

Mathematics

This Level 3 Certificate Mathematical Studies qualification will consolidate students' mathematical understanding, build their confidence and competence in applying mathematical techniques to solve a range of problems and introduce them to new techniques and concepts that will prepare them for further study and future employment within a broad range of academic, professional and technical fields.

Mathematical Studies aims to prepare students for the mathematical demands of higher education and work where there is a distinct mathematical or statistical element, but where the mathematical demands do not stretch to a requirement for A-level mathematics.

A course of study leading to this qualification should enable students to:

- study a mathematics curriculum that is integrated with other areas of their study, work or interest leading to the application of mathematics in these areas
- develop mathematical modelling, evaluating and reasoning skills
- solve problems some of which will not be well defined and may not have a unique solution
- solve substantial and real-life problems encountered by adults
- use ICT as an exploratory tool for developing mathematical understanding and when solving problems
- develop skills in the communication, selection, use and interpretation of their mathematics
- enjoy mathematics and develop confidence in using mathematics

Year 12 Level 3 Mathematical Studies (Core Maths)

Term One

Content of study	Getting Started – Talking about Mathematics
What are the aims and objectives of this term?	1.1 Voting Spreadsheet and analysis 1.2 Running your own car Personal Finance 1.3 Running Smart Circles 1.4 Maps and Measuring 2-D Shapes 1.5 Ice Cream Cones 3-D Shapes 1.6 Lines making Logos Straight line graphs
What previous knowledge is required?	1.1: N12 interpret fractions and percentages as operators S2 interpret and construct tables, charts and diagrams S4 appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers, quartiles and inter-quartile range) 1.2 N13 use standard units of mass, length, time and money 1.3 G17 know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2 ; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes

	1.4 G14 use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money, etc.) R2 use scale factors, scale diagrams and maps 1.5 G17 know the formulae: circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes A2 substitute numerical values into formulae and expressions, including scientific formulae R12 compare lengths, areas and volumes using ratio notation; make links to similarity (including trigonometric ratios) and scale factors G6 apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras' theorem and the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs 1.6 A8 work with coordinates in all four quadrants A9 plot graphs of equations that correspond to straight-line graphs in the coordinate plane; use the form $y = mx + c$ to identify parallel and perpendicular lines; find the equation of the line through two given points or through one point with a given gradient
How will this term's content help with future learning?	1.1 - Data analysis 1.2 - Personal Finance 1.3 - Estimation and Making assumptions 1.4 - Estimation 1.5 - Modelling shapes and evaluating results 1.6 - Regression Lines
Resources	• Tutorial videos for all topics and interactive questions available at www.hegartymaths.com. All students provided with an account • <i>Students are provided with Exam style questions in their assessment folders.</i> • <i>All classroom resources are published onto teams</i>
Links to the national curriculum/specification	1.1 • <i>Use of spreadsheets and tables</i> • <i>Knowledge and use of the GCSE Mathematical content of analysis of data</i> 1.2 • <i>Knowledge and use of the GCSE mathematical content of maths for personal finance elements</i> 1.3 • <i>Knowledge and use of the formulae for the circumference and the area of a circle</i> 1.4 • <i>Knowledge and use of the formulae for perimeter of two-dimensional shapes, their areas and for calculating fractional areas of circles and composite shapes</i> 1.5

	- Calculate the surface area of spheres, cones, pyramids and composite solids - Apply the concepts of similarity, including lengths in similar figures, and Pythagoras' theorem applied to two- and three-dimensional figures 1.6 - Knowledge and use of the formula $y=mx+c$ - Find the gradient of a straight line connecting two different points
Assessments	No assessments in term 1

Term Two

Content of study	Estimation and Analysis of Data
What are the aims and objectives of this term?	2.1 The Isle of Wright Mathematical modelling 2.2 Sun Cream Mathematical modelling 2.3 Piano Tuners Fermi Estimation 2.5 Campaigning for Change Discrete data, stem plots, box plots 2.6 Is it really true Continuous data, cumulative frequency 2.7 How fair is our Society? Calculating statistics to compare data 2.8 Should I take a day off? Grouped data, histograms
What previous knowledge is required?	2.1 The Isle of Wright N14 estimate answers; check calculations using approximation and estimation, including answers obtained using technology 2.2 Sun Cream A2 substitute numerical values into formulae and expressions, including scientific formulae 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; compare two quantities using percentages; work with percentages greater than 100%; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics R12 compare lengths, areas and volumes using ratio notation 2.3 Piano Tuners N9 calculate with and interpret standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer 2.5 Campaigning for Change

	S4 interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: - appropriate graphical representation involving discrete, continuous and grouped data, including box plots - appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers, quartiles and inter-quartile range) 2.6 Is it really true S4 see above S2 interpret and construct tables, charts and diagrams, including frequency tables. 2.7 How fair is our Society? S4 see above 2.8 Should I take a day off? S4 see above
How will this term's content help with future learning?	<i>The learning from this term will help students when attempting exam style questions on estimation and data analysis.</i>
Resources	- Tutorial videos for all topics and interactive questions available at www.hegartymaths.com. All students provided with an account - Students are provided with Exam style questions in their assessment folders. - All classroom resources are published onto teams
Links to the national curriculum/specification	2.1 The Isle of Wright E1.1 Representing a situation mathematically, using assumptions and simplifications; students will engage in the tackling of 'open' mathematical problem-solving where there may not be a clear single approach or 'correct' answer E1.2 Selecting and using appropriate mathematical techniques for problems and situations E1.3 Interpreting results in the context of a given problem E1.4 Evaluating methods and solutions including how they may have been affected by assumptions made 2.2 Sun Cream Same as 2.1 The Isle of Wright 2.3 Piano Tuners E2.1 Making fast, rough estimates of quantities that are either difficult or impossible to measure directly 2.5 Campaigning for Change D1.1 Appreciating the difference between qualitative and quantitative data, including the difference between discrete and continuous quantitative data

	D4.1 Constructing and interpreting diagrams for grouped discrete data, knowing their appropriate use and reaching conclusions based on these diagrams, including box and whisker plots and stem-and-leaf diagrams (including back-to-back) D3.1 Calculating/identifying mean, median, mode, quartiles, either from raw data or from stem-and-leaf diagrams or box plots. D3.2 Interpreting these numerical measures and reaching conclusions based on these measures. 2.6 Is it really true D1.2 Appreciating the difference between primary and secondary data D1.3 Collecting quantitative and qualitative primary and secondary data D4.1 See above, including cumulative frequency graphs 2.7 How fair is our Society? D3.1 See above D3.2 See above 2.8 Should I take a day off? D4.1 See above, including histograms with unequal class intervals
Assessments	<i>Assessment 1 (located in SOW) in week 6</i>
Term Three	
Content of study	<i>Estimation and Analysis of Data and Personal Finance</i>
What are the aims and objectives of this term?	2.4 Stocking as Super Market Estimation 2.9 How many fish are in the sea Sampling 2.11 Paying for university Student Loans 2.12 Making Money work for you Savings and investments 2.13 Looking for Loans Loans and APR
What previous knowledge is required?	2.4 Stocking as Super Market R12 compare lengths, areas and volumes using ratio notation G16 know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders) 2.9 How many fish are in the sea 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; compare two quantities using percentages; work with percentages greater than 100%; solve

	problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics N11 identify and work with fractions in ratio problems 2.11 Paying for university R9 See above 2.12 Making Money work for you R9 See above N15 round numbers and measures to an appropriate degree of accuracy 2.13 Looking for Loans A2 substitute numerical values into formulae and expressions, including scientific formulae A5 understand and use standard mathematical formulae; rearrange formulae to change the subject R9 See above
How will this term's content help with future learning?	<i>The learning from this term will help students when attempting exam style questions on estimation, data analysis and Personal Finance.</i>
Resources	• Tutorial videos for all topics and interactive questions available at www.hegartymaths.com. All students provided with an account • <i>Students are provided with Exam style questions in their assessment folders.</i> • <i>All classroom resources are published onto teams</i>
Links to the national curriculum/specification	2.4 Stocking as Super Market E2.1 Making fast, rough estimates or quantities that are either difficult or impossible to measure directly 2.9 How many fish are in the sea D2.1 Inferring properties of populations or distributions from a sample, whilst knowing the limitations of sampling D2.2 Appreciating the strengths and limitations of random, cluster, stratified and quota sampling methods and applying this understanding when designing sampling strategies 2.11 Paying for university F4.1 Student loans F2.5 Solving problems involving percentage increase 2.12 Making Money work for you F3.1 Simple and compound interest, Annual Equivalent Rate (AER) F3.2 Savings and investments F2.5 Solving problems involving simple and compound interest F7.2 Setting up, solving and interpreting the solutions to financial problems, including those that involve compound interest using iterative methods

	F1.3 Applying and interpreting limits or accuracy, specifying simple error intervals due to truncation or rounding 2.13 Looking for Loans F4.1 Annual Percentage Rate (APR) F1.1 Substituting numerical values into formulae and financial expressions
Assessments	<i>Estimation unit assessment in week 5</i>
Term Four	
Content of study	<i>Analysis of Data and Personal Finance</i>
What are the aims and objectives of this term?	2.10 Winning the heptathlon Mean and standard deviation 2.14 Can I afford to buy a house? Mortgages 2.15 What happens to your pay? Income tax and National Insurance 2.16 Out of one hundred Percentages and VAT
What previous knowledge is required?	2.10 Winning the heptathlon S4 interpret, analyse and compare the distributions of data sets from univariate empirical distributions through appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers) S2 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 2.14 Can I afford to buy a house? Using spreadsheet formulae A9 plot graphs of equations that correspond to straight-line graphs in the coordinate plane; A2 substitute numerical values into formulae and expressions, including scientific formulae A17 solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation); find approximate solutions using a graph 2.15 What happens to your pay? 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; compare two quantities using percentages; work with percentages greater than 100%; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics

	2.16 Out of one hundred R6 See above
How will this term's content help with future learning?	<i>The learning from this term with help students when attempting exam style questions on data analysis and Personal Finance.</i>
Resources	- Tutorial videos for all topics and interactive questions available at www.hegartymaths.com. All students provided with an account - Students are provided with Exam style questions in their assessment folders. - All classroom resources are published onto teams
Links to the national curriculum/specification	2.10 Winning the heptathlon D3.1 Calculating/identifying the mean and standard deviation, whether from raw data or from stem-and-leaf diagrams D3.2 Interpreting these numerical measures and reaching conclusions based on these measures 2.14 Can I afford to buy a house? F4.1 Mortgages and Annual Percentage Rate F5.1 Graphical representation, interpreting results from graphs in financial contexts F1.1 Substituting numerical values into formulae, spreadsheets and financial expressions F1.2 Using conventional notations for priority of operation, including brackets, powers, roots and reciprocals 2.15 What happens to your pay? F6.1 Income tax, National Insurance F1.2 See above 2.16 Out of one hundred F2.1 Interpreting percentages and percentage changes as a fraction or a decimal and interpreting these multiplicatively F2.4 Working with percentages over 100% F2.5 Solving problems involving percentage change, including percentage increase/decrease and original value problems F6.1 Value Added Tax
Assessments	<i>Analysis of Data unit assessment in week 5</i> <i>Assessment 2 (located in SOW) in week 6</i>
Term Five	
Content of study	<i>Personal Finance and exam technique</i>
What are the aims and objectives of this term?	2.17 Monitoring inflation Inflation and price indices 2.18 Holiday money Currency and exchange rates 2.19 Can I afford to leave home Budgeting

What previous knowledge is required?	2.17 Monitoring inflation 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; compare two quantities using percentages; work with percentages greater than 100%; solve problems involving percentage change, including percentage increase/decrease and original value problems, and simple interest including in financial mathematics A9 plot graphs of equations that correspond to straight-line graphs in the coordinate plane; use the form $y = mx + c$ to identify parallel and perpendicular lines; find the equation of the line through two given points or through one point with a given gradient S4 Calculate the mean 2.18 Holiday Money 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) R9 See above 2.19 Can I afford to leave home A2 substitute numerical values into formulae and expressions, including scientific formulae R9 See above
How will this term’s content help with future learning?	<i>The learning from this term with help students when attempting exam style questions on Personal Finance.</i>
Resources	• Tutorial videos for all topics and interactive questions available at www.hegartymaths.com. All students provided with an account • <i>Students are provided with Exam style questions in their assessment folders.</i> • <i>All classroom resources are published onto teams</i>
Links to the national curriculum/specification	2.17 Monitoring inflation F7.1 The effect of inflation F2.2 Express one quantity as a percentage of another F2.3 Compare two quantities using percentages F2.5 Solve problems involving percentage change 2.18 Holiday Money F7.3 Currency exchange rates including commission F1.1 Substituting numerical values into formulae, spreadsheets and financial expressions 2.19 Can I afford to leave home F7.4 Budgeting F1.1 See above F1.4 Finding approximate solutions to problems in financial context
Assessments	<i>Personal Finance assessment in Week 6</i>