

MASTERING MATHEMATICS PROGRESSION STRANDS MAPPED TO THE NEW KS3 PROGRAMME OF STUDY

Year 7		→ Year 9																			
Number	NUMBER PROPERTIES	Multiples •Use the concepts and vocabulary of multiples	Factors, Primes and Powers •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 and distinguish between exact representations of roots and their decimal equivalents				Divisibility tests •Recognise and use relationships between operations				Index notation •Use integer powers	Prime Factorisation •Use the concepts and vocabulary of common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation property									
	RATIO AND PROPORTION	Understanding ratio notation •Use ratio notation, including reduction to simplest form •Relate the language of ratios and the associated calculations to the arithmetic of fractions	Sharing in a given ratio •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				Working with proportional quantities •Understand that a multiplicative relationship between two quantities can be expressed as a ratio or a fraction •Solve problems involving direct proportion •Use compound units such as unit pricing to solve problems				The constant of proportionality •Relate the language of ratios and the associated calculations to linear functions •Solve problems involving direct proportion, including graphical and algebraic representations	Working with Inversely proportional quantities •Solve problems involving inverse proportion, including graphical and algebraic representations									
	PERCENTAGES	Understanding and using percentages •Define percentage as 'number of parts per hundred', express one quantity as a percentage of another, compare two quantities using percentages	Calculating percentages of quantities •Interpret percentages as operators				Converting between fractions, decimals and percentages •Order decimals and fractions •Work interchangeably with terminating decimals and their corresponding fractions •Interpret percentages as a fraction or a decimal, interpret these multiplicatively				Applying percentage increases and decreases to amounts •Work with percentages greater than 100% •Solve problems involving percentage change, including: percentage increase, decrease and simple interest in financial mathematics •Interpret percentages as a fraction or a decimal, interpret these multiplicatively	Finding the percentage change from one amount to another •Solve problems involving percentage change	Reverse percentages •Solve problems involving percentage change, including original value problems								
	FRACTIONS	Understanding Fractions •Express one quantity as a fraction of another, where the fraction is less than one and greater than one	Finding equivalent fractions Order fractions				Multiplying fractions •Use multiplication, including formal written methods, applied to proper fractions •Interpret fractions as operators •Relate the language of ratios and associated calculations to the arithmetic of fractions				Adding and subtracting fractions •Use addition and subtraction, including formal written methods, applied to proper fractions	Working with mixed numbers •Use addition, subtraction, and multiplication, including formal written methods, applied to improper fractions and mixed numbers	Dividing Fractions •Use division, including formal written methods, applied to proper fractions								
	ACCURACY	Rounding to the nearest 10 or 100 •Round numbers and measures	Rounding larger numbers •Round numbers and measures	Rounding decimals to the nearest integer •Round numbers and measures	Rounding decimals •Round numbers and measures	Significance •Round numbers and measures				Approximating •Use approximation through rounding to estimate answers	Limits of accuracy •Use approximation and calculate possible resulting errors expressed using inequality notation $a < x \leq b$										
	USING OUR NUMBER SYSTEM	Whole numbers •Understand and use place value for integers of any size •Order positive integers •Use the symbols =, ≠, <, >, ≤, ≥	Understanding Decimals •Understand and use place value for decimals •Order decimals •Use the number line as a model for ordering of the real numbers				Multiplying and dividing by powers of 10 Understand and use place value for decimals				Negative Numbers Order positive and negative integers	Using the number system effectively Understand and use place value for decimals	Writing numbers in standard form •Interpret and compare numbers in standard form $A \times 10^n$, $1 \leq A < 10$, where n is a positive or negative integer or zero								
	CALCULATING	Adding and subtracting whole numbers •Use addition and subtraction, including formal written methods, applied to positive integers	Multiplying whole numbers •Use multiplication, including formal written methods, applied to positive integers	Adding and subtracting decimals • Use addition and subtraction, including formal written methods, applied to positive decimals •Use standard units of money and other measures, including with decimal quantities				Dividing whole numbers •Use division, including formal written methods, applied to positive integers				Adding and subtracting negative numbers •Use addition and subtraction, applied to both positive and negative numbers	Multiplying and dividing negative numbers •Use multiplication and division, applied to both positive and negative numbers	BIDMAS •Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals •Use integer powers	Multiplying decimals •Use division, including formal written methods, applied to decimals •Use standard units of money and other measures, including with decimal quantities	Dividing decimals •Use division, including formal written methods, applied to decimals •Use standard units of money and other measures, including with decimal quantities					
	Algebra	STARTING ALGEBRA	Making and using word formulae •Recognise and use relationships between operations •Substitute numerical values into formulae •Model situations or procedures by translating them into formulae •Interpret mathematical relationships algebraically	Using letters •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	Combining variables •Use and interpret algebraic notation, including: ab, 3y in place of $y + y + y$, a^2 in place of $a \times a$, a^2b in place of $a \times a \times b$, a^2b in place of $a \times a \times b \times y$ instead of $x + y$, coefficients written as fractions rather than decimals •Substitute numerical values into expressions •Understand and use the concepts and vocabulary of expressions and terms •Simplify and manipulate expressions by collecting like terms •Model situations by translating them into algebraic expressions •Interpret relationships algebraically				Working with formulae •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				Setting up and solving simple equations •Understand and use the concepts and vocabulary of equations •Use algebraic methods to solve linear equations in one variable •Interpret mathematical relationships algebraically	Using brackets •Use and interpret algebraic notation, including brackets •Understand and use the concepts and vocabulary of factors •Simplify and manipulate 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	Working with more complex equations •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 $y = mx + c$	Solving equations with brackets •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 •Reduce a given linear equation in two variables to the standard form $y = mx + c$	Simplifying harder expressions •Understand and use the concepts and vocabulary of expressions and factors •Simplify and manipulate algebraic expressions to maintain equivalence by expanding products of two or more binomials •Model situations or procedures by translating them into algebraic expressions •Interpret mathematical relationships algebraically	Using complex formulae •Substitute numerical values into formulae, including scientific formulae •Understand and use standard mathematical formulae: rearrange formulae to change the subject •Model situations or procedures by translating them into formulae •Interpret mathematical relationships algebraically			
		ALGEBRAIC METHODS	Trial and improvement <i>This unit has been included because the technique of trial and improvement is often used in problem solving where, for example, a reasonable approach may result in an equation that does not have an analytical solution that is accessible to students</i>		Linear inequalities •Understand and use the concepts and vocabulary of inequalities				Solve pairs of equations by substitution •Calculate and interpret intercepts of graphs of linear equations numerically, graphically and algebraically				Solve simultaneous equations using elimination •Calculate and interpret intercepts of graphs of linear equations numerically, graphically and algebraically				Using graphs to solve simultaneous equations •Use linear graphs to find approximate solutions of simultaneous linear equations				
		FUNCTIONS AND GRAPHS	Real life graphs •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				Plotting graphs of linear functions •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 versa				The equation of a straight line •Model situations by using graphs •Interpret mathematical relationships algebraically and graphically •Calculate and interpret gradients and intercepts of graphs of linear equations in the standard form $y = mx + c$ numerically, graphically and algebraically				Plotting quadratic and cubic graphs •Model situations by using graphs •Recognise, sketch and produce graphs of quadratic functions of one variable with appropriate scaling, using equations in x and y and the Cartesian plane •Interpret mathematical relationships algebraically and graphically •Use quadratic graphs to estimate values of y for given values of x and vice versa						
SEQUENCES		What is a sequence? •Generate terms of a sequence from a term -to-term rule		Generating sequences •Generate terms of a sequence from a term -to-term or a position-to-term rule				Linear sequences •Generate terms of a sequence from a term-to-term or a position-to-term rule •Recognise arithmetic sequences and find the <i>n</i> th term				Special sequences •Generate terms of a sequence from a term -to-term or a position-to-term rule •Recognise geometric sequences and appreciate other sequences that arise				Quadratic Sequences •Generate terms of a sequence from a term -to-term or a position-to-term rule •Recognise geometric sequences					
3-D SHAPES		Properties of 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 3D •Interpret mathematical relationships both algebraically and geometrically				Understanding Nets •Use the properties of faces, surfaces, edges and vertices of cubes, cuboids, prisms, cylinders, pyramids, cones and spheres to solve problems in 3D				Volume and surface area of cuboids •Derive formulae to calculate and solve problems involving volume of cuboids (including cubes) •Use the properties of faces and surfaces of cubes and cuboids to solve problems in 3D •Interpret mathematical relationships both algebraically and geometrically				2-D representations of 3-D shapes Use the properties of faces, surfaces and edges to solve problems in 3D				Prisms •Derive formulae to calculate and solve problems involving volume prisms (including cylinders) •Use the properties of faces and surfaces of cubes and cuboids to solve problems in 3D •Interpret mathematical relationships both algebraically and geometrically			
TRANSFORMATIONS		Position and Cartesian coordinates •Position and Cartesian coordinates •Work with coordinates •Use the standard notations for labelling the sides and angles of triangle ABC	Cartesian coordinates in four quadrants •Work with coordinates in all four quadrants				Translation •Identify properties of, and describe the results of translations, applied to given figures	Reflection •Identify properties of, and describe the results of reflections, applied to given figures	Rotation •Identify properties of, and describe the results of rotations, applied to given figures				Enlargement •Use scale factors •Construct similar shapes by enlargement, with and without coordinate grids	Similarity •Use scale factors •Apply angle facts, similarity and properties of quadrilaterals to derive results about angles and sides •Interpret mathematical relationships both algebraically and geometrically	Trigonometry •Use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles •Interpret mathematical relationships both algebraically and geometrically						
CONSTRUCTIONS		Angles in degrees •Draw and measure angles in geometric figures				Constructions with a ruler and protractor •Draw and measure line segments and angles in geometric figures •Identify and construct congruent triangles				Constructing with a pair of compasses •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				Loc •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							
MEASURING SHAPES		Understanding area •Derive formulae to calculate and solve problems involving area				Finding area and perimeter •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 and geometrically				Circumference •Calculate and solve problems involving perimeters of 2-D shapes (including circles) and composite shapes •Interpret mathematical relationships both algebraically and geometrically				Area of circles •Calculate and solve problems involving areas of circles and composite shapes •Interpret mathematical relationships both algebraically and geometrically				Pythagoras' Theorem •Derive Pythagoras' Theorem •Use Pythagoras' Theorem to solve problems involving right-angled triangles •Interpret mathematical relationships both algebraically and geometrically			
PROPERTIES OF SHAPES		Common shapes •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				Line symmetry •Describe, sketch and draw using conventional terms and notations: polygons that are reflectively symmetric				Angle facts •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				Rotational symmetry •Describe, sketch and draw using conventional terms and notations: polygons that are rotationally symmetric				Angles in triangles and quadrilaterals •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	Types of Quadrilaterals •Derive and illustrate properties of triangles and quadrilaterals using appropriate language and technologies •Interpret mathematical relationships both algebraically and geometrically	Angles and Parallel lines •Understand and use the relationship between parallel lines and alternate and corresponding angles	Angles in a polygon •Use the sum of angles in a triangle to deduce the angle sum in any polygon, and to derive properties of regular polygons •Interpret mathematical relationships both algebraically and geometrically •Use known results to obtain simple proofs
UNITS AND SCALES		Length •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	Mass •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	Time •Use standard units of time •Change freely between related standard units				Volume •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	Interpreting Scales Understand a use place value for measures				The metric system •Understand a use place value for measures •Use standard units of measures, including with decimal quantities •Change freely between related standard units	Metric-imperial conversions •Understand a use place value for measures •Use standard units of measures, including with decimal quantities •Change freely between related standard units	Bearings •Draw and measure line segments in geometric figures, including interpreting scale drawings •Interpret mathematical relationships both algebraically and geometrically	Scale drawing •Use scale factors, scale diagrams and maps •Use ratio notation •Draw and measure line segments in geometric figures, including interpreting scale drawings	Compound units •Use compound units such as speed and density to solve problems				
PROBABILITY	Introduction to Probability •Record, describe and analyse the frequency of outcomes of simple probability using appropriate language and the 0-1 probability scale				Single event probability •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				Combined events •Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams •Generate theoretical sample spaces for combined events with equally likely, mutually exclusive outcomes and use these to calculate theoretical probabilities				Estimating probability •Record, describe and analyse the frequency of outcomes of simple probability experiments involving randomness, fairness, and unequally likely outcomes using appropriate language and the 0-1 probability scale								
COLLECTING DATA	Collecting data <i>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</i>										Designing a questionnaire <i>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</i>										
STATISTICAL DIAGRAMS	Using tables and charts •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				Stem and leaf diagrams •Describe, interpret and compare observed distributions of a single variable through appropriate graphical representation involving discrete data				Vertical line charts •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				Pie Charts •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				Displaying Grouped Data •Describe, interpret and compare observed distributions of a single variable through appropriate graphical representation involving continuous and grouped data •Construct and interpret appropriate tables, charts and diagrams, including frequency tables, for grouped numerical data				Scatter diagrams •Describe simple mathematical relationships between two variables in observational and experimental contexts and illustrate using scatter graphs
STATISTICAL MEASURES	Mode, median and Range •Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency and spread				Using Mean, Median, Mode and Range •Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency and spread				Using Frequency Tables •Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency				Using Grouped Frequency Tables •Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency				Interquartile range •Describe, interpret and compare observed distributions of a single variable through appropriate measures of central tendency				
Use a calculator and other technologies to calculate results accurately and then interpret them appropriately																					
Develop fluency, reason mathematically and solve problems																					

KEY

Band	b	c	d	e	f	g	h
Approximate equivalent old National Curriculum Level	2	3	4	5	6	7	8

Bold titles are the names of the units in *Mastering Mathematics*, bullet points show how each unit maps to the new KS3 programme of study. Due to their pervasive nature, aspects of ratio and proportion occur across several *Mastering Mathematics* strands. These are highlighted in purple.