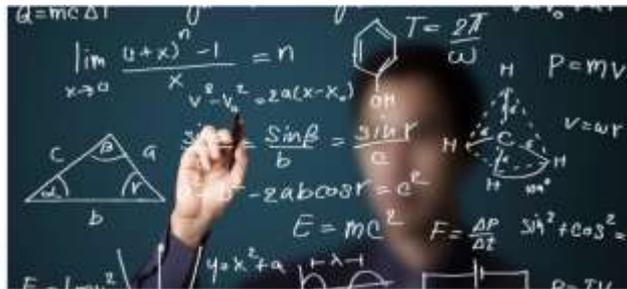# Mathematics

Cecil Jones Academy

Welcome

As a department our vision is to ensure all students have access to an exciting curriculum delivered to them in a way that maximises each individual's ability to learn and progress. Mathematics is a creative and highly inter-connected discipline where we want to show students how Maths has a massive part to play across the academy in other subjects from the sciences through to food technology, as well as the influence it will have in their future career paths.

Our enthusiasm and passion for the subject filters into the lessons we deliver, this along with our state of the art classrooms and the wide variety of resources we use allows us to create a high-quality mathematics education that therefore provides a foundation for understanding the world, the ability to reason mathematically and problem solve, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

KS3 MATHEMATICS

During year 7 and 8 students will be taught the foundations that will be required to begin their GCSE in Mathematics

Using data gathered over year 7 and 8 students are placed into the foundation or higher aspect of the mathematics GCSE.

Maths Curriculum Map - Year 7

Year 7	Unit 1 – Autumn 1 Analysing and Displaying Data	Unit 2 – Autumn 1 Number Skills	Unit 3 – Autumn 2 Expressions, Functions and Formulae	Unit 4 – Autumn 2 Decimals and Measures	Unit 5 – Spring 1 Fractions and Percentages	Unit 6 – Spring 1 Probability
Summary	This unit aims to develop an understanding of averages along with deciding which average is most appropriate. Then moving onto Bar Charts and Composite Bar Charts, deciding how to best represent data.	Students will use a variety of written and mental methods to improve understanding of the order of operations. They will then take these skills and apply them to calculations involving negative numbers.	Students will use functions machines to explore the concept of algebra. They will be able to simplify algebraic expressions and begin to create formulae and expressions from words.	In this unit students will take their ability to multiply by 10,100 and 1000 in order to convert metric units so they can solve a variety of problems involving scale drawings all the way to calculating perimeters and areas of 2D shapes.	Students will widen their understanding of fractions by understanding that simplifying them can make them easier to visualise and compare. They will also use the fact that percentage is "the number of parts per 100" to convert freely between percentages, fractions and decimals	In this unit students will develop a more comprehensive understanding of the language of probability and begin to calculate the chances of both an event occurring and not occurring. Students will use new notation to show their workings and will then apply these concepts to experimental/real world events.
Assessment Specification References	Unit 1 Assessment S1,S6	Unit 2 Assessment N1, N2, N3, N4, N5, N6, N13, N14, N15	Unit 3 Assessment A1, A2, A3, A4, A7	Unit 4 Assessment N1, N2, N13, N15, R1, R2, G14, G15, G16	Unit 5 Assessment N2, N8, N10, N12, R3, R9	Unit 6 Assessment P2, P3, P4
Grading	Students can achieve up to a grade 2 in this unit.	Students can achieve up to a grade 3 in this unit.	Students can achieve up to a grade 3 in this unit.	Students can achieve up to a grade 3 in this unit.	Students can achieve up to a grade 4 in this unit.	Students can achieve up to a grade 3 in this unit.
By the end of the unit students will be able to:	• Calculate averages from a list of discrete data. • Compare distributions using averages and measures of spread. • Use simple two-way tables • Interpret data from compound and comparative bar charts.	• Add and subtract integers both positive and negative. Multiply and divide negative integers. • Solve multi-step problems in contexts, including money and decide which operations and methods to use. • Recognise and use relationships between operations, including inverse operations.	• Use function machines to create expressions. • Simplify algebraic expressions by collecting like terms. • Construct simple formulae • Substitute positive and negative integers into formulae expressed in letter symbols.	• Measure lines to the nearest millimetre. • Convert one metric unit to another, including decimals. • Multiply and Divide decimals with one or two places by single-digit whole numbers • Calculate perimeter and area of compound shapes made from triangles, rectangle and other shapes.	• Convert terminating decimals to fractions and then simplify them. • Add and subtract fractions – proper and improper, positive and negative • Expression on quantity as a percentage of another. • Interpret percentages and percentage change as a fraction or a decimal.	• Use a probability scale with words • Find the theoretical probability of an event happening • Find the theoretical probability of an event not occurring • Estimate the number of times an event will occur, given the probability and the number of trials.

Maths Curriculum Map - Year 7

Year 7	Unit 7 – Spring 2 Ratio and Proportion	Unit 8 – Summer 1 Lines and Angles	Unit 9 – Summer 1 Sequences and Graphs	Unit 10 – Summer 2 Transformations		
Summary	This unit will ensure students can solve problems involving direct proportion by interpreting the relationship between two or more variables. They will also start to use ratios to share quantities and with this link it to previous knowledge of percentages and fractions.	Students will develop their ability to use a protractor to not only measure angles but to draw triangles accurately. Also in this unit students will use correct mathematical vocabulary to denote properties of triangles, quadrilaterals and other polygons.	In this unit students will begin to see the link between sequences and algebraic functions. They will take the skill of continuing sequences and spotting patterns and see finding the nth term can convert to coordinates on a graph.	This unit will look into symmetry of shapes and objects and then guide students through the four transformations; reflection, rotation, enlargement and translation. This is intended by investigating the affects these movements have on coordinates.		
Assessment Specification References Please see website for more information.	Unit 7 Assessment R1, R4, R5, R7, R8	Unit 8 Assessment G1, G3, G4, G15	Unit 9 Assessment A8, A9, A25, A24	Unit 10 Assessment G5, G7, G8		
Grading	Students can achieve up to a grade 6 in this unit	Students can achieve up to a grade 3 in this unit	Students can achieve up to a grade 6 in this unit	Students can achieve up to a grade 5 in this unit		
By the end of the unit students will be able to:	• Use the unitary method to solve simple word problems involving direct proportion • Reduce a ratio in its simplest form • Understand and use the relationship between fractions, ratio and proportion	• Draw 2D shapes using given dimension and angles • Derive and use the sum of angles in a triangles and a quadrilateral • Solve geometric problems using side and angle properties of triangles and quadrilaterals	• Generate arithmetic sequences of numbers and sequences derived from diagrams • Draw and recognise lines parallel to the x-axis and y-axis • Identify which terms cannot be in a sequence. • Find and use the nth term of an arithmetic sequence.	• Identify congruent shapes • Recognise line and rotational symmetry in 2D Shapes • Enlarge shapes by a given scale factor • Translate 2D shapes • Describe and draw rotations • Recognise and carry out reflections in a mirror line.		

Maths Curriculum Map - Year 8

Year 8	Unit 1 – Autumn 1 Number	Unit 2 – Autumn 1 Area and Volume	Unit 3 – Autumn 2 Statistics, Graphs and Charts	Unit 4 – Autumn 2 Expressions and Equations	Unit 5 – Spring 1 Real-Life Graphs	Unit 6 – Spring 1 Decimals and Ratio
Summary	In this unit students become more fluent with mental and written calculations with a focus on understanding divisibility rules. They will also then become more secure working with squares, cubes and roots.	Students will derive formulas for the areas of triangles and quadrilaterals and apply these to working with compound shapes. They will then take all this knowledge and apply it to surface areas and volumes of 3D solids.	In this unit students develop their analytical skills by interpreting data on a variety of charts and graphs. They will be using pie charts, scatter graphs and frequency table to compare results and describe trends and correlations.	Students will develop their algebraic thinking by using it to understand and simplify algebraic powers. They will also begin to look at the concepts of expanding and factorising expressions, a key skill for the remainder of the course.	In this unit students will model real world scenarios graphically in order to interpret specific scenarios. They will use conversion graphs to solve problems involving up to drawing and interpreting distance-time graphs.	Students will look at increasing their mental arithmetic capabilities in this unit by discovering what happens when you multiply and divide by decimals. They then apply these skills back to questions involving ratio, proportion and decimals.
Assessment Specification References Please see website for more information.	Unit 1 Assessment N2, N3, N4, N6	Unit 2 Assessment G12, G13, G14, G16	Unit 3 Assessment S2, S4, S5, S6	Unit 4 Assessment A1, A2, A3, A4, A5, A6, A7, A17	Unit 5 Assessment A10, A14	Unit 6 Assessment N1, N2, N15, R5
Grading	Students can achieve up to a grade 8 in this unit	Students can achieve up to a grade 4 in this unit	Students can achieve up to a grade 5 in this unit	Students can achieve up to a grade 5 in this unit	Students can achieve up to a grade 4 in this unit	Students can achieve up to a grade 8 in this unit
By the end of the unit students will be able to:	• Use mental strategies for multiplication – doubling and halving strategies. • Extend mental calculations to squares and square roots. • Use index notation for small integer powers • Use an extended range of calculator functions, including +, −, ×, x^2, $\sqrt{x}$, memory, x^y, $x^{\frac{1}{y}}$, brackets.	• Draw plans and elevations of 3D shapes • Use a formula to calculate the areas of triangles and parallelograms • Calculate the surface area of simple cuboids • Calculate volumes of shapes made from cuboids, for lengths given as whole numbers.	• From a frequency table, calculate the range and identify the interval containing the median and mode • Interpret pie charts and line graphs taking into account different sized samples • Interpret scatter graphs in terms of the relationship between two variables.	• Multiply together two algebraic expressions • Know that expressions involving repeated multiplication can be written as x, x^2, x^3. • Write expressions to solve problems representing a situation • Factorise to one bracket by taking out the highest common factors for all terms.	• Interpret and construct line graphs and use these to solve problems. • Discuss and interpret linear and non-linear graphs from a range of sources. • Interpret and construct line graphs and use these to solve problems.	• Multiply and divide by decimals, by transforming to multiplication or division by an integer and then converting back. • Simplify a ratio expressed in fractions or decimals. Find the theoretical probability of an event not occurring • Solve a ratio problem in context.

Maths Curriculum Map - Year 8

Year 8	Unit 7 – Spring 2 Lines and Angles	Unit 8 – Summer 1 Calculating with Fractions	Unit 9 – Summer 1 Straight-Line Graphs	Unit 10 – Summer 2 Percentages, Decimals and Fractions		
Summary	In this unit students will use angles properties to help classify quadrilaterals and start to look at the sizes of angles both inside and outside other polygons. Students will also begin spotting patterns on angles in parallel lines.	Students will ensure, throughout this unit, they are comfortable with performing any calculation where fractions are involved. This is core skill needed for fluency across most units in this course.	Across this unit students will develop their understanding of graphs and types of proportion by looking at the gradient, how steep a line is. They will also begin to use this to define straight lines using y=mx+c.	The final unit of the year bring back knowledge of equivalent fractions and decimals and using these concepts to look at how to increase and decrease amounts by a percentage using multipliers and other mental strategies.		
Assessment Specification References	Unit 7 Assessment G3, G4	Unit 8 Assessment N2, N8	Unit 9 Assessment A9, A10, R10, R11, R14	Unit 10 Assessment N1, N10, N12, R9		
Grading	Students can achieve up to a grade 5 in this unit.	Students can achieve up to a grade 6 in this unit.	Students can achieve up to a grade 7 in this unit.	Students can achieve up to a grade 8 in this unit.		
By the end of the unit students will be able to:	• Name all quadrilaterals that have a specific property. • Identify alternate and corresponding angles on parallel lines and their values. • Find the size of each interior angle or the size of each exterior angle or the number of sides of a regular polygon.	• Multiply an integer by a fraction. • Add and subtract fractions, with different denominators and mixed numbers, using the concept of equivalent fractions. • Find the reciprocal of simple numbers/fractions mentally.	• Know that the gradient of a line is the change in y over change in x. • Plot and draw graphs of straight lines using a table of values given in the form y = mx + c. • Identify direct proportion from a graph.	• Express one quantity as a percentage of another. • Order fractions by converting them to decimals or otherwise. • Find the outcome of a given percentage increase or decrease. • Compare two quantities using percentages, including a range of calculations and contexts.		

YEAR 9 ONWARDS GCSE MATHEMATICS

The Foundation Tier course consists of 20 units. Units 1 to 8 completed in year 9, units 9 to 17 completed in year 10 and the final 3 units complete at the beginning of year 11.

The Higher Tier course consists of 19 units. Unit 1 to 8 completed in year 9, units 9 to 17 complete in year 10 and the final 2 units completed at the beginning of year 11.

Examples of the GCSE Curriculum Maps can be seen below:

Maths Curriculum Map - Year 9 Higher

Year 9	Unit 1 – Autumn 1 Number	Unit 2 – Autumn 2 Algebra	Unit 3 – Spring 1 Interpreting and Representing Data	Unit 4 – Spring 1 Fractions, Ratio and Percentages	Unit 5 – Spring 1 Angles and Trigonometry	Unit 6 – Spring 2 Graphs
Summary	In this unit students will develop explore what happens when numbers are raised to powers that are negative and fractional and well as extending their knowledge of accuracy to a new topic of Surds.	Algebra is a prominent feature across the course and this unit helps embed the key skills needed throughout. Work in this unit involves the beginning of understanding quadratics, rearranging formulae as well as non-linear sequences.	Students will develop analytical skills from KS3 and use them to be able to make sure they are constructing graphs appropriate to the data they are using. They will then use these skills to recognise misleading graphs.	In this unit students will secure their ability to calculate and problem solve with fractions, percentage and ratio calculations to real-life scenarios. This includes working with currencies. Students also begin to use proportion to solve problems.	In this unit students discover for the first time the relationship between sides and angles of right-angled triangles through the concept of Trigonometry. They will also continue to work on Pythagoras' theorem and polygons.	Across this unit students work with a variety of graphs from drawing linear and quadratic graphs all the way to calculating speed from distance time graphs. Work on co-ordinate geometry in this unit starts to show how Maths looks at A-Level.
Assessment Specification References	Unit 1 Assessment A2 N3 N4 N5 N6 N7 N8 N3 N14 N15 **Surd laws** $\sqrt{x \times y} = \sqrt{x} \times \sqrt{y}$ $\sqrt{x \div y} = \sqrt{x} \div \sqrt{y}$	Unit 5 Assessment N5 N3 N8 N9 A1 A2 A3 A4 A5 A6 A7 A17 A21 A23 A25 A26 A25	Unit 5 Assessment S1A S1 S2 S3 S4 S5 S6	Unit 4 Assessment N2 N3 N8 N10 N11 N12 N13 R4 N4 R9 R6 R7 R8 R9 R10	Unit 5 Assessment N7 N8 N55 G1 G3 G4 G6 G20 G21	Unit 6 Assessment N13 A8 A9 A10 A11 A12 A14 A15 A16 A17 G11 R8 R10 R11
Grading	Students can achieve up to a grade 5 in this unit.	Students can achieve up to a grade 7 in this unit.	Students can achieve up to a grade 5 in this unit.	Students can achieve up to a grade 7 in this unit.	Students can achieve up to a grade 6 in this unit.	Students can achieve up to a grade 7 in this unit.
By the end of the unit students will be able to:	• Work out the total number of ways of performing a series of tasks. • Use negative indices. • Use fractional indices. • Calculate with numbers in standard form. • Understand the difference between rational and irrational numbers.	• Distinguish between expressions, equations, formulae and identities. • Solve equations involving brackets and numerical fractions. • Determine whether a particular number is a term of a given arithmetic sequence.	• Construct and use back-to-back stem and leaf diagrams. • Draw a line of best fit on a scatter graph. • Choose appropriate diagrams to display data. • Recognise misleading graphs.	• Add, subtract, multiply and divide fractions and mixed numbers. • Find the reciprocal of an integer, decimal or fraction. • Work out percentage increases and decreases. • Recognise and use direct proportion.	• Calculate the sum of the interior angles of a polygon. • Calculate the length of the hypotenuse in a right-angled triangle. • Use trigonometric ratios to find lengths in a right-angled triangle. • Find angles of elevation and angles of depression.	• Compare two graphs from their equations. • Find the equations of lines parallel or perpendicular to a given line. • Interpret quadratic graphs relating to real-life situations. • Find acceleration and distance from velocity-time graphs.

KEY AREAS – A LEVEL

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Year 9	Unit 7 – Summer 1 Area and Volume	Unit 8 – Summer 2 Transformations and Constructions				
Summary	The main focus of this unit to explore circles and how to find areas and arc lengths of sectors all the way to calculating volumes of cylinders, spheres and cones. This unit also explore bounds and how rounding can affect maximum and minimum values.	Students will continue work on the four transformations and then start to use mathematical equipment to construct accurate drawings and bisectors. They will then take these skills and solve problems using loci, showing regions of a given scenario.				
Assessment Specification References	Unit 7 Assessment N8 N13 N14 N15 N16 R1 G1 G9 G12 G14 G16 G17 G18	Unit 8 Assessment R2 R6 G1 G2 G7 G8 G12 G13 G15 G24 G25				
Grading	Students can achieve up to a grade 9 in this unit.	Students can achieve up to a grade 7 in this unit				
By the end of the unit students will be able to:	• Calculate area and circumference in terms of π. • Calculate volume and surface area of pyramids and cones. • Solve problems involving volumes and surface areas. • Calculate the maximum and minimum possible values of a measurement.	• Enlarge shapes by fractional and negative scale factors about a centre of enlargement. • Construct the perpendicular bisector of a line. • Bisect an angle using a ruler and compasses. • Use loci to solve problems.				

More examples of the curriculum maps can be found at:

https://www.ceciljonesacademy.net/secondary/curriculum/mathematics/

KS5 MATHEMATICS

At A-Level students aim to develop the ability to apply mathematical skills and techniques in other subjects and to lay foundations for the further study of mathematics and other disciplines. In this course students will study Pure mathematics which pushes students to develop their algebraic skills of sequences and co-ordinate geometry as well as pushes them to new heights where they will learn about differentiation and integration. Students will also learn topics revolving around Statistics and Mechanics, this applied branch of Mathematics allows student to develop skills on how Maths is implemented in the real world to solve and model complex problems and focusing on the laws of motion as well as forces acting on an object. In Statistics the emphasis is on analysing data and using this to test hypothesis and draw conclusions

Pure 1 and 2 Content List
-Topic 1 – Proof
-Topic 2 – Algebra and functions
-Topic 3 – Coordinate geometry in the (x, y) plane
-Topic 4 – Sequences and series
-Topic 5 – Trigonometry
-Topic 6 – Exponentials and logarithms
-Topic 7 – Differentiation
-Topic 8 – Integration
-Topic 9 – Numerical methods
-Topic 10 – Vectors .
Statistics
-Topic 1 – Statistical sampling.
-Topic 2 – Data presentation and interpretation
-Topic 3 – Probability
-Topic 4 – Statistical distributions
-Topic 5 – Statistical hypothesis testing.
Mechanics
-Topic 6 – Quantities and units in mechanics
-Topic 7 – Kinematics
-Topic 8 – Forces and Newton's laws
-Topic 9 – Moments.

Qualifications –

At GCSE level we follow the 1MA1 Qualification from Pearson Edexcel

The aims and objectives of the Pearson Edexcel Level 1/Level 2 GCSE (9–1) in Mathematics are to enable students to:

● develop fluent knowledge, skills and understanding of mathematical methods and concepts
● acquire, select and apply mathematical techniques to solve problems
● reason mathematically, make deductions and inferences, and draw conclusions
● comprehend, interpret and communicate mathematical information in a variety of forms appropriate to the information and context.

Students will sit either the higher or foundation tier course, each consisting of three 90 minute papers.

Students can achieve a maximum of a grade 5 on the foundation paper and a maximum of a grade 9 on the Higher tier paper.

At A-Level we follow the 9MA0 Qualification for Pearson Edexcel

The aims and objectives of this qualification are to enable students to:
 ● understand mathematics and mathematical processes in a way that promotes confidence, fosters enjoyment and provides a strong foundation for progress to further study
● extend their range of mathematical skills and techniques
● understand coherence and progression in mathematics and how different areas of mathematics are connected
● apply mathematics in other fields of study and be aware of the relevance of mathematics to the world of work and to situations in society in general
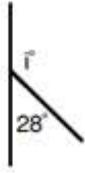● use their mathematical knowledge to make logical and reasoned

Students will sit 3 papers at then end of year 13, 2 papers covering the pure aspects of the course and 1 paper covering the applied modules of statistics and mechanics.

AN ACTIVITY TO TRY AT HOME
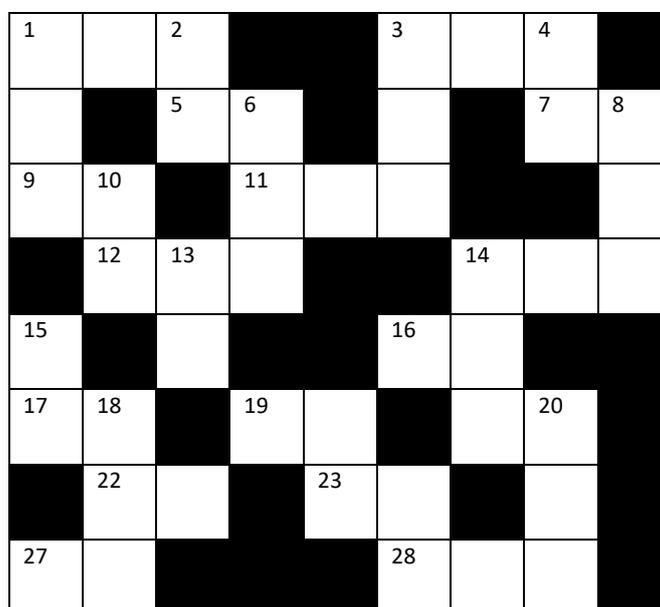
Across

1. The missing angle i.

3. Find the value of 32 x 6

5. The next number in the sequence, 14, 24, 34, ...

7. The ratio 8:26 simplifies to 4:n. Find the value for n.

9. The 6th prime number.

11. The probability of picking a red ball is 0.12. Calculate the probability of not picking a red ball.

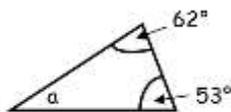12. The value of 20 x 25.

14. Angles in a triangle add up to…..?

16. The lowest common multiple of 11 and 6.

17. The next number in the sequence 13, 15, 17, 19,…..

19. Calculate the 5th term of 3n + 3

22. Value of 5^2

23. Find the missing angle a.

27. Katie has 40 pens, she shares them with Frank and James in the ratio of 5:3. How many pens does James receive?

28. Geoff uses 101g of chocolate in his mousse, he needs to use 4 times as much how much chocolate does he use?

Down

1. Calculate the 50th term of 2n + 1.

2. The Lowest Common Multiple of 12 and 8.

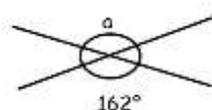3. Jack shares £180 with his sisiter Jane and Judy in the ratio 3:2. How much does Jane get?

4. Find the value of 210 ÷ 10.

6. 200g of flour are needed to make 6 cakes. How much is needed to make 12 cakes?

8. Number of degrees around a point.

10. If 4 pens cost 20p, how much do 7 pens cost?

13. The probability of josh being late is 0.4, what is the probaility of Josh not being late?

14. The missing angle a.

15. The highest common factor of 24 and 36.

18. James uses 50g of butter to make 12 biscuits, how much butter does he need for 30 biscuits.

20. The prime factors of a number are 2^{3}x23, what number is it