

## Curriculum Intent

Mathematic teachers are striving for all students to be successful and enjoy the subject, irrespective of their prior experience. Students will be encouraged to see the link between topics across the curriculum, as well as their application to problems, which can include a real-life emphasis.

Students are being prepared for studying the subject at GCSE, in the Sixth Form and beyond. They will appreciate its relevance to the world of work, in particular, where problem-solving strategies are needed to tackle tasks where the correct approach is not immediately clear.

As well as being knowledgeable with their application, students will need to adopt a risk-taking approach in order to make an initial attempt. They will need to be reflective of the solution, or progress made towards one, and ensure their final answer is communicated in a mathematically coherent manner.

## Autumn Term | Number | Pythagoras and Trigonometry | Algebra | Ratio and Proportion

### Number

Recognise significant figures  
 Round a number to one significant figure  
 Round decimals to the nearest decimal place  
 Estimate calculations by rounding to one significant figure and multiplying and dividing mentally  
 Use inequality notation to specify simple error intervals due to rounding  
 Upper and lower bounds  
 Understand and use the equivalence between recurring decimals and fractions  
 Understand and use efficient methods to add, subtract, multiply and divide fractions, interpreting division as a multiplicative inverse  
 Express numbers in standard form  
 Calculate with numbers expressed in standard form

### Ratio and Proportion

Simplify ratios and use ratio notation  
 Find one number as a fraction of another  
 Divide a quantity into two or more parts in a given ratio  
 Apply ratio to real contexts and problems  
 Use and understand the notation for direct and inverse proportion  
 Solving problems involving direct and inverse proportion, including graphical and algebraic representation  
 Interpret the gradient of a straight line graph as a rate of change  
 Set up, solve and interpret answers in growth and decay problems including compound interest  
 Understand and use measures of speed, density (and pressure) to solve problems

### Algebra

Substitute numbers into expressions and formulae  
 Use formulae from mathematics and other subjects  
 Derive a formula and, in simple cases, change its subject  
 Change the subject of the formula where the subject appears on both sides, or with the power of a subject  
 Generate terms of a linear sequence  
 Deduce expressions to calculate the  $n$ th term of a linear sequence  
 Recognise and use Fibonacci type sequences, quadratic sequences, and simple geometric progressions ( $r^n$ ,  $n$  integer,  $r$  rational)

Find the next term of quadratic sequences and functions  
 Find the  $n$ th term of quadratic sequences and functions  
 Multiply a single term over a bracket  
 Expand the product of two linear expressions  
 Square a linear expression  
 Expand products of more than two binomials  
 Factorise using common factors  
 Factorise quadratic expressions, including the difference of two squares  
 Solve quadratic equations by factorisation (and link to roots of a quadratic equation)

### Pythagoras and Trigonometry

Understand and apply Pythagoras' theorem when solving problems in 2-D  
 Understand and use Pythagoras' theorem to solve 3-D problems  
 Understand and use trigonometric relationships in right-angled triangles  
 Use the trigonometric ratios in right angled triangles to solve problems, angles of elevation and depression  
 Solve problems with trigonometry  
 Know the exact values of  $\sin$ ,  $\cos$  and  $\tan$  for  $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$  (and  $90^\circ$ , except  $\tan$ )  
 Draw, sketch and describe the graphs of trigonometric functions for angles of any size

### How is homework used to enhance learning?

- Homework book
- Mathswatch
- Review exercise
- Exam Style questions

### What does Excellence look like?

- Use fractions, decimals and negative in the data to find averages.
- Use algebra to find a number given the mean.
- Angles in a full circle – part of a circle, arcs and sectors.
- Order fractions.
- Find areas of circles and round the answer.
- Square and square root.
- Substitution.
- Rearranging equations.
- Substitution into formula.
- Ratio – enlargement/similar triangles.
- Area and perimeter of shapes.
- Name shapes to transform.
- Lines of reflection.
- Negative numbers
- Sequences
- Ratio
- Converting units.
- Types and properties of shapes.



### Statistics

Calculate the mean etc. from a frequency table  
 Estimate the mean, median and range of a set of grouped data and determine the modal class  
 Draw and interpret frequency polygons  
 Construct and interpret cumulative frequency graphs  
 Draw and compare two box plots

### Vectors

Use vector notation  
 Understand the effect of multiplying a vector by a scalar  
 Add and subtract vectors and find the resultant vector  
 Use vectors to construct geometric argument and proof

### Graphs

Plot and interpret graphs of non-standard functions to find approximate solutions to problems such as simple kinematics – distance, speed and acceleration  
 Plot straight line graphs (table not given)  
 Interpret and analyse straight line graphs  $y=mx+c$  (gradient, intercept)  
 Use the form  $y=mx+c$  to identify parallel lines  
 Use the form  $y=mx+c$  to identify perpendicular lines  
 Find the equation of the line through two given points or through one point with a given gradient  
 Plot graphs of simple quadratic and cubic functions  
 Plot cubic and reciprocal graphs, recognise the shapes of quadratic and cubic graphs  
 Plot cubic, reciprocal and exponential graphs  
 Identify and sketch graphs of linear and simple quadratic and cubic functions  
 Identify and interpret roots, intercepts, turning points of quadratic functions graphically  
 Interpret the gradient of a straight line graph as a rate of change  
 Solve linear inequalities in two variables and represent the solution on a graph

### Percentages

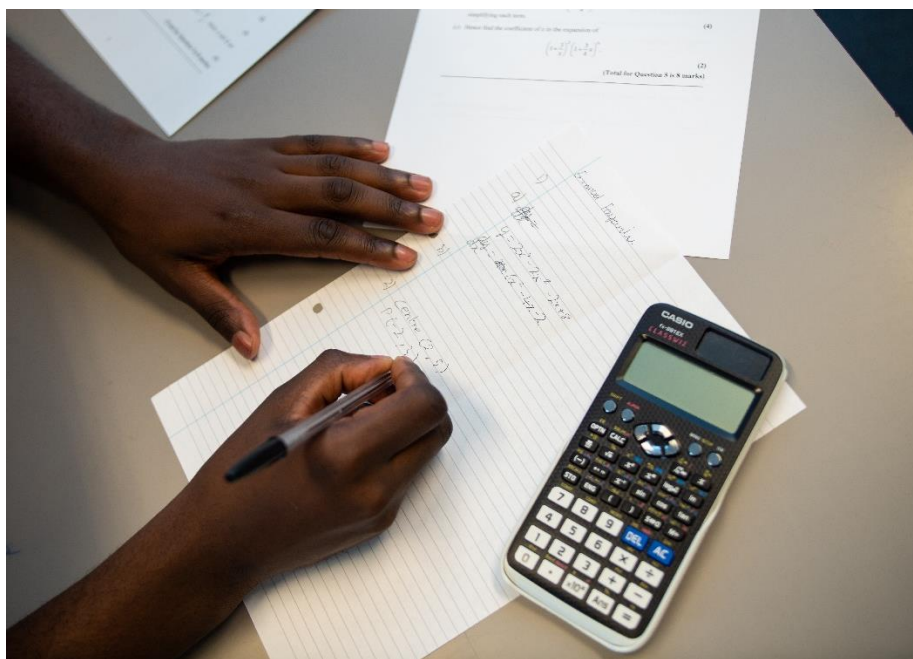
Calculate percentages and find the outcome of a given percentage increase or decrease  
 Use reverse percentages to solve problems (original value problems)  
 Calculate compound interest Write lengths in terms of the vector given

#### What does excellence look like?

- Ratio
- Scatter graphs
- Graphs – gradient Solving equations  
Bar modelling.
- Enlargement
- Types of shapes and properties of shapes.
- Converting units.
- Translation.
- Graphs.
- Negative, fraction and decimal numbers
- Solving equations.
- Trigonometry
- Speed, distance, time. Etc.
- Sequences – substitution.

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### Travel Graphs

Interpret distance-time graphs  
 Understand and use measures of speed, density (and pressure) to solve problems  
 Interpret gradient and area under graph for velocity-time graphs

### Similar Figures

Understand and use congruence and similarity  
 Know, and use, that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio  
 Calculate area and volume of similar shapes

### Area and Volume

Use formulae for the area of a triangle, parallelogram and trapezium  
 Perimeter and area of compound shapes (including circles)  
 Calculate lengths of arcs and areas of sectors, including answers in terms of  $\pi$   
 Volume of prisms including cylinders  
 Surface area of 3D shapes (prisms, cones, pyramids, spheres and composite solids)

### Loci

Use straight edge and compasses to do standard constructions  
 Produce shapes and paths by using descriptions of loci  
 Draw the locus equidistant between two points or from a point

## International Opportunities

### Within the curriculum

History of fractions <https://nrich.maths.org/2515>

Tasks for fractions [https://nrich.maths.org/public/topic.php?group\\_id=2&code=19](https://nrich.maths.org/public/topic.php?group_id=2&code=19)

Al-Khwarizmi Born 830AD Developed Algebra

Muslim mathematician and astronomer whose major works introduced Hindu-Arabic numerals and the concepts of algebra into European mathematics.

Fibonacci sequence – The magic of Fibonacci numbers Arthur Benjamin – TED talk

Sequence within voting systems – resource within the international folder.

Leonhard Euler 1707 – 1783 A Swiss mathematician who developed notation including the use of  $\pi$ .

Srinivasa Ramanujan 1887-1920 An Indian mathematician who discovered the formula for  $\pi$

Using circles to estimate areas of fields.

<http://www.agritechtalk.org/Uno%20How%20Visit%201%20part%201.html>

Use temperatures of the states of America in international folder.

The number of Significant figures used for different data changes depending on how accurate you need to be.

John Napier 1550-1617 standardised the use of the decimal point.

Thales c.636 – c.546BC A Greek philosopher found that angles at the base of an isosceles triangle are equal.

Euclid born 300BC A Greek mathematician who was the 'founder of geometry' proved the exterior angles theory.

Euclid born 300BC A Greek mathematician who was the 'founder of geometry' found an algorithm for finding HCF and LCM.

Use different units of measurements eg. km, miles as well as different SI units.

Where and why did metric come about?

The golden ratio <https://www.livescience.com/37704-phi-goldenratio.html>

Use literacy rates as percentages or any other international data.

Use international data.

Baye's theorem <https://www.mathsisfun.com/data/bayes-theorem.html>

Thomas Bayes 1702 – 1761 English Statistician.

Abraham de Moivre French mathematician 1667 – 1754 developed game theory and actuarial mathematics.