Mathematics KS3 Programme of Study

This document outlines the prescribed syllabus that students will be taught within Key Stage 3. The curriculum develops understanding from Key Stage 2 and guides learners on a journey towards the understanding they need to succeed at Key Stage 4.

Students that arrive at any point within Year 7, 8 and 9 can slot into each strand based upon their previous knowledge. They can then acquire new skills to move towards GCSE mastery.

Glossary of Terms

Number

BODMAS – Order of operations – Is the order in which a calculation should be solved. It stands for Brackets, pOwers, Division, Multiplication, Addition, Subtraction (Can also be known as BIDMAS – using Indices instead of Powers which are the same thing)

Factor – A number that divides exactly into another number e.g. 5 is a factor of 20

HCF – highest common factor – the highest number that can be divided exactly into a set of numbers

Interger – A whole number

Inverse operations – the opposite operation e.g. subtraction is the inverse of addition and division is the inverse of multiplication

LCM – lowest common multiple – the smallest number that's in the times table of a group of numbers

Multiple – A value in a number's times table e.g. 20 is a multiple of 5

Operations – the collective term for + - x ÷

Place Value - the value represented by a digit in a number on the basis of its position in the number e.g. in the number 254, the 2 is equal to 200, the 5 is equal to 50 and the 4 is equal to 4.

Product – the result when two things are multiplied together e.g. 20 is the product of 4x5

Powers – also known as Indices - An expression that represents repeated multiplication of the same factor e.g. 2^2 is the same as 2x2 and 4^5 is the same as 4x4x4x4x4

Root – is the inverse of a power e.g. the square root of 9 is 3 because 3^2 is 9. Normally shown $\sqrt{9}$

Algebra

Consecutive – following each other continuously

Equation – An algebraic statement made up of two expressions separated by an equals sign e.g. 2x + 3 = y

Expand – To multiply out brackets to remove them from an expression

Expression – A collection of terms made up of numbers and letters, separated by + or – signs

Formula – A rule for working something out often written using an algebraic expression

Inequalities – The relationship between two expressions which are not equal to one another. The symbols used for inequalities are: Less than or equal to ≤, More than or equal to ≥, Not equal to ≠

N^{th} Term – the rule for working out the value in a sequence

Quadrants – A quarter of a grid

Term – Each part of an expression expressed by a letter or number or both

Variable – An unknown quantity, usually shown by a letter

Ratios

Denominator- The bottom number in a fraction. Shows how many equal parts the item is divided into.

Equivalent fractions- fractions which have the same value, even though they may look different. Example ½ and 2/4 are equivalent, because they are both "half"

Improper fractions- A fraction where the numerator(the top number) is greater than or equal to the denominator(the bottom number)

Mixed numbers/Mixed fractions- A whole number and a fraction combined into one "mixed" number. Example: 1½ (one and a half) is a mixed number

Numerator- The top number in a fraction. Shows how many parts we have.

Geometry

Acute angle- An angle less than 90° (90° is called a Right Angle)

Obtuse- An obtuse angle is more than 90° but less than 180°

Perpendicular lines- Lines that are at right angles (90°) to each other

Reflex- An angle that is more than 180° but less than 360°

Symmetry- When two or more parts are identical after a flip, slide or turn.

Statistics

Continuous data- Data that can take any value (within a range) Example: People's heights could be any value (within the range of human heights)

Discreet data- Data that can only take certain values. Example: the number of students in a class (you can't have half a student).

Outliers- A value that "lies outside" (is much smaller or larger than) most of the other values in a set of data.

Key Stage 3- Number Strand

Apply place value to real life contexts			-understand the value of number			GCSE Level Foundation Mastery
Recognise the difference between odd and even numbers	Recognising the place value of a two digit number	Recognising the place value of a three and four digit numbers	Recognise the place value office and six digit numbers	Recognising the value of a decimal number (make link between decimals and fractions)	State the value of a decimal number. Ordering decimal numbers up to four decimal places	Understand and use place value for decimals, measures and integers of any size

Apply knowledge to solve problems		-understand the concept of addition			GCSE Level Foundation Mastery
Add a two digit number using formal written method	Adding two digit number that require carrying	Adding three digit numbers (including carrying)	Adding four digit numbers (including carrying)	Use addition to solve word problems in real life context	Carry out addition: formal written method to integers, decimals and simple fractions

Use the calculator accurately and appropriately		-able to use a calculator to support mathematics			GCSE Level Foundation Mastery
Using calculator to carry out four operations using whole numbers	Use calculator to carry out operations using decimals	To be able to read the calculator and supply the answer in correct monetary unit	calculate powers and roots		Confidence in use of a calculator and ability to use accurately

Apply numerical knowledge to solve problems related to division		-understand the concept of division			GCSE Level Foundation Mastery
Explain Division using objects and different representations	Divide 2 digits by 1 digit without remainders	Divide 3 digits by 1 digit without remainders	Divide 3 and 4 digits by 2 digit With/out remainders	Divide 3 and 4 digits by 2 digit with a decimal product	Solve multiplication problems using a real life context	Carry out Division : formal written method (Short and long division)to integers, decimals and simple fractions

Key Stage 3- Number Strand continued

Use the concepts and vocabulary of factors and multiples			-understand a factor and multiple			GCSE Level Foundation Mastery
To understand the definition of factors and multiples	Identify multiples	Identify factors	Identify and recognise factors and multiples from a given list	Find the highest common factor and lowest common multiple		To understand the concept of factors and multiples

Be able to make calculations using inverse calculation			-understand the concept of inverse			GCSE Level Foundation Mastery
Number bonds to 10 Addition and Subtraction facts	Number bonds to 20 Addition and Subtraction facts	Number bonds to 100 Addition and Subtraction facts	Use inverse operations to check calculations Addition and subtraction	Use inverse operations to check calculations Division and multiplication		Understanding the inverse relationship between operations (addition and subtraction/division and multiplication)

Be able to accurately measure and convert units			-understands the units of measure and conversions			GCSE Level Foundation Mastery
Recognise units of measure: length (m/cm) mass (kg/g), Capacity,(litres/ml)	Measure m, cm, mm using a ruler	Convert between m,cm,mm	Solving problems involving m cm mm	Know and convert grams, kilo grams, Tonnes Know and convert capacity, millilitres and litres	Solving real life problems using units of measure	Choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm) mass(kg/g), Capacity,(litres/ml) to the nearest appropriate units

Apply knowledge of money to real life contexts			-understand the values of money and how it is presented			GCSE Level Foundation Mastery
Identify values of coins and notes, recognise symbols	Combine amounts to make values	Convert pence to pounds and pounds to pence	Use estimation to calculate	Solve problems involving money and calculation		To understand the value of money including decimals

Key Stage 3- Number Strand continued

Apply knowledge to solve problems using multiplication			-understand the concept of multiplication			GCSE Level Foundation Mastery
Explain multiplication using concrete objects and different representations	Recall and derive multiplications facts for x2,x4,x8; x5 x10; x3,x6,x9	Fluent in all x tables up to 12	Multiply by 2 and 3 digit numbers using formal written layout	Multiply 4 digit numbers by 1 or 2 digit number using a formal written method	Solve multiplication problems using a real life context	Carry out multiplication: formal written method to integers, decimals and simple fractions

Order number and apply to real life context			-understand the concept of a negative number			GCSE Level Foundation Mastery
Recognise the symbol for a negative number	Recognise that 0 is a place value holder	Placing positive and negative numbers on a number line	Order positive and negative numbers without the number line	Apply this knowledge to real life problems		Recognise and understand negative numbers

Complete a range of calculations using BODMAS as a tool			-how to carry out an accurate calculation without using a calculator			GCSE Level Foundation Mastery
Recognise the importance of completing calculations in the correct order	Understand the acronym BODMAS	Calculations using + - x ÷	Calculations using + - x ÷ brackets	Calculations using + - x ÷ brackets powers and routes		Use conventional notation for the priority of operations, including brackets, powers, roots and reciprocals

Key Stage 3- Number Strand continued

Calculate using percentages			-understand that a % means parts per 100			GCSE Level Foundation Mastery
Recognise the % symbol Understand percent relates to a number of parts per hundred and as a decimal	Calculate the percentage of a number 10%, 50%, 25% Link to decimals and fraction	Using these products (previous step) to calculate percentages between 1 – 99 Link to decimals and fractions	Find the whole given the part and the percentage Link to decimals and fractions	Find the percentage of a number other than 100	Calculate percentages in real life contexts	Define percentage as number parts of 100 and calculate percentages Understand the relationships between decimals fractions and percentages

Apply their knowledge of place value and rounding to estimate			-know the place value of each digit			GCSE Level Foundation Mastery
Round 2 digit numbers to 10	Round 3 digit numbers to 100	Round any number to the nearest 10, 100 or thousand	Round one decimal place to the nearest whole number	Round numbers up to 2 decimal places to one decimal place and whole number	Use rounding to estimate calculations	Round numbers and measures to an appropriate degree of accuracy

Apply knowledge to solve problems			- understand the concept of subtraction			GCSE Level Foundation Mastery
Subtract a two digit number using formal written method	Understand 0 as a place value and the effect within subtraction	Subtract two digit number that require carrying	Subtract three digit numbers (including carrying)	Subtract four digit numbers (including carrying)	Use subtraction to solve word problems in real life context	Carry out subtraction: formal written method to integers, decimals and simple fractions

Key Stage 3- Algebra Strand

Be able to recognise that algebraic notation is an unknown			-be able to manipulate an algebraic expression			GCSE Level Foundation Mastery
Collect like terms 3y in place of y + y + y and 3 × y	Simplify by multiplying and dividing A/b in place of a ÷b ab in place of a × b	Understand that a x a becomes a^2 etc	Multiply a single term over a bracket	Expand and simplify an algebraic expression in two brackets. 3(x+ 5) + 4(x +2)		Simplify and manipulate algebraic expressions to maintain equivalence

Recognise an equation with an unknown and manipulate it			-use algebraic methods to solve linear equations in one variable			GCSE Level Foundation Mastery
Be able to find the missing number	Express missing number problems algebraically	Solve missing number problems algebraically (addition , subtraction)	Solve missing number problems algebraically including all four operations (make link to using the inverse)	Solve two step algebraic equations 3x + 5 = 20	Solve two step algebraic equations with a variable on each side 3x + 5 = 20 + x	Use algebraic methods to solve linear equations in one variable

Understand what variables in a formula stand for			-problems using substitution			GCSE Level Foundation Mastery
Substitute in to a simple expression What is the value of x + 3 when x =10	Substitute in to a expression What is the value of 3x + 4 when x =304	Substitute in to a formula for example pay per hour (How much does Bob earn when he works for 5 hours at £8.95).	Substitute in to a formula for example speed, distance, time			Substitute numerical values into formulae and expressions, including scientific formulae

Key Stage 3- Algebra Strand continued

Be able to describe and interpret co-ordinates and linear graphs			-Plot co-ordinates in linear graphs			GCSE Level Foundation Mastery
Be able to read co-ordinates in the first quadrant	Recognise co-ordinates in all four quadrants	Recognise the vocabulary e.g. origin equals 0,0	Be able to plot and recognise named lines e.g. Y= 5 , X = -3	Use substitution to plot graphs of simple linear equations e.g Y = X + 4		Work with coordinates in all four quadrants

Recognise patterns within sequences			-To be able to find and generate sequences			GCSE Level Foundation Mastery
Recognise a sequence of number or images	Continuing a sequence	Find a missing number in a sequence	Recognise non linear sequences E.g. square numbers, triangular numbers	Understand the vocabulary associated with sequences e.g. term, generate, consecutive	Find the nth term and generate a sequence given the nth term	Generate terms of a sequence from either a term-to-term or a position-to-term rule

The notation associated with inequalities. =, ≠, , ≤, ≥			-Be able to apply inequality notations			GCSE Level Foundation Mastery
Identify an expression, equation or inequalities	Understand the notation associated with inequalities. =, ≠, , ≤, ≥	Solve inequalities				Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors

Key Stage 3- Ratio, Proportion & Rates of Change Strand

Be able to recognise difference units of measures and their applications		-Be able to convert between different units of measure			GCSE Level Foundation Mastery
Recognise different units of measure used in context And their abbreviations e.g. kg	Measure and record • Lengths and height • Mass and weigh • Capacity and volume	Convert between metric units. Recap multiplying by 10, 100, 1000	Measure , compare add and subtract lengths, weights and capacity	Use metric conversion in real life context.	change freely between related standard units [for example time, length, area, volume/capacity, mass]

Knowing the term scales and what that means	-be able to use scale in real life context			GCSE Level Foundation Mastery
Recap ratios e.g. 1:100	Understand the term scale	Solve practical problems using simple scales e.g. 1-20	Use scale practice to enlarge shapes	Solve practical problems using real life examples e.g. maps	Use scale factors, scale diagrams and maps

Know that denominators make up the bottom number in equal parts and that the top part is the numerator	-be able to compare and order fractions			GCSE Level Foundation Mastery
Knowing what a numerator and a denominator e.g. ¼ 4 parts equal a whole	Recogise find , name and write fractions 1/3 ¼ 2/4 and ¾ of a length, shape set of objects or a quantity	Order fractions with the same denominator	Recognise equivalent fractions	order fractions and compare fractions with different demoniators	Recognise mixed numbers and improper fractions, convert and calculate	Understand and manipulate fractions

Key Stage 3- Ratio proportion and rates of change Strand continued

That a fraction is a part of a whole			-be able to use fractions to sole solve calculations			GCSE Level Foundation Mastery
Knowing what a numerator and a denominator e.g. ¼ 4 parts equal a whole	Add and subtract fractions with the name denominator within one whole	Adding and subtract fractions with different dominators	Multiply and divide fractions and simply writing the answer in its simplest form	Calculate a fraction of an amount	Express one quantity as a fraction of another where a fraction is less than one or greater than one.	Calculate fractions

Understanding the meaning of ratio			-Be able to use ratio in real life context (money)			GCSE Level Foundation Mastery
Recognise ratio and proportion notation	Be able to reduce a ratio to its simplest form	Divide a quantity by a given ratio	Solving problems using ratio e.g scaling Eg 3 parts cement how much sand is needed	Solve best buy problems. Using informal strategies or the unitary method		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; apply ratio to real contexts and problems.

Understand the impact of percentage increase and decrease			-calculate percentages for a real life contexts.			GCSE Level Foundation Mastery
Calculate the percentage of a number 10, 50, 25 Link to decimals and fractions	Understand the difference between percentage increase and decrease	Find a percentage of an amount and Be able to add or subtract the increase or decrease	Using a multiplier to find the percentage increase or decrease. (Calculator)	Calculate simple interest	Calculate the original value. I.e. depreciation of a car	Solve problems involving percentage change, including percentage increase/decrease, and simple interest

Key Stage 3- Geometry and Measure Strand

Solve problems relating to area and perimeter of polygons			-recall the formula for calculating the area and perimeter of polygons			GCSE Level Foundation Mastery
Know the difference between area and perimeter	Calculate the perimeter of a rectangle	Find the area of a triangle	Solve problems involving compound shapes (area, perimeter, missing sides)	Find the area and sides of parallelograms, trapezia	Find the area and perimeter of a circle	Derive and apply formulae to calculate and solve problems involving: perimeter and area of quadrilaterals, triangles, parallelograms and trapezia.

Solve problems relating to volume of prisms			-be able to recall the formula for calculating the area for finding volume			GCSE Level Foundation Mastery
Know the difference between area and perimeter and volume	Recap the formula for the area of polygons	Make 3D models of polygons	Apply a given formula to find the volume of cubes and cuboids	Apply a given formula to find the volume of other prisms		Calculate the volume of different prisms

Accurately measure, draw an angle			-identify angles			GCSE Level Foundation Mastery
Measure m, cm, mm using a ruler	Be able to use a protractor to measure an angle accurately	Identify parallel and perpendicular lines	Identify a right angle, an acute, reflex, angle and obtuse angle.	Be able to use a protractor to draw and angle accurately		Draw and measure line segments and angles in geometric figures, describe, points, lines, parallel lines, perpendicular lines, right angles

Key Stage 3- Geometry and Measure Strand continued

To solve problems involving properties of shapes.			-describe the properties of shape			GCSE Level Foundation Mastery
Recognise shapes	Describe properties of shapes, i.e. angles, symmetry, diagonals and sides	Describe the properties of triangles and their names	To solve problems involving properties of shape given their properties-understand the fractions are part of a whole.	Be able to identify parts of a circle		Use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries; use the standard conventions for labelling and referring to the sides and angles of triangles;

Key Stage 3- Probability Strand

Calculate possible outcomes			-understand the concept and vocabulary of probability			GCSE Level Foundation Mastery
Understand mathematical vocabulary. Impossible, certain, unlikely	Understand the 0-1 scale of probability and link with fractions	Describe the probability of an event happening. E.g. rolling a 4 on a fair dice.	Understand that all probabilities have an outcome of the sum of 1 e.g. The chances of rolling a six is 1/6 chances of not rolling a 6 is 5/6.			Record, describe and analyse the frequency of outcomes of probability experiments. Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes,relate relative expected frequencies to theoretical probability, using appropriate language and the 0-1 probability scale.

Calculate probabilities from sample space diagrams			-understand how to systematically record potential outcomes			GCSE Level Foundation Mastery
Understand what a mutually exclusive event is.	Complete a sample space diagram.	Use the sample space diagram to calculate the potential probability	Use a sample space diagram to predict outcomes.			Construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities

Key Stage 3-Statistics Strand

be able to choose the appropriate graph and measure of average			-know the vocabulary of statistical measures			GCSE Level Foundation Mastery
Understand the meaning of discreet and continuous data	Interpret and present discreet and continuous data using appropriate graphical methods	Understand the vocabulary of averages. Mean, median , mode	Be able to calculate averages and range.	Consider outliers and their impact on the result.		interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: ● appropriate graphical representation involving discrete, continuous and grouped data ● appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers)

Construct and interpret information presented graphically			-recognise the different way information can be presented graphically.			GCSE Level Foundation Mastery
Collect data by means of tally chart	Interpret and construct simple pictograms, tally charts, block diagrams and tables.	Answer questions using pictograms, tally charts and basic diagrams.	Solve one step and two step questions. E.g. how many more or how many fewer. Using information presented in scaled bar charts and pictograms and tables.	Solve comparison, sum and difference problems using information presented in a line graph.	Interpret and construct pies charts.	Interpret and construct tables, charts and diagrams, including frequency tables, bar charts, pie charts and pictograms for categorical data, vertical line charts for ungrouped discrete numerical data, tables and line graphs for time series data and know their appropriate use