight/mass, capacity	<ul style="list-style-type: none"> <li>find perimeters of shapes with straight sides</li> <li><b>make estimates of length, weight/mass and capacity based on familiar and less familiar objects</b> ❖</li> <li>read and interpret scales on a range of measuring instruments</li> <li>convert between units of the metric system and carry out calculations</li> <li><b>understand that some measurements take particular values and others can take any value within a given range</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>use the common units of measure, convert between related units of the metric system and carry out calculations</li> <li>use rough metric equivalents of imperial units in daily use</li> <li><b>recognise measurements that are discrete and those that are continuous</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>find circumferences of circles</li> <li>make links between speed, distance and time</li> <li><b>interpret conversion graphs</b> ❖</li> <li><b>define upper and lower bounds of discrete measurements</b> ❖</li> <li><b>recognise that there are different considerations for continuous data</b> ❖</li> </ul>
	Time	<ul style="list-style-type: none"> <li>measure and record time in hundredths of a second</li> <li>use time zones</li> <li><b>recognise time expressed as a decimal, e.g. 1.5, 1.25, 1.75 hours</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>interpret fractions of a second appropriately</li> <li>use timetables and time zones to calculate travel time</li> <li><b>interpret times expressed as decimals</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li><b>use timetables and time zones to calculate travel time for a multi-stage journey</b> ❖</li> <li><b>enter time appropriately on a calculator</b> ❖</li> </ul>
	Temperature	<ul style="list-style-type: none"> <li>record temperatures in appropriate temperature scales</li> </ul>	<ul style="list-style-type: none"> <li>convert temperatures between appropriate temperature scales</li> </ul>	<ul style="list-style-type: none"> <li>convert temperatures between appropriate temperature scales</li> </ul>
	Area and volume Angle and position	<ul style="list-style-type: none"> <li><b>devise and</b> use formulae for the area of rectangles and triangles ▲</li> <li><b>devise and use formulae to calculate the area of parallelograms</b> ❖</li> <li>measure, draw <b>and label angles to the nearest degree, e.g. angle ABC</b> ▲</li> <li><b>use knowledge of angle types to estimate angles</b> ❖</li> <li><b>calculate angles on a straight line, around a point, vertically opposite and in triangles</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>calculate areas of compound shapes (e.g. consisting of rectangles and triangles) and volumes of simple solids (e.g. cubes and cuboids)</li> <li><b>devise and use formulae to calculate the area of trapezia and kites</b> ❖</li> <li><b>find horizontal and vertical distances using coordinates</b> ❖</li> <li>use compass bearings and grid references to specify location</li> <li><b>use bearings to describe the location of one object in relation to another</b> ❖</li> <li><b>know and use the angle properties of quadrilaterals</b> ❖</li> <li><b>understand exterior angles of triangles</b> ❖</li> </ul>	<ul style="list-style-type: none"> <li>find areas of circles</li> <li><b>calculate surface areas of cubes and cuboids</b> ❖</li> <li><b>calculate volumes of prisms constructed from cuboids</b> ❖</li> <li>apply understanding of bearings and scale to interpret maps and plans, and to create plans and drawings to scale</li> <li><b>draw the relative position of objects given the bearing of one from the other</b> ❖</li> <li><b>calculate angles involving parallel lines</b> ❖</li> <li><b>calculate interior and exterior angles of polygons</b> ❖</li> </ul>



Strands	Elements	Year 7	Year 8	Year 9
		Learners are able to:	Learners are able to:	Learners are able to:
Using geometry skills	Shape	<ul style="list-style-type: none"> <li>• make connections between nets and prisms and pyramids ❖</li> <li>• define solid shapes by their properties using the terms edges, faces, vertices and prism ❖</li> <li>• explain the properties of congruent shapes ❖</li> <li>• identify a radius and diameter and use the relationship between them ❖</li> <li>• identify a circumference ❖</li> </ul>	<ul style="list-style-type: none"> <li>• classify quadrilaterals ❖</li> <li>• explore the tessellation of two shapes ❖</li> <li>• recognise shapes that will or will not tessellate ❖</li> </ul>	<ul style="list-style-type: none"> <li>• recognise similar shapes and calculate the size of missing sides with whole number scale factor ❖</li> <li>• explore properties of shapes that tessellate ❖</li> </ul>
	Construction	<ul style="list-style-type: none"> <li>• construct circles using compasses ❖</li> <li>• draw triangles accurately given lengths and angles, using ruler and protractor ❖</li> </ul>	<ul style="list-style-type: none"> <li>• recognise and draw to scale on square paper nets of cubes and cuboids ❖</li> <li>• construct triangles given three lengths, using a ruler and compasses ❖</li> <li>• consider sets of lengths that cannot form a triangle ❖</li> </ul>	<ul style="list-style-type: none"> <li>• represent 3D shapes on isometric paper and draw plans and elevations of 3D shapes made out of cubes ❖</li> <li>• recognise and draw accurate nets of prisms ❖</li> <li>• select and use appropriate equipment to draw triangles when given sufficient angles and sides ❖</li> </ul>
	Movement	<ul style="list-style-type: none"> <li>• translate a shape using a description, e.g. <i>4 squares right and 2 squares down</i> ❖</li> <li>• know the symmetry properties of regular and irregular shapes ❖</li> <li>• rotate a shape on a grid ❖</li> </ul>	<ul style="list-style-type: none"> <li>• describe a translation ❖</li> <li>• explore symmetrical properties of 3D shapes; identify planes of symmetry ❖</li> <li>• enlarge shapes on square paper where the scale factor is a positive whole number ❖</li> </ul>	<ul style="list-style-type: none"> <li>• explore locus where the path is a given distance from a point, line or shape ❖</li> <li>• rotate shapes about the origin ❖</li> <li>• describe rotations about the origin ❖</li> <li>• enlarge a shape around a centre where the scale factor is positive ❖</li> </ul>





		←	Year 7	↔	Year 8	↔	Year 9	→
Strands	Elements	Learners are able to:		Learners are able to:		Learners are able to:		
Using algebra skills	Number sequences	<ul style="list-style-type: none"> <li>distinguish between a term to term rule and a position to term rule ❖</li> <li>start to express position to term rules involving one and two steps in words ❖</li> </ul>		<ul style="list-style-type: none"> <li>use algebra to express the position to term rule ❖</li> <li>use the position to term rule to find particular terms ❖</li> <li>use the position to term rule to generate a sequence ❖</li> </ul>		<ul style="list-style-type: none"> <li>use the position to term rule to determine whether a number is in a sequence ❖</li> <li>determine the position number of a given term ❖</li> </ul>		
	Expressions and formulae	<ul style="list-style-type: none"> <li>show that <math>a + b = b + a</math> and <math>a - b</math> is not equal to <math>b - a</math> ❖</li> <li>show that <math>a \times b = b \times a</math> and <math>\frac{a}{b}</math> is not equal to <math>\frac{b}{a}</math> ❖</li> <li>know that <math>4g \times 2h = 8gh</math> ❖</li> <li>know that <math>b</math> divided by 2 is notated as <math>\frac{b}{2}</math> and <math>\frac{1}{2}b</math> ❖</li> <li>substitute positive whole numbers into one and two step expressions ❖</li> <li>simplify expressions involving the addition and subtraction of two or more variables ❖</li> </ul>		<ul style="list-style-type: none"> <li>know that <math>a \times a = a^2</math></li> <li>know that <math>2a \times a = 2a^2</math> ❖</li> <li>substitute positive and negative whole numbers into one and two step expressions ❖</li> <li>simplify expressions involving the addition and subtraction of two or more variables, including those where one or more of the simplified variables is negative ❖</li> <li>rearrange formulae involving two variables ❖</li> </ul>		<ul style="list-style-type: none"> <li>show and use rules that involve the multiplication, division and use of brackets with index variables ❖</li> <li>substitute into a variety of expressions, including simple quadratic and cubic ❖</li> <li>simplify expressions including expansion of a single bracket, including <math>a(b + c) + d(e + f)</math> ❖</li> <li>rearrange formulae involving two or more variables ❖</li> </ul>		
	Functions and graphs	<ul style="list-style-type: none"> <li>express output generated from two (or more) step function machines, taking into account the order of operations using algebra ❖</li> <li>read, plot and write coordinates in all four quadrants ❖</li> </ul>		<ul style="list-style-type: none"> <li>express output generated from function machines, taking into account the order of operations ❖</li> <li>generate and plot points for linear functions ❖</li> </ul>		<ul style="list-style-type: none"> <li>examine features of linear functions, read an intercept from a graph, and recognise positive and negative gradients ❖</li> <li>recognise the impact of the coefficient of <math>x</math> on the gradient of the line ❖</li> </ul>		

# Key Stage 3 Mathematics Programme of Study



		Year 7	Year 8	Year 9
Strands	Elements	Learners are able to:	Learners are able to:	Learners are able to:
Using algebra skills	Equations and inequalities	<ul style="list-style-type: none"> <li>• solve two step equations ❖</li> <li>• express a set of numbers as an inequality using <math>&lt;</math> <math>&gt;</math> <math>\leq</math> <math>\geq</math> ❖</li> <li>• give solutions for inequalities <math>&lt;</math> <math>&gt;</math> <math>\leq</math> <math>\geq</math>, recognising that there are an infinite number of solutions ❖</li> </ul>	<ul style="list-style-type: none"> <li>• solve equations including those where the solution is a negative, a fraction or a decimal ❖</li> <li>• give a set of solutions from an inequality with two boundaries and show them on a number line ❖</li> <li>• express a set of numbers as an inequality ❖</li> <li>• complete and interpret simple information and distance–time graphs, showing an understanding of gradients within the context of the question ❖</li> </ul>	<ul style="list-style-type: none"> <li>• construct and solve equations that include brackets ( ) and <math>a( ) + b( )</math> ❖</li> <li>• construct and solve equations where the variable appears on both sides of the equals sign ❖</li> <li>• express situations as inequalities ❖</li> <li>• solve inequalities and show the solutions on a number line ❖</li> <li>• construct and interpret information graphs that relate to a variety of situations, e.g. <i>running a bath</i> ❖</li> </ul>
	Using data skills	Collect and record data Present and analyse data Interpret results	<ul style="list-style-type: none"> <li>• collect own data for a survey, e.g. <i>through designing a questionnaire</i></li> <li>• construct frequency tables for sets of data, grouped where appropriate, in equal class intervals (groups given to learners)</li> <li>• construct a wide range of graphs and diagrams to represent the data and reflect the importance of scale</li> <li>• interpret diagrams and graphs (including pie charts)</li> <li>• use mean, median, mode and range to compare two distributions (discrete data)</li> </ul>	<ul style="list-style-type: none"> <li>• plan how to collect data to test hypotheses</li> <li>• construct a wide range of graphs and diagrams to represent discrete and continuous data</li> <li>• construct frequency tables for sets of data in equal class intervals, selecting groups as appropriate</li> <li>• construct graphs to represent data including scatter diagrams to investigate correlation</li> <li>• interpret diagrams and graphs to compare sets of data</li> <li>• use mean, median, mode and range to compare two distributions (continuous data)</li> </ul>



		↔	Year 7	↔	Year 8	↔	Year 9	↔
Strands	Elements	Learners are able to:		Learners are able to:		Learners are able to:		
Using data skills	Probability	<ul style="list-style-type: none"> <li>recognise that impossible = 0 and certain = 1 and that the probability of an event will lie on a scale between 0 and 1 ❖</li> <li>express the probability of an event as a number ❖</li> <li>give simple examples that have a probability of <math>\frac{1}{2}</math> ❖</li> <li>determine events with two outcomes that are/aren't equally likely ❖</li> <li>record all the outcomes of two events as an exhaustive list ❖</li> <li>estimate the number of successes of an event, e.g. <i>flipping a coin ten times, how many heads would be expected?</i> ❖</li> </ul>		<ul style="list-style-type: none"> <li>show that the sum of all probabilities = 1 ❖</li> <li>recognise that some outcomes cannot occur simultaneously, e.g. <i>a coin cannot show heads and tails at the same time</i> ❖</li> <li>know that events that have two outcomes are not necessarily equally likely ❖</li> <li>complete a sample space diagram or two way table ❖</li> <li>estimate the number of successes of an event, e.g. <i>rolling a fair dice 300 times, how many 3s would be expected?</i> ❖</li> </ul>		<ul style="list-style-type: none"> <li>use the sum of all probabilities is 1 – simple cases, e.g. <i>rolling a dice P (not 6)</i> ❖</li> <li>recognise that practice is different from theory and that repeated experiments may give different results ❖</li> <li>construct a sample space diagram or two way table. ❖</li> </ul>		