



ACLE ACADEMY GCSE 9-1
2 YEAR HIGHER MATHS
CURRICULUM MAP AND
ROUTE MAP



GCSE 9-1 HIGHER MATHS CURRICULUM MAP AND ROUTE MAP

- This Scheme of Learning (SOL) shows the progression of our 2 year GCSE course which follows the AQA 2 year GCSE route map.
- The LAST presentation under this scheme will be for year 10 in the 2019-20 academic year.
- Please note, dates for presentation are approximate and are subject to change dependent on the needs of the students in any given class. However, all content will be covered appropriately.
- On the next slide is a table showing where tracking point assessments will take place. These will normally consist of a single GCSE paper except for year 11 PPE exams and end of year 10 exams, which will consist of a whole set of 3 papers.
- There will also be topic by topic pre-checks and progress check assessments.

**GCSE MATHS ASSESSMENT**

| Assessment | Year | Exam Start Dates (approx) | Format |
|--------------------------|-------------|--------------------------------------|---------------|
| Tracking 1 | 10 and 11 | 28/10/2019 | 1 GCSE paper |
| Year 11 PPE 1 | 11 | 04/11/2019 | 3 GCSE papers |
| Tracking 2 | 10 and 11 | 9/2/2020 | 1 GCSE paper |
| Year 11 PPE 2 | 11 | 24/02/2020 | 3 GCSE papers |
| Tracking 3 | 10 | 15/06/2020 | 1 GCSE paper |
| Final Exams | 11 | May-20 | 3 GCSE papers |
| End of Year Exams | 10 | Jun-20 | 3 GCSE papers |

GCSE Mathematics 2 year Higher Tier Routemap (2015 specification)



Number



Algebra



Ratio, proportion and
rates of change



Geometry and
measures



Probability



Statistics

Year 10

| SEPTEMBER | | | | OCTOBER | | | | NOVEMBER | |
|--------------------------------------|-------------------------------------|------------------------|---------------------------|---------------------------------|------------------------------|-------------|----------------------------------|----------------------------------|-------------|
| <u>Wk1</u> | <u>Wk2</u> | <u>Wk3</u> | <u>Wk4</u> | <u>Wk5</u> | <u>Wk6</u> | <u>Wk7</u> | <u>Wk8</u> | <u>Wk9</u> | <u>Wk10</u> |
| Angles , Scale diagrams and Bearings | Basic Number, Factors and Multiples | Basic algebra review | Fractions and Decimals | Coordinates and Linear Graphs | Holiday | Rounding | Collecting and Representing Data | | |
| NOVEMBER | | | | DECEMBER | | | | JANUARY | |
| <u>Wk11</u> | <u>Wk12</u> | <u>Wk13</u> | <u>Wk14</u> | <u>Wk15</u> | <u>Wk16</u> | <u>Wk17</u> | <u>Wk18</u> | <u>Wk19</u> | <u>Wk20</u> |
| Collecting and Representing Data | Sequences | Basic Percentages | Examinations and Revision | Examinations and Revision | Holiday | Holiday | Perimeter and Area | Circumference and Area | |
| JANUARY | | FEBRUARY | | | | MARCH | | | |
| <u>Wk21</u> | <u>Wk22</u> | <u>Wk23</u> | <u>Wk24</u> | <u>Wk25</u> | <u>Wk26</u> | <u>Wk27</u> | <u>Wk28</u> | <u>Wk29</u> | <u>Wk30</u> |
| Real Life Graphs | Ratio and Proportion | Properties of polygons | Holiday | Equations | Indices | Surds | Basic Probability | Standard Form | Measures |
| APRIL | | | | MAY | | | | JUNE | |
| <u>Wk31</u> | <u>Wk32</u> | <u>Wk33</u> | <u>Wk34</u> | <u>Wk35</u> | <u>Wk36</u> | <u>Wk37</u> | <u>Wk38</u> | <u>Wk39</u> | <u>Wk40</u> |
| Holiday | Holiday | Transformations | Congruence and Similarity | 2D Representations of 3D shapes | Calculating with Percentages | Holiday | Summer Examinations and Revision | Summer Examinations and Revision | |
| JUNE | | JULY | | | | | | | |
| <u>Wk41</u> | <u>Wk42</u> | <u>Wk43</u> | <u>Wk44</u> | <u>Wk45</u> | | | | | |
| Summer Examinations and Revision | Summer Examinations and Revision | Statistical Measures | Constructions and Loci | | | | | | |

Year 11

| SEPTEMBER | | | | | OCTOBER | | | | NOVEMBER | |
|---|------------------------------|-------------|--|--------------------------------|------------------------|-----------------------|-------------------|-------------------------------|----------------------|------------------------------|
| <u>Wk1</u> | <u>Wk2</u> | <u>Wk3</u> | <u>Wk4</u> | <u>Wk5</u> | <u>Wk6</u> | <u>Wk7</u> | <u>Wk8</u> | <u>Wk9</u> | <u>Wk10</u> | |
| Probability | | Volume | Algebra: Quadratics, rearranging formulae and identities | | | Scatter Graphs | Numerical Methods | Holiday | Equation of a Circle | Further Equations and Graphs |
| NOVEMBER | | | | | | | | | | |
| <u>Wk11</u> | <u>Wk12</u> | <u>Wk13</u> | <u>Wk14</u> | <u>Wk15</u> | <u>Wk16</u> | <u>Wk17</u> | <u>Wk18</u> | <u>Wk19</u> | <u>Wk20</u> | |
| Further Equations and Graphs | Simultaneous Equations | | Mock Examinations and Revision | Mock Examinations and Revision | Holiday | Holiday | Sketching Graphs | Direct and Inverse proportion | Inequalities | |
| JANUARY | | FEBRUARY | | | MARCH | | | | | |
| <u>Wk21</u> | <u>Wk22</u> | <u>Wk23</u> | <u>Wk24</u> | <u>Wk25</u> | <u>Wk26</u> | <u>Wk27</u> | <u>Wk28</u> | <u>Wk29</u> | <u>Wk30</u> | |
| Pythagoras Theorem and Basic Trigonometry | | Holiday | Growth and Decay | Vectors | Transforming Functions | Sine and Cosine Rules | Circle Theorems | Holiday | | |
| APRIL | | | | | | | | | | |
| <u>Wk31</u> | <u>Wk32</u> | <u>Wk33</u> | <u>Wk34</u> | <u>Wk35</u> | <u>Wk36</u> | <u>Wk37</u> | <u>Wk38</u> | <u>Wk39</u> | <u>Wk40</u> | |
| Holiday | Gradients and rate of change | | Pre-calculus and area under a curve | Algebraic Fractions | REVISION | | | Holiday | REVISION | |
| JUNE | | JULY | | | | | | | | |
| <u>Wk41</u> | <u>Wk42</u> | <u>Wk43</u> | <u>Wk44</u> | <u>Wk45</u> | | | | | | |
| June Examinations | June Examinations | | | | | | | | | |



Angles, Scale Diagrams and Bearings

| | Specification content: | Specification notes: |
|-----|---|---|
| G1 | <ul style="list-style-type: none"> ➤ Use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles, polygons, regular polygons and polygons with reflection and/or rotation symmetries ➤ Use the standard conventions for labelling and referring to the sides and angles of triangles ➤ Draw diagrams from written descriptions | |
| G3 | <ul style="list-style-type: none"> ➤ Apply the properties of: angles at a point, angles at a point on a straight line, vertically opposite angles ➤ Understand and use alternate and corresponding angles on parallel lines | <ul style="list-style-type: none"> ➤ colloquial terms such as Z angles are not acceptable and should not be used |
| R2 | <ul style="list-style-type: none"> ➤ Use scale factors, scale diagrams and maps | <ul style="list-style-type: none"> ➤ including geometrical problems |
| G15 | <ul style="list-style-type: none"> ➤ Measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings | <ul style="list-style-type: none"> ➤ including the eight compass point bearings and three-figure bearings |

Basic Number, Factors and Multiples (Slide 1 of 2)

Continued
on next
page



| | Specification content: | Specification notes: |
|-----|--|---|
| N1 | <ul style="list-style-type: none">➤ Order positive and negative integers➤ Use the symbols $=, \neq, <, >, \leq, \geq$ | <ul style="list-style-type: none">➤ including use of a number line➤ know the conventions of an open circle on a number line for a strict inequality and a closed circle for an included boundary |
| N2 | <ul style="list-style-type: none">➤ Apply the four operations, including formal written methods, to integers both positive and negative➤ Understand and use place value (eg when working with very large or very small numbers, and when calculating with decimals) | <ul style="list-style-type: none">➤ including questions set in context➤ knowledge of terms used in household finance, for example profit, loss, cost price, selling price, debit, credit, balance, income tax, VAT and interest rate |
| N3 | <ul style="list-style-type: none">➤ Recognise and use relationships between operations including inverse operations (eg cancellation to simplify calculations and expressions) | |
| N14 | <ul style="list-style-type: none">➤ Estimate answers➤ Check calculations using approximation and estimation, including answers obtained using technology | <ul style="list-style-type: none">➤ including evaluation of results obtained |

Basic Number, Factors and Multiples (Slide 2 of 2)

| | Specification content: | Specification notes: |
|----|--|---|
| N4 | <ul style="list-style-type: none">➤ Use the concepts and vocabulary of prime numbers, factors (divisors), multiples, common factors, common multiples, highest common factor, lowest common multiple, prime factorisation, including using product notation and the unique factorisation theorem | <ul style="list-style-type: none">➤ prime factor decomposition including product of prime factors written in index form |
| N5 | <ul style="list-style-type: none">➤ Apply systematic listing strategies including use of the product rule for counting | <ul style="list-style-type: none">➤ including using lists, tables and diagrams |

Basic Algebra Review

| | Specification content: | Specification notes: |
|----|---|---|
| A1 | <ul style="list-style-type: none"> ➤ Use and interpret algebraic notation, including: <ul style="list-style-type: none"> – ab in place of $a \times b$ – $3y$ in place of $y + y + y$ and $3 \times y$ – a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a^2b in place of $a \times a \times b$ – $\frac{a}{b}$ in place of $a \div b$ – coefficients written as fractions rather than as decimals – brackets | <ul style="list-style-type: none"> ➤ it is expected that answers will be given in their simplest form without an explicit instruction to do so |
| N3 | <ul style="list-style-type: none"> ➤ Use conventional notation for priority of operations, including brackets, powers, roots and reciprocals | |
| A3 | <ul style="list-style-type: none"> ➤ Understand and use the concepts and vocabulary of expressions, equations, formulae, <u>identities</u>, inequalities, terms and factors | <ul style="list-style-type: none"> ➤ this will be implicitly and explicitly assessed |
| A4 | <ul style="list-style-type: none"> ➤ Simplify and manipulate algebraic expressions (<u>including those involving surds</u>) by: <ul style="list-style-type: none"> – collecting like terms – multiplying a single term over a bracket – taking out common factors | |

Fractions and Decimals

| | Specification content: | Specification notes: |
|-----|--|--|
| N1 | <ul style="list-style-type: none"> ➤ Order positive and negative decimals and fractions | |
| N2 | <ul style="list-style-type: none"> ➤ Apply the four operations, including formal written methods, to decimals and simple fractions (proper and improper), and mixed numbers - both positive and negative ➤ Understand and use place value (eg when calculating with decimals) | <ul style="list-style-type: none"> ➤ including questions set in context ➤ knowledge of terms used in household finance, for example profit, loss, cost price, selling price, debit, credit, balance, income tax, VAT and interest rate |
| N3 | <ul style="list-style-type: none"> ➤ Calculate exactly with fractions | |
| N10 | <ul style="list-style-type: none"> ➤ Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ and 0.375 and $\frac{3}{8}$) ➤ Change recurring decimals into their corresponding fractions and vice versa | <ul style="list-style-type: none"> ➤ including ordering |

Coordinates and Linear Graphs

| | Specification content: | Specification notes: |
|-----|--|----------------------|
| A8 | <ul style="list-style-type: none"> ➤ Work with coordinates in all four quadrants | |
| G11 | <ul style="list-style-type: none"> ➤ Solve geometrical problems on coordinate axes | |
| A9 | <ul style="list-style-type: none"> ➤ Plot graphs of equations that correspond to straight-line graphs in the coordinate plane. ➤ <u>Use the form $y = mx + c$ to identify parallel and perpendicular lines</u> ➤ <u>Find the equation of the line through two given points, or through one point with a given gradient</u> | |
| A10 | <ul style="list-style-type: none"> ➤ Identify and interpret gradients and intercepts of linear functions graphically and algebraically | |

Rounding

| | Specification content: | Specification notes: |
|-----|---|---|
| N15 | <ul style="list-style-type: none"> ➤ Round numbers and measures to an appropriate degree of accuracy (eg to a specified number of decimal places or significant figures) ➤ <u>Use inequality notation to specify simple error intervals due to truncation or rounding</u> | <ul style="list-style-type: none"> ➤ including appropriate rounding for questions set in context. ➤ know not to round values during intermediate steps of a calculation |
| N16 | <ul style="list-style-type: none"> ➤ <u>Apply and interpret limits of accuracy including upper and lower bounds</u> | |

Collecting and Representing Data

| | Specification content: | Specification notes: |
|----|---|---|
| S2 | <ul style="list-style-type: none"> ➤ Interpret and construct tables, charts and diagrams, including: <ul style="list-style-type: none"> – frequency tables, bar charts, pie charts and pictograms for categorical data – vertical line charts for ungrouped discrete numerical data – <u>tables and line graphs for time series data</u> ➤ And know their appropriate use | <ul style="list-style-type: none"> ➤ including choosing suitable statistical diagrams |
| S4 | <ul style="list-style-type: none"> ➤ Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through: <ul style="list-style-type: none"> – appropriate graphical representation involving discrete, continuous and grouped data – including boxplots | <ul style="list-style-type: none"> ➤ know and understand the terms primary data, secondary data, discrete data and continuous data |
| S3 | <ul style="list-style-type: none"> ➤ Construct and interpret diagrams for grouped discrete data and continuous data, ie histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use | |

Sequences

| | Specification content: | Specification notes: |
|-----|---|---|
| A23 | <ul style="list-style-type: none"> ➤ Generate terms of a sequence from either a term-to-term or a position-to-term rule | <ul style="list-style-type: none"> ➤ including from patterns and diagrams |
| A24 | <ul style="list-style-type: none"> ➤ Recognise and use: <ul style="list-style-type: none"> – sequences of triangular, square and cube numbers – simple arithmetic progression, – <u>Fibonacci-type sequences</u>, – <u>quadratic sequences</u>, – <u>simple geometric progressions (r^n where n is an integer and r is a rational number > 0)</u> – other sequences | <ul style="list-style-type: none"> ➤ other recursive sequences will be defined in the question |
| A25 | <ul style="list-style-type: none"> ➤ Deduce expressions to calculate the nth term of linear and quadratic sequences | |

Basic Percentages

| | Specification content: | Specification notes: |
|-----|--|---|
| R9 | <ul style="list-style-type: none">➤ 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% | |
| N12 | <ul style="list-style-type: none">➤ Interpret fractions and percentages as operators | <ul style="list-style-type: none">➤ including interpreting percentage problems using a multiplier |

Perimeter and Area

| | Specification content: | Specification notes: |
|-----|--|----------------------|
| G12 | <ul style="list-style-type: none"> ➤ Identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres | |
| G17 | <ul style="list-style-type: none"> ➤ Calculate the perimeter of 2D shapes and composite shapes ➤ <u>Find the surface area of pyramids and composite solids</u> | |
| G16 | <ul style="list-style-type: none"> ➤ Know and apply formulae to calculate area of: <ul style="list-style-type: none"> - triangles - parallelograms - trapezia | |

Circumference and Area

| | Specification content: | Specification notes: |
|-----|---|---|
| G9 | <ul style="list-style-type: none"> ➤ Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, <u>tangent, arc, sector and segment</u> | |
| G17 | <ul style="list-style-type: none"> ➤ Know and use the formulae: <ul style="list-style-type: none"> - Circumference = $2\pi r = \pi d$ - Area of a circle = πr^2 ➤ Calculate the perimeters of 2D shapes including circles and composite shapes ➤ Calculate areas of circles and composite shapes ➤ <u>Calculate surface area of spheres, cones and composite solids</u> | <ul style="list-style-type: none"> ➤ solutions in terms of π may be asked for |
| G18 | <ul style="list-style-type: none"> ➤ <u>Calculate arc lengths, angles and areas of sectors of circles</u> | |

Real Life Graphs

| | Specification content: | Specification notes: |
|-----|---|---|
| A14 | <ul style="list-style-type: none">➤ Plot and interpret graphs (<u>including reciprocal graphs and exponential graphs</u>) and graphs of non-standard functions in real contexts, to find approximate solutions to problems such as simple kinematic problems involving distance, speed and acceleration | <ul style="list-style-type: none">➤ including problems requiring a graphical solution |
| R14 | <ul style="list-style-type: none">➤ <u>Interpret the gradient of a straight-line graph as a rate of change</u> | |

Ratio and Proportion

| | Specification content: | Specification notes: |
|-----|---|---|
| N11 | ➤ Identify and work with fractions in ratio problems | |
| R3 | ➤ Express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1 | |
| R4 | ➤ Use ratio notation, including reduction to simplest form | |
| 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 and concentrations) | ➤ including better value or best-buy problems |
| R6 | ➤ Express a multiplicative relationship between two quantities as a ratio or fraction | |
| R7 | ➤ Understand and use proportion as equality of ratios | |
| R8 | ➤ Relate ratios to fractions and to linear functions | |

Properties of Polygons

| | Specification content: | Specification notes: |
|----|---|---|
| G3 | <ul style="list-style-type: none"> ➤ Derive and use the sum of angles in a triangle (eg to deduce and use the angle sum in any polygon, and to derive properties of regular polygons) | |
| G4 | <ul style="list-style-type: none"> ➤ Derive and apply the properties and definitions of: <ul style="list-style-type: none"> – special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus – and triangles and other plane figures using appropriate language | <ul style="list-style-type: none"> ➤ including knowing names and properties of isosceles, equilateral, scalene, right-angled, acute-angled, obtuse-angled triangles. ➤ including knowing names and using the polygons: pentagon, hexagon, octagon and decagon |

Equations

| | Specification content: | Specification notes: |
|-----|---|---|
| A2 | <ul style="list-style-type: none">➤ Substitute numerical values into formulae and expressions, including scientific formulae | <ul style="list-style-type: none">➤ unfamiliar formulae will be given in the question |
| A17 | <ul style="list-style-type: none">➤ Solve linear equations in one unknown algebraically (<u>including those with the unknown on both sides of the equation</u>) | <ul style="list-style-type: none">➤ including use of brackets |

Indices

| | Specification content: | Specification notes: |
|----|--|---|
| 9N | <ul style="list-style-type: none">➤ 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 | <ul style="list-style-type: none">➤ including square numbers up to 15×15➤ know that $1000 = 10^3$ and 1 million = 10^6 |
| LN | <ul style="list-style-type: none">➤ <u>Calculate with roots, and with integer and fractional indices</u> | |

Basic Probability

| | Specification content: | Specification notes: |
|----|---|---|
| P1 | <ul style="list-style-type: none"> ➤ Record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees | <ul style="list-style-type: none"> ➤ probabilities should be written as fractions, decimals or percentages |
| P4 | <ul style="list-style-type: none"> ➤ Apply the property that the probabilities of an exhaustive set of outcomes sum to 1 ➤ Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one | |
| P7 | <ul style="list-style-type: none"> ➤ Construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities | |

Surds

| | Specification content: | Specification notes: |
|-----|--|----------------------|
| N8 | <ul style="list-style-type: none">➤ Calculate exactly with surds➤ Simplify surd expressions involving squares (eg $\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}$) and rationalise denominators | |
| A24 | <ul style="list-style-type: none">➤ Recognise and use <u>simple geometric progressions (r^n where n is an integer and r is a surd)</u> | |

Standard Form

| | Specification content: | Specification notes: |
|----|--|---|
| N2 | <ul style="list-style-type: none">➤ Understand and use place value (eg when working with very large or very small numbers) | <ul style="list-style-type: none">➤ including questions set in context |
| N9 | <ul style="list-style-type: none">➤ Calculate with and interpret standard form $A \times 10^n$ where $1 \leq A < 10$ and n is an integer | <ul style="list-style-type: none">➤ with and without a calculator➤ interpret calculator displays |

Measures

| | Specification content: | Specification notes: |
|-----|--|--|
| N16 | <ul style="list-style-type: none"> ➤ Apply and interpret limits of accuracy including upper and lower bounds | |
| G14 | <ul style="list-style-type: none"> ➤ Use standard units of measure and related concepts (length, area, volume/capacity, mass, time, money etc.) | |
| N13 | <ul style="list-style-type: none"> ➤ Use standard units of mass, length, time, money and other measures (including standard compound measures) using decimal quantities where appropriate | <ul style="list-style-type: none"> ➤ know and use metric conversion factors for length, area, volume and capacity. ➤ imperial/metric conversions will be given in the question |
| R1 | <ul style="list-style-type: none"> ➤ Change freely between related standard units (eg time, length, area, volume/capacity, mass) and compound units (eg speed, rates of pay, prices, <u>density, pressure</u>) in numerical <u>and algebraic contexts</u> | |
| R11 | <ul style="list-style-type: none"> ➤ Use compound units such as speed, rates of pay, unit pricing, <u>density and pressure</u> | <ul style="list-style-type: none"> ➤ including making comparisons |

Transformations

| | Specification content: | Specification notes: |
|-----|--|---|
| G7 | <ul style="list-style-type: none"> ➤ Identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement including <u>fractional and negative scale factors</u> | |
| G24 | <ul style="list-style-type: none"> ➤ Describe translations as 2D vectors | |
| G8 | <ul style="list-style-type: none"> ➤ Describe the changes and invariance achieved by combinations of rotations, reflections and translations | <ul style="list-style-type: none"> ➤ including using column vector notation for translations |

Congruence and Similarity

| | Specification content: | Specification notes: |
|-----|---|----------------------|
| G5 | <ul style="list-style-type: none">➤ <u>Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)</u> | |
| G6 | <ul style="list-style-type: none">➤ <u>Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including the fact that the base angles of an isosceles triangle are equal, and use known results to obtain simple proofs</u> | |
| G19 | <ul style="list-style-type: none">➤ <u>Apply and use the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures</u> | |

2D Representations of 3D Shapes

| | Specification content: | Specification notes: |
|-----|---|----------------------|
| G13 | <p>➤ <u>Construct and interpret plans and elevations of 3D shapes</u></p> | |

Calculating with Percentages

| | Specification content: | Specification notes: |
|----|--|---|
| R9 | <ul style="list-style-type: none">➤ Solve problems involving percentage change, including :<ul style="list-style-type: none">– percentage increase/decrease problems– original value problems– simple interest, including in financial mathematics | <ul style="list-style-type: none">➤ problems may be set in context➤ using a multiplier |

Statistical Measures

| | Specification content: | Specification notes: |
|----|--|--|
| S4 | <ul style="list-style-type: none"> ➤ Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through : <ul style="list-style-type: none"> - appropriate measures of central tendency (median, mean, mode and modal class) - spread (range, including consideration of outliers, quartiles and inter-quartile range) | <ul style="list-style-type: none"> ➤ students should know and understand the terms: primary data, secondary data, discrete data and continuous data |
| S5 | <ul style="list-style-type: none"> ➤ Apply statistics to describe a population | |
| S1 | <ul style="list-style-type: none"> ➤ <u>Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling</u> | |

Constructions and Loci

| | Specification content: | Specification notes: |
|----|---|--|
| G2 | <ul style="list-style-type: none">➤ <u>use the standard ruler and compass constructions (perpendicular bisector of a line segment, constructing a perpendicular to a given line from/at a given point, bisecting a given angle)</u>➤ <u>Use these to construct given figures and solve loci problems</u>➤ <u>Know that the perpendicular distance from a point to a line is the shortest distance to the line</u> | <ul style="list-style-type: none">➤ including constructing an angle of 60° |

Probability

| | Specification content: | Specification notes: |
|----|---|--|
| P2 | <ul style="list-style-type: none"> ➤ Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes or multiple future experiments | |
| P3 | <ul style="list-style-type: none"> ➤ Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 – 1 probability scale | |
| P5 | <ul style="list-style-type: none"> ➤ <u>Understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size</u> | |
| P6 | <ul style="list-style-type: none"> ➤ Enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams <u>and tree diagrams</u> | |
| P8 | <ul style="list-style-type: none"> ➤ <u>Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions</u> | <ul style="list-style-type: none"> ➤ including knowing when to add and when to multiply two or more probabilities |
| P9 | <ul style="list-style-type: none"> ➤ Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams | |

Volume

| | ➤ Specification content: | Specification notes: |
|-----|---|--|
| R12 | <ul style="list-style-type: none"> ➤ Compare lengths, areas and volumes using ratio notation ➤ Scale factors ➤ <u>Make links to similarity</u> | |
| G16 | <ul style="list-style-type: none"> ➤ Know and apply the formulae to calculate volume of cuboids and other right prisms (including cylinders) | |
| G17 | <ul style="list-style-type: none"> ➤ <u>Calculate the volume of spheres, pyramids, cones and composite solids</u> | <ul style="list-style-type: none"> ➤ including frustums |
| N8 | <ul style="list-style-type: none"> ➤ <u>Calculate exactly with multiples of π</u> | |

Algebra: Quadratics, rearranging formulae and identities

| | ➤ Specification content: | ➤ Specification notes: |
|----|---|--|
| A4 | <ul style="list-style-type: none"> ➤ Simplify and manipulate algebraic expressions <u>(including those involving surds)</u> by: <ul style="list-style-type: none"> - <u>expanding products of two or more binomials</u> - <u>factorising quadratic expressions of the form $x^2 + bx + c$ including the difference of two squares</u> - factorising quadratic expressions of the form $ax^2 + bx + c$ - simplifying expressions involving sums, products and powers, including the laws of indices | |
| A5 | <ul style="list-style-type: none"> ➤ Understand and use standard mathematical formulae ➤ Rearrange formulae to change the subject | <ul style="list-style-type: none"> ➤ including use of formulae from other subjects in words and using symbols |
| A6 | <ul style="list-style-type: none"> ➤ <u>Know the difference between an equation and an identity</u> ➤ <u>Argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments and proofs</u> | |
| A7 | <ul style="list-style-type: none"> ➤ Where appropriate, interpret simple expressions as functions with inputs and outputs ➤ Interpret the reverse process as the ‘inverse function’ ➤ Interpret the succession of two functions as a ‘composite function’ | <ul style="list-style-type: none"> ➤ understanding and use of function notation: $f(x), fg(x), f^{-1}(x)$ is expected at higher tier |

Scatter Graphs

| | Specification content: | Specification notes: |
|----|--|--|
| 9S | <ul style="list-style-type: none">➤ Use and interpret scatter graphs of bivariate data➤ Recognise correlation <u>and know that it does not indicate causation</u>➤ <u>Draw estimated lines of best fit</u>➤ <u>Make predictions</u>➤ <u>Interpolate and extrapolate apparent trends whilst knowing the dangers of doing so</u> | <ul style="list-style-type: none">➤ know and understand the terms: positive correlation, negative correlation, no correlation, weak correlation and strong correlation |

Numerical Methods

| | Specification content: | Specification notes: |
|-----|--|---|
| A20 | <ul style="list-style-type: none">➤ Find approximate solutions to equations numerically using iteration including the use of suffix notation | <ul style="list-style-type: none">➤ including the use of suffix notations in recursive formulae |

Equation of a circle

| | Specification content: | Specification notes: |
|-----|--|----------------------|
| A16 | <p>➤ Recognise and use the equation of a circle with centre at the origin</p> <p>➤ Find the equation of a tangent to a circle at a given point</p> | |

Further Equations and Graphs

| | Specification content: | Specification notes: |
|-----|--|--|
| A17 | <ul style="list-style-type: none"> ➤ Solve linear equations in one unknown algebraically (<u>including those with the unknown on both sides of the equation</u>) ➤ Find approximate solutions using a graph | <ul style="list-style-type: none"> ➤ including use of brackets |
| A18 | <ul style="list-style-type: none"> ➤ Solve quadratic equations (including those that require rearrangement) algebraically by factorising, by completing the square and by using the quadratic formula ➤ <u>Find approximate solutions using a graph</u> | |
| A12 | <ul style="list-style-type: none"> ➤ Recognise, sketch and interpret graphs of linear and quadratic functions | |
| A11 | <ul style="list-style-type: none"> ➤ <u>Identify and interpret roots, intercepts and turning points of quadratic functions graphically</u> ➤ <u>Deduce roots algebraically</u> ➤ Deduce turning points by completing the square | <ul style="list-style-type: none"> ➤ including the symmetrical property of a quadratic |
| A21 | <ul style="list-style-type: none"> ➤ <u>Translate simple situations or procedures into algebraic expressions or formulae</u> ➤ <u>Derive an equation, solve the equation and interpret the solution</u> | <ul style="list-style-type: none"> ➤ including solution of geometrical problems and problems set in context |

Simultaneous Equations

| | Specification content: | Specification notes: |
|-----|--|--|
| A19 | <ul style="list-style-type: none"> ➤ <u>Solve two simultaneous equations in two variables (linear/linear or linear/quadratic) algebraically</u> ➤ <u>Find approximate solutions using a graph</u> | |
| A21 | <ul style="list-style-type: none"> ➤ <u>Translate simple situations or procedures into algebraic expressions or formulae</u> ➤ <u>Derive an equation (or two simultaneous equations), solve the equations and interpret the solution</u> | <ul style="list-style-type: none"> ➤ including the solution of geometrical problems and problems set in context |

Sketching Graphs

| | Specification content: | Specification notes: |
|-----|---|----------------------|
| A12 | <p>➤ Recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, and the reciprocal function $y = \frac{1}{x}$ for $x \neq 0$, exponential functions $y = k^x$ for positive values of k, and the trigonometric functions (with arguments in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$ for angles of any size</p> | |

Direct and Inverse Proportion

| | Specification content: | Specification notes: |
|-----|---|----------------------|
| R10 | <ul style="list-style-type: none"> ➤ Solve problems involving direct and inverse proportion, including graphical and algebraic representations | |
| R13 | <ul style="list-style-type: none"> ➤ <u>Understand that X is inversely proportional to Y is equivalent to X is proportional to $\frac{1}{Y}$</u> ➤ Construct and interpret equations that describe direct and inverse proportion | |
| R14 | <ul style="list-style-type: none"> ➤ <u>Recognise and interpret graphs that illustrate direct and inverse proportion</u> | |

Inequalities

| | Specification content: | Specification notes: |
|-----|---|---|
| A22 | <ul style="list-style-type: none">➤ <u>Solve linear inequalities in one or two variable(s) and quadratic inequalities in one variable</u>➤ <u>Represent the solution set on a number line, using set notation and on a graph</u> | <ul style="list-style-type: none">➤ know the conventions of an open circle on a number line for a strict inequality and a closed circle for an included boundary➤ know the convention of a dashed line for strict inequalities and a solid line for an included inequality |

Pythagoras' Theorem and Basic Trigonometry

| | Specification content: | Specification notes: |
|-----|--|----------------------|
| G20 | <ul style="list-style-type: none"> ➤ Know the formula for Pythagoras' Theorem $a^2 + b^2 = c^2$ and the trigonometric ratios $\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}, \cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}, \tan \theta = \frac{\text{opposite}}{\text{adjacent}}$ <ul style="list-style-type: none"> ➤ Apply them to find angles and lengths in right angled triangles and, where possible, general triangles in two and three dimensional figures | |
| G21 | <ul style="list-style-type: none"> ➤ Know the exact values of $\sin \theta$ and $\cos \theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90° ➤ Know the exact value of $\tan \theta$ for $0^\circ, 30^\circ, 45^\circ, 60^\circ$ | |
| G6 | <ul style="list-style-type: none"> ➤ Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to conjecture and derive results about angles and sides, including Pythagoras Theorem, and use known results to obtain simple proofs | |
| R12 | <ul style="list-style-type: none"> ➤ Compare lengths using ratio notation and make links to trigonometric ratios | |

Growth & Decay

| | Specification content: | Specification notes: |
|-----|---|----------------------|
| R16 | <p>➤ <u>Set up, solve and interpret the answers in growth and decay problems, including compound interest and work with general iterative processes</u></p> | |

Vectors

| | Specification content: | Specification notes: |
|-----|---|----------------------|
| G25 | <ul style="list-style-type: none">➤ <u>Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representation of vectors</u>➤ Use vectors to construct geometric arguments and proofs | |

Transforming Functions

| | Specification content: | Specification notes: |
|-----|---|----------------------|
| A13 | <ul style="list-style-type: none">➤ Sketch translations and reflections of a given function | |

Sine and Cosine Rules

| | Specification content: | Specification notes: |
|-----|---|----------------------|
| G22 | <ul style="list-style-type: none"> ➤ Know and apply the Sine rule $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ and cosine rule $a^2 = b^2 + c^2 - 2bc \cos A$ to find unknown lengths and angles | |
| G23 | <ul style="list-style-type: none"> ➤ Know and apply $\text{Area} = \frac{1}{2}ab\sin C$ to calculate the area, sides or angles of any triangle | |

Circle Theorems

| Specification content: | Specification notes: |
|--|---|
| G10 ➤ Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results | ➤ Including: ➤ angle at centre is equal to twice angle at circumference; angle in a semi-circle is 90° ; ➤ angles in the same segment are equal; ➤ opposite angles in a cyclic quadrilateral sum to 180° ; ➤ tangent at any point on a circle is perpendicular to the radius at that point ➤ tangents from an external point are equal in length; ➤ the perpendicular from the centre to a chord bisects the chord; ➤ alternate segment theorem |

Gradients and rate of change

| | Specification content: | Specification notes: |
|-----|--|----------------------|
| R15 | <ul style="list-style-type: none">➤ Interpret the gradient at a point on a curve as the instantaneous rate of change➤ Apply the concepts of average and instantaneous rates of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts | |
| R14 | <ul style="list-style-type: none">➤ <u>Interpret the gradient of a straight-line graph as a rate of change</u> | |

Pre-calculus and area under a curve

| | Specification content: | Specification notes: |
|-----|---|----------------------|
| A15 | <ul style="list-style-type: none">➤ Calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs)➤ Interpret the results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts | |

Algebraic Fractions

| | Specification content: | Specification notes: |
|----|--|----------------------|
| A4 | <p>➤ Simplify and manipulate algebraic expressions involving algebraic fractions</p> | |