

Maths

INTENT- KS3

Mathematics is a hierarchical subject where success at each level is reliant on the mastery of all that sits below. We aim to ensure core knowledge and skills are taught in an appropriate, consistent and explicit manner. Clear explanations, practice and regular retrieval are used to build resilience to organise and recall knowledge. Students will develop sufficient understanding and unconscious competence in core skills to enable them to tackle deeper tasks. In KS3 we are aiming to build confident students who are not afraid to tackle mathematical problems.

The program of study for KS3 is organised into distinct domains but students should build on KS2 and connections across mathematical ideas to develop fluency, mathematical reasoning and competence. They should also apply their mathematical knowledge in science, geography, computing and other subjects.

Decisions about progress are based on the security of student's understanding and their readiness to progress to the next stage. Students who grasp concepts readily will be challenged through being offered rich and sophisticated problems. Those who are not sufficiently fluent will consolidate their understanding including with additional practice before moving on. SEND/PP students have a parallel scheme of work where appropriate that is tailored to help them grasp and secure the key skills in each area including competence with time and money.

Students will develop their KNOWLEDGE of		Students will develop their SKILLS in	
7	<ul style="list-style-type: none"> Interpreting ratio tables and use these as tools to solve numerical problems. Using additive and multiplicative strategies (the multiplier is an integer value) Using and applying ratio tables in the context of division and multiplication. Making appropriate use of number lines to represent and solve numerical problems including comparing measurements. Using the area model for long multiplication of integers and decimal numbers Using 'reallotting' strategies to solve area problems of compound shapes. 	<ul style="list-style-type: none"> Describing given diagrams, identifying key features. Where appropriate students make sense of a situation by drawing diagrams. Identifying similarities and differences in situations and using these to provide examples of their own of a similar nature. Students are able to provide examples of, as well as, counter examples. Offering suggestions and beginning to ask 'what if' questions considering the affects that changing one aspect has. Students provide explanations for their reasoning. Beginning to consider if mathematical statements are sometimes/always/never true. Describing and interpreting graphs and given a context provide meaning. Accepting that being stuck is a vital aspect of mathematical development and beginning to simplify a problem to attempt to make progress. 	
Students will develop their KNOWLEDGE of		Students will develop their SKILLS in	
8	<ul style="list-style-type: none"> Being able to interpret ratio tables and using these as tools to solve numerical problems. Using appropriate calculations including unitary method and begin to consider decimal and fractional multipliers. Using the number line effectively to order numbers written in different formats as well as to solve equations with the unknown on both sides. Using the area model to expand single and double brackets and begin to reverse this process (leading to factorisation). Using a combination of strategies to calculate the area of more complex shapes. 	<ul style="list-style-type: none"> Building on the noticing skills developed, they make and test conjectures. Students successfully justify their conjectures and refine these with contribution from others. Regularly questioning peers' contributions to the development of mathematical ideas. Being able to compare graphs and representations. Students use information given in graphical form to drive new information. Students appreciate links in graphical representation and are able to reverse problems (start with any aspect to complete others). Considering what makes a given problem more demanding as well as how it can be simplified. 	
Students will develop their KNOWLEDGE of		Students will develop their SKILLS in	
9	<ul style="list-style-type: none"> Using ratio tables to solve problems with fluency. They select appropriate strategies considering efficiency when using a calculator and when this is not allowed. They use multiplicative and division by decimals and fractions with relative ease. Using the number line efficiently to order numbers written in different formats including index form, standard form and surd form. They solve linear simultaneous equations. Developing effective strategies to solve equations with unknown on both sides, including those involving subtraction and fractional solutions. Using the area model effectively to factorise and expand single and double brackets. Using a combination of strategies to calculate area and surface area of complex shapes. 	<ul style="list-style-type: none"> Appreciating that being stuck is a necessary step and are developing strategies to make progress. They are able to simplify multi-step problems and appreciate the importance of identifying what they can work out in order to move forward. Developing noticing and justification skills to actively make links in areas of mathematics and outside the subject. They have an inquisitive approach and are not satisfied with reaching a solution. They ask themselves questions like 'how can the problem be made easier/harder', 'what happened if we change...', 'is this always/sometimes/never true'. Appreciating links in graphical representation and are able to reverse problems (start with any aspect to complete others) – in particular the graph of quadratics. Using mathematical language appropriately Beginning to distinguish between examples and mathematical proof. Using construction equipment with relative ease. 	

INTENT- KS4

During our KS4 curriculum we build on the strong foundations we have developed in KS3, students feel confident with the knowledge and skills they have developed and are successful applying these when solving increasingly complex and sophisticated problems. Their ability to use and apply their knowledge wherever necessary in other subjects develops as well as their understanding and competence with financial situations.

The decision about when to progress and ultimately whether the foundation or higher tier at GCSE is suitable is based on the students' security and understanding. Pupils who grasp concepts readily will pursue the higher tier syllabus and will be challenged through being offered rich and sophisticated problems. Those who are not sufficiently fluent with earlier material will consolidate their understanding with additional practice before moving on. The appropriate exam tier of entry will be selected based on the objective of all students feeling challenged and stretched whilst experiencing success and a feeling of accomplishment.

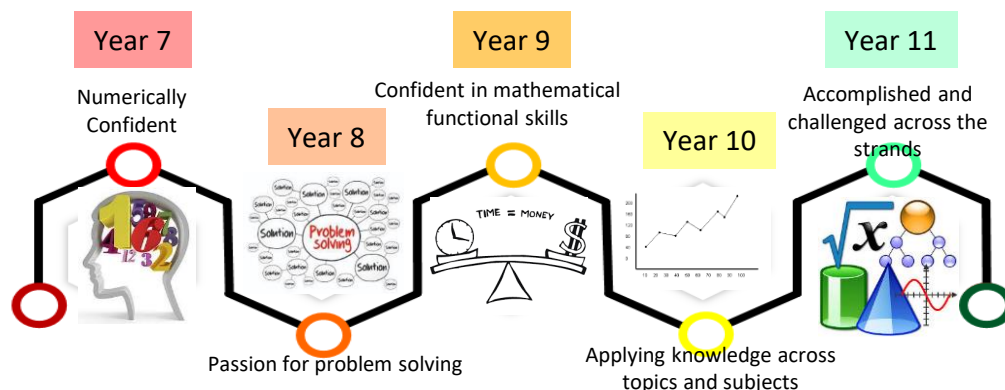
The intent of the department is to develop students who can take advantage of their mathematical education to secure independent achievement in work, academia and personal development of for the sheer enjoyment of the subject.

	Students will develop their KNOWLEDGE of	Students will develop their SKILLS in
1 0 & 1 1	<ul style="list-style-type: none"> Accurately recalling facts, terminology and definitions. Using and interpreting notation correctly. Accurately carry out routine procedures or set tasks requiring multi-step solutions. Making deductions, inferences and draw conclusions from mathematical information. Constructing chains of reasoning to achieve a given result. Translating problems in mathematical or non-mathematical contexts into a process or a series of mathematical processes. Making and use connections between different parts of mathematics 	<ul style="list-style-type: none"> Interpreting and communicating information accurately Presenting arguments and proofs Assessing the validity of an argument and critically evaluate a given way of presenting information. Interpreting results in the context of a given problem. Evaluating methods used and results obtained. Evaluating solutions to identify how they may have been affected by assumptions made.

Qualification gained by the end of year 11: GCSE mathematics at foundation or higher tier

Whole school vision links developed in this subject	After school destinations linked to this subject	
<ul style="list-style-type: none"> Numerically and financially competent and secure in the part individuals play in society. Numeracy skills allow full participation and appreciation of the LLMAC and CA programs. British values through understanding of numerical data and statistics in the news and community. Participation and team working in inter-house maths competitions Promotion of high ambition from university visits. 	<ul style="list-style-type: none"> Accountant Animator Architect Astronaut Banker Chemist Computer scientist Doctor Engineer Financial advisor Forensic scientist 	<ul style="list-style-type: none"> Game designer Maths teacher Physicist Sports scientist Statistician Veterinarian

Maths CURRICULUM THEMES



Cross Curriculum links in maths

- Geography- navigating maps
- PE- grids and scoring systems
- History- time-lines and statistics.
- Science- collection, analysis, presentation and interpretation of data.
- English- time-lines and statistics
- CA- navigating maps
- Art – symmetry and proportion
- Food technology – proportion and ratio
- DT – calculations and scale.

"DREAM BIG, WORK HARD, DON'T QUIT"

Maths Curriculum Year 7

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KS2 recap

Order of operations, rounding, inverse operations, positive and negative integers, estimation.

3. Expression and formulae

Using letters for unknowns, simplifying expressions, removing brackets, substitution, formulae.

4. Angles and 2D shapes

Measuring and drawing, calculating angles, angles in a triangle, quadrilateral and polygon.

6. Analysing and displaying data

Collecting data, bar charts and frequency diagrams, pie charts, line graphs, averages and comparing data.

9. Factors and Multiples

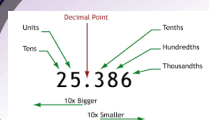
Finding factors and multiples of a number, squares and square roots, prime numbers, LCM and HCF of 2 numbers

10. Constructions and 3D shapes

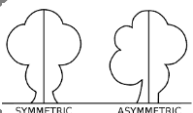
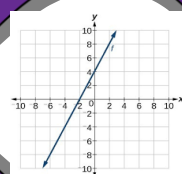
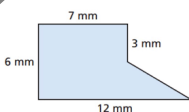
Constructing triangles, scale drawings, 3D shapes, isometric drawing, nets, volume..

12. Probability

Placing probability on 0-1 scale, describing probabilities, trials, outcomes and events, theoretical and experimental probability, Venn diagrams



expression
 $4x + 2$
equation
 $4x + 2 = 100$



12: 1, 12, 2, 6, 3, 4
 $1 \times 12 = 12$
 $2 \times 6 = 12$
 $3 \times 4 = 12$

$4:3$



Can You Solve This?
 $4 + 1 + 1 = 60$
 $4 + 1 + 1 = 30$
 $4 - 1 = 3$
 $4 \times 1 = ?$

1. Measure, perimeter and area

Reading scale, measure, metric units, perimeter and area, composite shapes

2. Fractions, decimals and percentages

Equivalent fractions, fraction operations, decimals and fractions, percentages

5. Sequences and graphs

Coordinates, tables of values, straight line graphs, sequence rules, term to term rule, position in a sequence, patterns

7. Transformations

Reflection, rotation, line and rotational symmetry, translations, introduction to enlargement, tessellation.

8. Equations

Multiplying and dividing in algebra, balancing and solving equations, 2 step equations,

11. Ratio and proportion

Proportion as a fraction or percentage, increase or decrease by direct proportion, using and simplifying ratio,

Progressing into year 8

Key numeracy skills, problem solving, holistic summer assessments.

Maths Curriculum Year 8

Cumbria Futures Federation

Year 7 recap

Order decimals, multiples, factors, primes, tests for divisibility, prime factor decomposition, LCM and HCF, squares, cubes and roots.

3. Fractions, decimals and percentages

Convert between fractions, decimals and percentages, order fractions, 4 operations with fractions, fraction and percentage of amount, percentage change.

4. Angles and 2D shapes

Angles on a straight line, at a point and in a triangle. Parallel lines, quadrilaterals and their properties, polygons. Congruence of shapes.

6. Analysing and displaying data

Plan and collect data, draw pie charts, draw bar charts and frequency diagrams, calculate averages and range, construct and interpret scatter graphs

9. Factors and Multiples

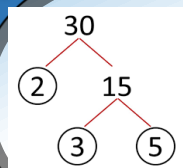
Carry out the 4 operations with integers and decimals, use order of operations, find factors, multiples, squares, cubes and roots. Prime numbers

10. Constructions and 3D shapes

Construct triangles and quadrilaterals, construct perpendicular bisectors, use bearings and construct angles involving bearings.

12. Probability

Record mutually exclusive events, find probabilities on equally likely outcomes, calculate the probability of an event not happening, estimate probability from experiments.



$5\frac{1}{3}$

Stem	Leaf
4	4 6 7 9
5	
6	3 4 6 8 8
7	2 2 5 6
8	1 4 8
9	
10	6

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

$$18 - 4x = 5x$$

$$18 = 9x$$

$$2 = x$$

3:1



1. Measure, perimeter and area

Measure length, mass and capacity, convert between metric units, area of triangle, parallelogram and trapezium, circle parts.

2. Expression and formulae

Substitute into expressions and formulae, simplify like terms, expand brackets, laws of indices, construct formulae, change the subject.

5. Sequences and graphs

Graph from table of values, use gradient and intercept, interpret and draw real life graphs. Draw line graphs from time series, term to term and position to term rule of a sequence.

7. Transformations

Reflect, rotate and translate 2D shapes, transform 2D shapes with a combination of transformations, Enlarge a 2D shape given a scale factor and centre of enlargement.

8. Equations

Solve one step and multi-step equations. Solve equations with unknown on both sides. Solve equations with brackets. Solve real life equations.

11. Ratio and proportion

Simplify ratio, divide in a given ratio, direct proportion, calculate percentages, percentage increase and decrease, Solving problems involving proportion

Progressing into year 9

Key numeracy skills, problem solving, holistic summer assessments.

Maths Curriculum Year 9

Year 8 recap

Multiply and divide by powers of 10, round to a given power of 10, round to decimal places and 1 significant figure, factors, multiples and primes.

3. Fractions, decimals and percentages

Carry out 4 operations with fractions, convert between fractions, decimals and percentages, percentage change, represent proportion, compound interest problems

4. Angles and 2D shapes

Angles in triangles and quadrilaterals, angles on parallel lines, interior and exterior angles of polygons, constructing triangles and quadrilaterals

6. Analysing and displaying data

Organise data into tables, plot and analyse time series, plot and describe scatter graphs, use averages and range to explain data, make comparisons between data.

9. Factors and Multiples

Find squares and roots by trial and improvement, use the rules of indices, simplify expressions in surd form, use standard form

10. Constructions and 3D shapes

Construct triangles. Construct line and angle bisectors, find and describe loci. Use Pythagoras' Theorem in right-angled triangles.

12. Probability

Use the vocabulary of uncertainty and prediction. Find and record outcomes of a single trial. Understand theoretical probability. Use sample spaces and tree diagrams. Calculate experimental probability and compare with theoretical. Enumerate with Venn diagrams.

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1. Measure, perimeter and area

Convert between metric units for length, mass and volume, compare metric and imperial, work out area of 2D shapes and circles, use compound measure

2. Expression and formulae

Factorise expressions, equivalent algebraic fractions, substitution into formulae, changing the subject, deriving formulae, drawing graphs

5. sequences and graphs

Straight line graph from table of values and from its equation. Gradient and intercept, $y=mx+c$, draw and interpret real life graphs. Sequence rules.

7. Transformations

Reflect, rotate and translate 2D shapes, Enlarge shapes given scale factor and centre of enlargement, use combinations of transformations, use scale and bearings

8. Equations

Solve equations by inverse operations, solve equations with brackets and fractions, solve equations with unknown on both sides. Create equations and solve them.

11. Ratio and proportion

Solve problems that involve direct proportion, calculate percentage change, simplify ratios, divide quantities into a given ratio, compare ratios

Progressing into year 10

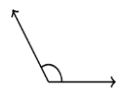
Key numeracy skills, problem solving, holistic summer assessments.

x	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

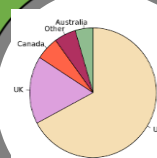
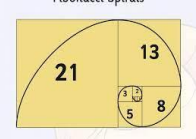
Algebraic Expressions

$$2x + 3y - 7$$

Coefficients



Fibonacci Spirals



$$1^3 = 1 \times 1 \times 1 = 1$$

$$2^3 = 2 \times 2 \times 2 = 8$$

$$3^3 = 3 \times 3 \times 3 = 27$$

$$4^3 = 4 \times 4 \times 4 = 64$$

3 : 1



$$\begin{array}{r} ? + ? = 8 \\ + \\ ? - ? = 6 \\ \hline 13 \end{array}$$

Can you solve this problem?

Maths Curriculum Year 10

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Year 9 recap

Numbers and inequalities, apply operations to fractions and mixed numbers, rounding and error intervals, order of operations, powers, roots and reciprocals.

3. Handling Data (1)

Populations and sampling. Construct and interpret bar charts, pie charts, pictograms and time series. Frequency polygons, cumulative frequency and box plots, histograms.

4. Fractions, decimals and percentages

Order decimals and fractions, terminating decimals and their corresponding fractions. Algebraic fractions. Percentage problems

6. Working in 2D

Scale factors, scale drawings and maps. Area and volume. Reflection, rotation, translations and enlargement (including negative and fractional scale factors). 2D vectors

9. Equations and inequalities

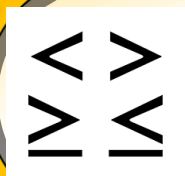
Solve equations including graphically, Derive equations and solve simultaneous equations, Solve quadratic equations and use quadratic graphs

10. Circles and constructions

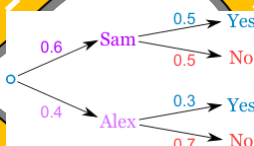
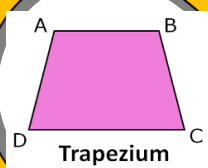
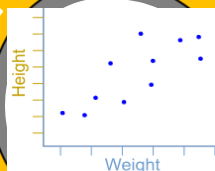
Circle parts. Application of circumference and area formulae. Arc lengths and sectors. Standard circle theorems. Loci problems and bearings.

12. Factors, powers and roots

Prime numbers, factors (divisors), multiples, LCM, HCF, prime factorisation. Apply systematic listing strategies. Powers, roots and surds. Rationalising denominators



expression
 $4x + 2$
equation
 $4x + 2 = 100$



$$\begin{aligned} x + y &= 24 \\ 2x - y &= -6 \end{aligned}$$

3:2

ratio

$\frac{3}{2}$

fraction



$$6(4x - (2 - 5y + 2x)) = -5$$

1. Expressions

Use and interpret algebraic notation, substitution, understand expressions, equations, formulae, identities, inequalities, terms and factors. Manipulate algebraic expressions, Index laws. Algebraic fractions.

2. Angles and polygons

Angles at a point, straight line, in a triangle and those formed on parallel lines. Angle sum of polygons (interior and exterior). Triangle congruence and similarity. Pythagoras' Theorem

5. Formulae and functions

Substitute into mathematical and scientific formulae, Changing the subject. Expanding brackets and binomials. Factorising linear and quadratic expressions.

7. Probability

Record, describe and analyse the outcomes of probability experiments, Carry out probability calculations with sample space, frequency diagrams, tree diagrams and Venn diagrams

8. Measure and accuracy

Approximation and estimation. Rounding and error intervals, Upper and lower bounds. Mass, length, time, money and compound measures.

11. Ratio and proportion

Express one quantity as a fraction of another, Interpret percentages and percentage change as a fraction or a decimal. Solve percentage problems. Divide in a given ratio

Progressing into year 11

Exam practice on modified GCSE papers. Problem solving.

Maths Curriculum Year 11

Year 10 Recap and graphs (1)

Key skills starters and plenaries. Straight line graphs and equations. Quadratic graphs. Cubic, reciprocal, exponential and trigonometric graphs. Distance/time and velocity/time graphs.

3. Calculations

Positive integer powers and associated roots. Fractional and negative indices. Algebraic fractions and surds. Linear, quadratic and simultaneous equations. Standard form.

4. Graphs (2)

Recognise, sketch and interpret linear and quadratic functions, cubic, reciprocal, exponential and trigonometric. Distance/time and velocity/time graphs. equation of circle

6. The probability of combined events

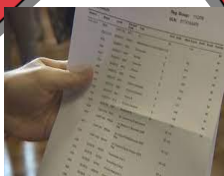
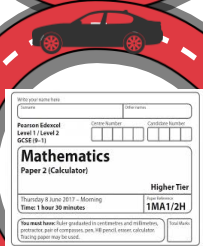
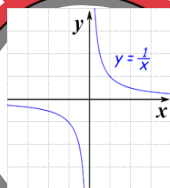
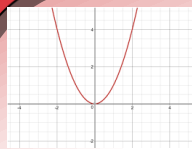
Enumerate sets systematically using tables, grids, Venn diagrams and tree diagrams. Calculate probability of independent and combined events. Find probabilities from experiments

9. Revision and exam practice

Regular past paper exam practice throughout year 11. Progressing through the grades of either foundation or higher questions with prompt feedback. Revision guides provided to every student..

Exam- Calculator

Edexcel papers 2 and 3 calculator exams. 90 minutes each. Either foundation (grades 1 – 5) or higher (grades 4 – 9) as appropriate.



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1. Working in 3D

Properties of cubes, cuboids, prisms, cylinders, pyramid, cones and spheres. Plans and elevations. Volume and surface area of 3D shapes. Circle formulae and composite shapes.

2. Handling Data

Compare distributions of data sets through charts, averages and range. Draw and interpret pie charts, bar charts, frequency polygons, time series, cumulative frequency graphs and histograms

5. Pythagoras and Trigonometry

Application of Pythagoras and Trigonometry including 3D. Calculate exactly with fractions, surds and multiples of pi. Know and apply Sine Rule. Cosine Rule and find area using Sine.

7. Sequences

Generate rules of a sequence from either a term to term or position to term rule, arithmetic and geometric. Recognise and use sequences of square, cube, triangle, and Fibonacci numbers.

8. Units and proportionality

Change freely between related standard units (time, length, area, volume). Solve problems involving direct and inverse proportion including algebraic representations.

Exam- non calculator

Edexcel paper 1 non- calculator exam. 90 minutes. Either foundation (grades 1 – 5) or higher (grades 4 – 9) as appropriate.

Potential destinations

Careers interviews giving advice on destinations. Apprenticeship, college or A- levels.

