

Malbank School Mathematics Curriculum



Malbank School
& Sixth Form College

Intent: In Malbank's Mathematics Department we aim to develop confident and enthusiastic mathematicians who understand the relevance, value and beauty of mathematics and its place in the world. We will give students opportunities to look more deeply into mathematical concepts and where they can be used, so that they can see the links between the different aspects of the course to help them gain a greater understanding of the subject.



Knowledge and progression of topics over the 5 years are broken down into the categories of:

1. Number
2. Algebra
3. Ratio & Proportion
4. Geometry and Measure
5. Statistics
6. Probability

The progression routes for these are on the following pages.



Throughout the Maths curriculum and years we look to develop learners who demonstrate:

- Resilience
- Good communicators
- Good organisers, both written, verbal and mathematically
- Initiative
- Self-motivated
- Supportive
- Reflective
- Inquisitive
- Positive learners



The skills we nurture and develop throughout the Maths curriculum are:

- To write mathematically and logically
- Understand and use mathematical terminology and notation
- Interpret problems
- Apply mathematical knowledge to different contexts and understand how Maths can be used in the wider world
- Link different topics together
- Realise there can be multiple routes to solutions

1. Number

7	8	9	10	11
order positive and negative integers	order positive and negative decimals and fractions use the symbols =, ≠, <, >, ≤, ≥	Revisit through all situations e.g. when collecting like terms and simplifying expressions	Revisit through all situations e.g. when collecting like terms and simplifying expressions	Revisit through all situations e.g. when collecting like terms and simplifying expressions
Apply the four operations, including formal written methods, to integers both positive and negative	apply the four operations, including decimals and fractions			
Understand and use place value - multiplying and dividing by 10,100,1000	understand and use place value multiplying and dividing by powers of 10	Write large and small numbers in standard form	Calculate with and interpret standard form	
Recognise and use relationships between operations. Use conventional notation for priority of operations	recognise and use relationships between operations, including inverse operations Understand and use BIDMAS			
Understand factors, multiples and use to find HCFs & LCMs	Write all numbers as a product of their prime factors			
	apply systematic listing strategies		Use of the product rule for counting for counting	
use positive integer powers and square and cube roots	use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5		estimate powers and roots of any given positive number	
calculate with roots, and with integer indices		Know and understand negative indices	calculate with fractional indices	
calculate exactly with fractions	calculate exactly with multiples of pi		calculate exactly with surds simplify surd expressions involving squares and rationalise denominators	
work interchangeably with terminating decimals and their corresponding fractions		change recurring decimals into their corresponding fractions and vice versa		
interpret fractions and percentages as operators	identify and work with fractions in ratio problems	including interpreting percentage problems using a multiplier.		
use standard units of mass, length, time, money and other measures using decimal quantities where appropriate. Know and use metric conversion factors for length,	use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate	know and use metric conversion factors for length, area, volume and capacity.		
round numbers and measures to an appropriate degree of accuracy	estimate answers check calculations using approximation and estimation	use inequality notation to specify simple error intervals due to truncation or rounding	apply and interpret limits of accuracy including upper and lower bounds	

2. Algebra (Part 1)

	Year 7	Year 8	Year 9	Year 10	Year 11
A1	Use and interpret algebraic notation, including coefficients written as fractions rather than as decimals brackets				
A2	Substitute into basic expressions	Substitution into more complex expressions and formulae (including scientific)			
A3	Substitution into more complex expressions and formulae (including scientific)	Recap vocabulary from year 7, extend to looking at identities, formulae and inequalities			
A4	Collect like terms Expand single brackets Factorise single brackets	Expand and simplify expressions with multiple brackets	Simplify expressions involving indices Expanding 2 binomials Factorising quadratics	Expanding two or more binomials Factorising quadratics of the form ax^2+bx+c , including difference of two squares. Expanding and simplifying including laws of surds.	Simplify and manipulate algebraic fractions
A5		Understand and use standard formulae	Rearrange formulae to change the subject	Rearrange formulae to change the subject where the unknown appears more than once	
A6		Know the difference between identities and equations		Produce mathematical arguments and algebraic proofs	
A7	Use function machines to find inputs and outputs				Function notation including inverse and composite functions
A8	Read and plot coordinates in all 4 quadrants				
A9		Plot linear graphs from the coordinates	Recognise gradients and intercepts of linear graphs. Recognise parallel graphs	Find the equation of a line given 2 points. Calculate equations of perpendicular lines	
A10			Identify and interpret gradients and intercepts of linear functions graphically and algebraically, using real life examples		
A11		Factorise basic quadratics	Solve quadratic equations by factorising Solve quadratic equations using the formula Find approximate solutions from graphs	Solve quadratics by completing the square	
A12			Plot quadratic equations, identifying roots, intercepts and turning points of quadratic equations	Deduce turning points by completing the square	

2. Algebra (Part 2)					
	Year 7	Year 8	Year 9	Year 10	Year 11
A13			Recognise, sketch and interpret graphs of linear and quadratic functions		Plotting and sketching simple cubic, and reciprocal functions Plotting and sketching exponential functions and trigonometric functions
A14					Sketch translations and reflections of a given function
A15		Plot real life graphs, including speed distance time	Plot real life graphs, including speed distance time	Plot real life graphs including reciprocals and exponentials	
A16				Calculate and estimate gradients of graphs are areas under graphs and interpret results	
A17					Recognise and use the equation of a circle with centre at the origin Find the equation of a tangent to a circle at a point
A18	Solve linear equations in one unknown algebraically	Solve linear equations with unknowns on both sides	Find approximate solutions to linear solutions using a graph		
A19			Solve two simultaneous equations in two variable (linear/linear) algebraically Find approximate solutions to simultaneous equations using a graph	Solve linear/quadratic simultaneous equations algebraically and graphically	
A20					Find approximate solutions to equations numerically using iteration
A21	Translate simple situations into algebraic expressions	Translate simple algebraic situations into expressions and formulae and substitute to solve	Derive an equation or two simultaneous equations and solve the equations and interpret the solutions		
A22		Find integer solutions to inequalities	Solve linear inequalities in one variable Represent the solution set on a number line	Solve linear inequalities in one or two variables and quadratic inequalities in one variable Represent the solution set on using set notation and regions on a graph	
A23	Generate terms of a sequence from term to term rules, including patterns and diagrams	Generate terms of a sequence using a position to term rule			
A24	Recognise and use sequences of triangular, square and cube numbers	Recognise and use Fibonacci-type sequences and quadratic sequences	Recognise and use simple geometric progressions	Recognise and use other sequences including using surds	
A25	Write nth term rules for linear sequences		Write nth term rules for quadratic sequences		

3. Ratio & Proportion

Year 7	Year 8	Year 9	Year 10	Year 11
R1 - change freely between related standard units (eg time, length, area, volume/capacity, mass)	R1 - change freely between related standard units (eg speed, rates of pay, prices) in numerical contexts	R1 - compound units (eg density, pressure)	R1 - in numerical and algebraic contexts	R5 -apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)
R2 - Scales	R3 - express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1	R2- scale factors	R2 - scale factors, scale diagrams and maps	R9 -solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics
R4- use ratio notation, including reduction to simplest form	R5 -apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)	R5 -apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)	R5 -apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations)	solve problems including graphical and algebraic representations
R5 -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 (such as those involving conversion, comparison, scaling, mixing, concentrations)	R8-relate ratios to fractions	R6- express a multiplicative relationship between two quantities as a ratio or a fraction	R9 -solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics	R13 - construct and interpret equations that describe direct and inverse proportion
R7- understand and use proportion as equality of ratios	R9 - compare two quantities using percentages solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics	R8 - relate ratios to linear functions	R10 - solve problems involving direct and inverse proportion	R14 - interpret the gradient of a straight-line graph as a rate of change recognise and interpret graphs that illustrate direct and inverse proportion
R9 - define percentage as 'number of parts per hundred' interpret percentages and percentage changes as a fraction or a decimal, and interpret these multiplicatively express one quantity as a percentage of another work with percentages greater than 100% Solve problems		R9 -solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics	R11 - use compound units such as density and pressure	R15 - interpret the gradient at a point on a curve as the instantaneous rate of change apply the concepts of average and instantaneous rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts
		R11 - use compound units such as speed, rates of pay, unit pricing	R12 - make links to similarity (including trigonometric ratios)	R16 - set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes
		R12 - compare lengths, areas and volumes using ratio notation scale factors	R13 - understand that X is inversely proportional to Y is equivalent to X is proportional to interpret equations that describe direct and inverse proportion	
			R16 - set up, solve and interpret the answers in compound interest	

4. Geometry & Measures

	Year 7	Year 8	Year 9	Year 10	Year 11
	2D & 3D Shape Properties	Bisectors	Loci		
	Angles on a line/point/vertically opposite/triangle	Angles on parallel lines & polygons	Bearings & Scale Drawings		
	Lines of symmetry Reflection in a mirror line Rotation from a given point Translations using words Enlargement with a scale factor Rotational symmetry	Reflections with an equation of a line Rotation about a co-ordinate point Translations with vectors Enlargement from a point	Enlargement with a fractional scale factor Column vectors (Addition, subtraction & multiplication)	Enlargement with a negative scale factor Vector proofs	Describe transformation invariants.
	Perimeter and area rectangles, triangles, parallelograms, trapeziums, compound Properties of circles - radius/diameter/circumference S.A. cuboids/triangular prisms	Circumference and area of circles/semi-circles S.A. cylinders Volume prisms	Area and perimeter - Sectors S.A. sphere/cone Volume - cone/sphere/pyramid Circle properties - tangent/arc/sector/segment	Area using trig $\frac{1}{2}ab\sin C$ Volume frustums	Circle theorems
			Congruence/similarity		Similarity - area & volume
		Pythag	Trig (right-angled)	Trig - 3D/non-right angled	Trig exact values
		Convert metric units	Converting time	Converting measures of area & volume	
				Solve geometric problems on coordinate axes	
		Plans & elevations			

5. Statistics

	Year 7	Year 8	Year 9	Year 10	Year 11
S1	Be able to collect data and use to test hypotheses	Sampling methods and identifying different types of data	Be aware of different sampling methods and the pros and cons of each one, including random sampling	Carry out stratified sampling methods and know the pros and cons of this	Review and recap through starters, assessments and therapy
S2 & S3	Choose appropriate types of graphs for data sets. Construct and interpret frequency tables, bar charts, pie charts and pictograms	Tables and line graphs for time series data	Construct and interpret cumulative frequency graphs & boxplots	Construct and interpret histograms with unequal class intervals	Review and recap through starters, assessments and therapy
S4	Know and use appropriate measures of central tendency and spread	Calculate measures of central tendency for grouped data presented in table form	Calculate quartiles, interquartile range and percentiles	Review and recap through starters, assessments and therapy	Review and recap through starters, assessments and therapy
S5	Apply appropriate statistical techniques to interpret data sets and populations and draw conclusions using the techniques mentioned in appropriate year				
S6		Plot scatter graphs with bivariate data and draw lines of best fit Recognise correlation	Use lines of best fit to make predictions	Recap and interpolate/extrapolate trends and know the limitations of doing this	Review and recap through starters, assessments and therapy

6. Probability

	<u>Year 7</u>	<u>Year 8</u>	<u>Year 9</u>	<u>Year 10</u>	<u>Year 11</u>
P1	Know the difference between theoretical and experimental probability. Conduct probability experiments and record outcomes appropriately.	Analyse the frequency of outcomes using frequency trees and two way tables			
P2	Understand concepts of randomness, fairness and equally likely events.	Calculate expected outcomes of multiple future experiments			
P3/P4/ P5	Introduce the probability scale and know the appropriate language for probability. Understand that 1 is the largest probability of an event occurring	Apply the property that the probabilities of an exhaustive set of outcomes sum to 1 - use this to find probabilities of events not happening	Compare relative frequency to theoretical probability Know that the more you do an experiment; the more accurate the results will become		
P6/P7		List outcomes systematically	Construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities		
P8/P9		Use tree diagrams to show the probability of combined independent events	Use tree diagrams to show the probability of dependent events	Calculate probabilities of successive dependent events Calculate and interpret conditional probabilities through representation using expected frequencies Know when to add and when to multiply two or more probabilities	Calculate probabilities using Venn diagrams and set notation.