**Curriculum Mapping 2022-23 Subject: Mathematics Curriculum Leader: D. Watson**

|  |  |  |  |
| --- | --- | --- | --- |
|  | **KS3 Curriculum**1. Teaching crucial knowledge.
2. Exposing to key vocabulary.
3. Developing cultural capital.
4. Enabling the development of knowledge.
5. Challenging misconceptions.
6. Emphasising inter-connectedness.
7. Teaching and development of skills.
 | **KS4 Curriculum**1. Transition to education after KS4
2. Developing further on the attitudes and attributes for success.
3. Building on all areas from KS3 and Accelerated Curriculum.
4. Guidance for next stage of education
 | **KS5 Curriculum**1. Transition to HE/FE/Employment (including apprenticeship).
2. Developing further on the attitudes and attributes for success.
3. Building on all areas from KS3 and KS4.
 |
|  | **Year 7** | **Year 8** | **Year 9** | **Year 10** | **Year 11** | **Year 12** | **Year 13** |
| **Spiral****Curriculum** | **Vertically integrated across Key Stages – Each KS** |
| **Skills** | **The core tenet of Problem Solving:*** **Define**
* **Design**
* **Implement**

**Mathematical Narrative:** Express solutions in a clear coherent fashionMake connectionsMathematics is a creative and highly inter-connected discipline that has been developed over centuries**, providing the solution to some of history’s most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.****Mathematics aims to ensure that all pupils:**** become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.**** reason mathematically by following a line of enquiry, conjecturing relationships and****generalisations, and developing an argument, justification or proof using mathematical****language**** can solve problems by applying their mathematics to a variety of routine and nonroutine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.****Mathematics is an interconnected subject in which pupils need to be able to move fluently between representations of mathematical ideas. The programme of study for key stage 3 is organised into apparently distinct domains, but pupils should build on key stage 2 and connections across mathematical ideas to develop fluency, mathematical reasoning and competence in solving increasingly sophisticated problems. They should also apply their mathematical knowledge in science, geography, computing and other subjects.****Decisions about progression should be based on the security of pupils’ understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and sophisticated problems before any acceleration through new content in preparation for key stage 4. Those who are not sufficiently fluent should consolidate their understanding, including through additional practice, before moving on.** | **The core tenet of Problem Solving:*** **Define**
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| **Knowledge & Understanding** **Key Topics per half Term**  | **SoW SEE APPENDIX**T1 SoWT2 SoWT3 SoWT4 SoWT5 SoWT6 SoW | **SoW SEE APPENDIX**T1 SoWT2 SoWT3 SoWT4 SoWT5 SoWT6 SoW | **SoW SEE APPENDIX**T1 SoWT2 SoWT3 SoWT4 SoWT5 SoWT6 SoW | **SoW SEE APPENDIX**T1 SoWT2 SoWT3 SoWT4 SoWT5 SoWT6 SoW | Complete Curriculum **(SoW SEE APPENDIX)** and begin consolidation and GCSE exam preparationsT1 SoWT2 SoWT3 SoWT4 SoWT5 SoWT6 SoW | **SoW SEE APPENDIX**T1 SoWT2 SoWT3 SoWT4 SoWT5 SoWT6 SoW | Complete Curriculum **(SoW SEE APPENDIX)**  and begin consolidation and Exam PreparationsT1 SoWT2 SoWT3 SoWT4 SoWT5 SoWT6 SoW |
| **Common Assessment of Progress and Performance** **(CAPP)**  | Classwork and HomeworkHalf-termly assessments based on SoW covered so farEnd of Year assessmentAll formal assessments cover aspects of AO1, AO2, AO3 | Classwork and HomeworkHalf-termly assessments based on SoW covered so farEnd of Year assessmentAll formal assessments cover aspects of AO1, AO2, AO3 | Classwork and HomeworkHalf-termly assessments based on SoW covered so farEnd of Year assessmentAll formal assessments cover aspects of AO1, AO2, AO3 | Classwork and HomeworkHalf-termly assessments based on SoW covered so farEnd of Year assessmentAll formal assessments cover aspects of AO1, AO2, AO3 | Classwork and HomeworkHalf-termly assessments based on SoW covered so farEnd of Year assessmentAll formal assessments cover aspects of AO1, AO2, AO3 | Classwork and HomeworkHalf-termly assessments based on SoW covered so farEnd of Year assessmentAll formal assessments cover aspects of AO1, AO2, AO3 | Classwork and HomeworkHalf-termly assessments based on SoW covered so farEnd of Year assessmentAll formal assessments cover aspects of AO1, AO2, AO3 |
| **Wider Curriculum including extracurricular opportunities** **e.g SMSC ,Careers and Employability , Literacy and Numeracy**  | Would like to develop the introduction of STEMTake advantage of opportunities introduce some historical context to various topicsTake advantage of opportunities to make pupils aware of career opportunitiesUse examples and tasks to see how application of mathematics relates to the real world. | Would like to develop the introduction of STEMTake advantage of opportunities introduce some historical context to various topicsTake advantage of opportunities to make pupils aware of career opportunitiesUse examples and tasks to see how application of mathematics relates to the real world. | Would like to develop the introduction of STEMTake advantage of opportunities introduce some historical context to various topicsTake advantage of opportunities to make pupils aware of career opportunitiesUse examples and tasks to see how application of mathematics relates to the real world. | Would like to develop the introduction of STEMTake advantage of opportunities introduce some historical context to various topicsTake advantage of opportunities to make pupils aware of career opportunitiesUse examples and tasks to see how application of mathematics relates to the real world. | Would like to develop the introduction of STEMTake advantage of opportunities introduce some historical context to various topicsTake advantage of opportunities to make pupils aware of career opportunitiesUse examples and tasks to see how application of mathematics relates to the real world. | Would like to develop the introduction of STEMTake advantage of opportunities introduce some historical context to various topicsTake advantage of opportunities to make pupils aware of career opportunitiesUse examples and tasks to see how application of mathematics relates to the real world. | Would like to develop the introduction of STEMTake advantage of opportunities introduce some historical context to various topicsTake advantage of opportunities to make pupils aware of career opportunitiesUse examples and tasks to see how application of mathematics relates to the real world. |
| **Attitudes & Attributes****Growth Mindset,****Independent Learning**  | Reviewing and correcting mistakes and misconceptions. This process should be initially undertaken by the pupil in the first instance and moved up to working the teacher if the pupil is unable to fix things. | Reviewing and correcting mistakes and misconceptions. This process should be initially undertaken by the pupil in the first instance and moved up to working the teacher if the pupil is unable to fix things. | Reviewing and correcting mistakes and misconceptions. This process should be initially undertaken by the pupil in the first instance and moved up to working the teacher if the pupil is unable to fix things. | Reviewing and correcting mistakes and misconceptions. This process should be initially undertaken by the pupil in the first instance and moved up to working the teacher if the pupil is unable to fix things. | Reviewing and correcting mistakes and misconceptions. This process should be initially undertaken by the pupil in the first instance and moved up to working the teacher if the pupil is unable to fix things. | Reviewing and correcting mistakes and misconceptions. This process should be initially undertaken by the pupil in the first instance and moved up to working the teacher if the pupil is unable to fix things. | Reviewing and correcting mistakes and misconceptions. This process should be initially undertaken by the pupil in the first instance and moved up to working the teacher if the pupil is unable to fix things. |
|  |  |  |  |  |  |  |  |

**Intent –** Implementation – Impact

Intent - The ambitions and plans that are in place up to the point of delivery

Implementation – the means for how these are delivered and assessed

Impact – the achievements of students as evidence by work produced, attitudes to learning, participation in extra curricular, summative assessment and final outcomes

Our definitions

**Spiral Curriculum**

How the building blocks of our curriculum are constructed and built upon through students’ journey through school

**Appendix**

**Year 7 overview**

|  |  |  |  |
| --- | --- | --- | --- |
| Unit 1   |  Fractions    [Unit 01 Quiz.rtf](https://cdarwinbromley.sharepoint.com/sites/Maths_Staff/_layouts/15/Doc.aspx?sourcedoc=%7B59DB764E-0032-4508-8184-37F7079BEADB%7D&file=Unit%2001%20Quiz.rtf&action=default)  | 12 lessons   | Autumn 1   |
| Unit 2   | Decimals and Rounding    | 10 lessons   | Autumn 1   |
| Unit 3   | Calculations and Estimations        [Unit 03 Quiz.rtf](https://cdarwinbromley.sharepoint.com/sites/Maths_Staff/_layouts/15/Doc.aspx?sourcedoc=%7BBB3B0978-F841-4859-94EB-80ED594B3924%7D&file=Unit%2003%20Quiz.rtf&action=default&DefaultItemOpen=1)  | 4 lessons   | Autumn 1   |
| Revision   |
| Assessment 1    |
| Unit 4 i  | Factors, Multiples and Primes         [Unit 04 Quiz.rtf](https://cdarwinbromley.sharepoint.com/sites/Maths_Staff/_layouts/15/Doc.aspx?sourcedoc=%7B447B0C6B-EE4F-4FEB-BD6A-1D6382C179A4%7D&file=Unit%2004%20Quiz.rtf&action=default&DefaultItemOpen=1)  | 7 lessons   | Autumn 2   |
| Unit 5   | Algebra - Simplifying, Expanding, Factorising and Substitution        [Unit 05 Quiz.rtf](https://cdarwinbromley.sharepoint.com/sites/Maths_Staff/_layouts/15/Doc.aspx?sourcedoc=%7BE8EE3F19-F6C6-4558-9862-1E15C7A7ADC7%7D&file=Unit%2005%20Quiz.rtf&action=default&DefaultItemOpen=1)  | 15 lessons   | Autumn 2   |
| Recap   | Unit 1-3   | 2 lessons   | Autumn 2   |
| Revision   |
| Assessment 2   |
| Unit 6   | Indices, Powers and Roots   [Unit 06 Quiz.rtf](https://cdarwinbromley.sharepoint.com/sites/Maths_Staff/_layouts/15/Doc.aspx?sourcedoc=%7BF858CC04-6B06-421D-A954-B72EEE54462F%7D&file=Unit%2006%20Quiz.rtf&action=default&DefaultItemOpen=1)  | 10 lessons   | Spring 1   |
| Unit 7   | Units of measurements and Conversions      [Unit 07 Quiz.rtf](https://cdarwinbromley.sharepoint.com/sites/Maths_Staff/_layouts/15/Doc.aspx?sourcedoc=%7BC4889EA0-FE91-47DA-B98C-47AFEB0D6501%7D&file=Unit%2007%20Quiz.rtf&action=default&DefaultItemOpen=1)  | 6 lessons   | Spring 1   |
| Recap   | Unit 1-5   | 4 lessons   | Spring 1   |
| Revision   |
| Assessment 3   |
| Unit 8   | Percentages (Emphasis on calculator work)    | 12 lessons   | Spring 2   |
| Unit 9  | Speed, Distance, Time Graphs and Calculations                  [Unit 09 Quiz.rtf](https://cdarwinbromley.sharepoint.com/sites/Maths_Staff/_layouts/15/Doc.aspx?sourcedoc=%7BB2E6E0B2-4BFF-4616-B187-FE4B7F0DC6CD%7D&file=Unit%2009%20Quiz.rtf&action=default&DefaultItemOpen=1)  | 4 lessons  | Spring 2  |
| Unit 10  | Line Graphs and Scatter Graphs      | 4 lessons  | Spring 2  |
| Recap   | Unit 1-7   | 2 lessons   | Spring 2   |
| Revision   |
| Assessment 4   |
|  **SUMMER TERM 1** **Revise above for End of Year assessmeny** |
| Unit 11   | Construction, Loci and Bearings       [Unit 08 Quiz.rtf](https://cdarwinbromley.sharepoint.com/sites/Maths_Staff/_layouts/15/Doc.aspx?sourcedoc=%7B4D05DB91-7E74-4804-BAF0-DD4756CCCA8F%7D&file=Unit%2008%20Quiz.rtf&action=default&DefaultItemOpen=1)   | 12 lessons   | Summer 1   |
| Unit 12   | Setting up, Solving and Rearranging Equations    | 12 lessons   | Summer 1   |
| Recap   | Unit 1-10   | 5 lessons   | Summer 1   |
| Revision   |
| EOY Test (Assessment 5)   |
| Unit 13   | Polygons   | 8 lessons   | Summer 2   |
| Unit 14   | Angles and Parallel Lines   | 7lessons   | Summer 2   |

**Year 8 Overview**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Topic Number** | **Topic** | **Teaching Time** | **Term** | **9-1 GCSE Specification** | **Reference to CGP GCSE Foundation Textbook Green book** | **Mathswatch Clip** | **Other Resources** |
| 1 | Ratio and proportion | 11 | Autumn 1 | R3 R4 R5, R6, R7, R10, R14 | Section 6 and 14 | **(Ratios)** 38, 39, 106, 107, 165a,b,c, 200; **(Proportions)** 42, 199 | Corbett Maths, Maths Box |
| 2a, 2b | Fractions, Decimals, Percentages | 13 | Autumn 1 | N1, N2,N3, N8, N10, N12, R3, R9 | Section 5 and Section 7 |  24-26, 30 - 32, 66, 67,70-74, 85, 86-89  | Corbett Maths, Maths Box |
|  | **Assessment week** |  | **Autumn 1** | **Assessment week** |  | **Assessment week** | Corbett Maths, Maths Box |
| 3 | Basic Algebra | 15 | Autumn 2 | N1, N3, A1, A2, A3, A4, A5, A7, A21 | Section 8, Section 9, and Section 10 | 7, 33, 34, 35, 36, 93, 94, 95, 100, 101, 134a, 134b, 135a, 135b, 136, 137, 190 | Corbett Maths, Maths Box |
| 4 | Sequences | 8 | Spring 1 | A7, A23, A24 | Section 11 | 37, 102, 103, 141 | Corbett Maths, Maths Box |
| 5a | Probability | 10 | Spring 1 | P1, P2, P3, P4, P5, P6, P7, P8, P9 | Section 27 | 14, 58, 59, 60, 125, 126, 151, 152, 204 | Corbett Maths, Maths Box |
| 5b | Sets and Venn Diagrams | 4 | Spring 1/2 | P9 | Section 27 | 127a, 127b, 185 | Corbett Maths, Maths Box |
|  | **Assessment week** |  | **Spring 1** | **Assessment week** |  | **Assessment week** |  |
| 6 | Pythagoras' Theorem | 4 | Spring 2 | G20 | Section 19 | 150a, 150b | Corbett Maths, Maths Box |
| 7 | Trigonometry (sin, cos, and tan) | 4 | Spring 2 | G20 | Section 19 | 168 | Corbett Maths, Maths Box |
| 8 | Analysing Data | 8 | Summer 1 | S2, S4, S5 | Section 26 | 15, 61, 62, 130a, 130b | Corbett Maths, Maths Box |
|   | Revision (including key topics from Year 7) |   | Summer 1 | **Revision** |   | **Revision** |   |
|   | End of Year Assessment |  | **Summer 1** | **End of Year Assessment** |  | **End of Year Assessment** |  |
| 9 | Graphs | **8** | Summer 2 | A8, A9, A10, 14 | Section 12 | 8, 96, 98, 133 | Corbett Maths, Maths Box |
| 10 | Real-Life Graphs | **4** | Summer 2 | A7, A8, A9, A10.A14 | Section 13 | 107, 143 | Corbett Maths, Maths Box |
| 11 | Standard Form | **4** | Summer 2 | N9 | Section 3 | 83 | Corbett Maths, Maths Box |

**Year 9 Foundation (Sets 3, 4 & 5) Overview**

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| --- | --- | --- | --- |
| **Unit** | **Title** | **Estimated hours** |  |
| 1  | a  | Integers and place value  | 6  | 9A1  |
| b  | Decimals   | 5  | 9A1  |
| c  | Indices, powers and roots  | 7  | 9A1  |
| ASSESSMENT 1  |
| d  | Factors, multiples and primes  | 6  | 9A1/2  |
| 2  | a  | Algebra: the basics  | 8  | 9A2  |
| b  | Expanding and factorising single brackets  | 6  | 9A2  |
| c  | Expressions and substitution into formulae  | 7  | 9A2  |
|   | ASSESSMENT 2  |
| 3  | a  | Tables   | 7  | 9SPR1  |
| b  | Charts and graphs  | 7  | 9SPR1  |
| c  | Pie charts  | 4  | 9SPR1  |
| ASSESSMENT 3  |
| d  | Scatter graphs  | 4   | 9SPR2  |
| 4  | a  | Fractions   | 7  | 9SPR2  |
| b  | Fractions, decimals and percentages  | 4  | 9SPR2  |
| c  | Percentages  | 7  | 9SPR2  |
| ASSESSMENT 4  |
| 5  | a  | Equations   | 7  | 9SM1  |
| b  | Inequalities  | 5  | 9SM1  |
| c  | Sequences   | 7  | 9SM1  |
| HALF TERM  |
| 6  | a  | Properties of shapes, parallel lines and angle facts  | 10  | 9SM2  |
| b  | Interior and exterior angles of polygons  | 6  | 9SM2  |
| **EOY EXAMS** |

**Year 9 Higher (Sets 1 & 2) Overview**

|  |  |  |  |
| --- | --- | --- | --- |
| **Unit** | **Title** | **Estimatd hours** |  |
| 1  | a  | Calculations, checking and rounding  | 7  | 9A1  |
| b  | Indices, roots, reciprocals and hierarchy of operations  | 8  | 9A1  |
| c  | Factors, multiples and primes  | 6  | 9A1  |
|   | ASSESSMENT 1  |
| d  |  |   |  |
| 2  | a  | Algebra: the basics  | 8  | 9A2  |
| b  | Setting up, rearranging and solving equations  | 8  | 9A2  |
| c  | Sequences  | 6  | 9A2  |
|   | ASSESSMENT 2   |
| 3  | a  | Averages and range  | 7  | 9SPR1  |
| b  | Representing and interpreting data  | 8  | 9SPR1  |
| c  | Scatter graphs  | 4  | 9SPR1  |
| ASSESSMENT 3  |
| 4  | a  | Fractions   | 7  | 9SPR2  |
| b  | Percentages  | 7  | 9SPR2  |
| c  | Ratio and proportion  | 7  | 9SPR2  |
| ASSESSMENT 4  |
| 5  | a  | Polygons, angles and parallel lines  | 8  | 9SM1  |
| b  | Pythagoras’ Theorem and trigonometry  | 8  | 9SM1  |
| 6  | a  | Graphs: the basics and real-life graphs  | 7  | 9SM1/2  |
| b  | Linear graphs and coordinate geometry  | 10  | 9SM2  |
| c  | Quadratic, cubic and other graphs  | 8  | 9SM2  |
| EOY EXAMS  |

**Year 10 & 11 Foundation Overview**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| [7](#Unit7) | [a](#Unit7a) | Equations (Year 9) | 7 | 9SM2 |
|  |  |  |  |
| [b](#Unit7b) | Inequalities | 5 | 10A1 |
| [c](#Unit7c) | Sequences  | 7 | 10A1 |
| [8](#Unit8) | [a](#Unit8a) | Perimeter and area | 10 | 10A1 |
| [b](#Unit8b) | 3D forms and volume | 6 | 10A1 |
|  |  | Assessment |  |  |
| [9](#Unit9) | [a](#Unit9a) | Real-life graphs | 9 | 10A2 |
| [b](#Unit9b) | Straight-line graphs | 6 | 10A2 |
| [10](#Unit10) | [a](#Units10a) | Transformations I: rotations and translations | 6 | 10A2 |
| [b](#Units10b) | Transformations II: reflections and enlargements | 8 | 10A2/SP1 |
|  |  | Assessment |  |  |
| [11](#Unit11) | [a](#Unit11a) | Ratio  | 6  | 10SP1 |
| [b](#Unit11b) | Proportion | 6  | 10SP1 |
| [12](#Unit12) |  | Right-angled triangles: Pythagoras and trigonometry | 6 | 10SP1 |
|  |  | Assessment |  |  |
| [13](#Unit13) | [a](#Unit13a) | Probability I  | 5 | 10SP2 |
| [b](#Unit13b) | Probability II | 9 | 10SP2 |
| [14](#Unit14) |  | Multiplicative reasoning | 7 | 10SP2 |
|  |  | Assessment |  |  |
| [15](#Unit15) | [a](#Unit15a) | Plans, elevations and nets | 6 | 10SM1 |
| [b](#Unit15b) | Constructions, loci and bearings | 10 | 10SM1 |
| [16](#Unit16) | [a](#Unit16a) | Quadratic equations: expanding and factorising  | 5 | 10SM1 |
| [b](#Unit16b) | Quadratic equations: graphs  | 4 | 10SM1 |
| [17](#Unit17) |  | Circles, cylinders, cones and spheres | 7  | 10SM2 |
|  |  | REVISION AND ASSESSMENT EOY TESTS |  |  |
| [18](#Unit18) | [a](#Unit18a) | Fractions and reciprocals  | 5 | 10SM2 |
| [b](#Unit18b) | Indices and standard form | 6 | 11A1 |
| [19](#Unit19) | [a](#Unit19a) | Similarity and congruence in 2D | 7  | 11A1 |
| [b](#Unit19b) | Vectors  | 7  | 11A1 |
| [20](#Unit20) |  | Rearranging equations, graphs of cubic and reciprocal functions and simultaneous equations | 5 | 11A1 |

**Year 10 & 11 Higher Overview**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| [7](#Unit7) | [a](#Unit7a) | Perimeter, area and 3D forms | 8 | 10A1 |
| [b](#Unit7b) | Circles, cylinders, cones and spheres | 8 | 10A1 |
| [c](#Unit7c) | Accuracy and bounds | 6 | 10A1 |
|  |  | ASSESSMENT |  |  |
| [8](#Unit8) | [a](#Unit8a) | Transformations | 8 | 10A1/A2 |
| [b](#Unit8b) | Constructions, loci and bearings | 8 | 10A2 |
| [9](#Unit9) | [a](#Unit9a) | Solving quadratic and simultaneous equations | 8 | 10A2 |
| [b](#Unit9b) | Inequalities | 6 | 10A2 |
|  |  | ASSESSMENT |  |  |
| [10](#Unit10) |  | Probability | 10 | 10SP1 |
| [11](#Unit11) |  | Multiplicative reasoning  | 8 | 10SP1 |
| [12](#Unit12) |  | Similarity and congruence in 2D and 3D | 8 | 10SP1/SP2 |
|  |  | ASSESSMENT |  |  |
| [13](#Unit13) | [a](#Unit13a) | Graphs of trigonometric functions | 6 | 10SP2 |
| [b](#Unit13b) | Further trigonometry | 10 | 10SP2 |
|  |  | ASSESSMENT |  |  |
| [14](#Unit14) | [a](#Unit14a) | Collecting data | 6 | 10SM1 |
| [b](#Unit14b) | Cumulative frequency, box plots and histograms | 7 | 10SM1 |
| [15](#Unit15) |  | Quadratics, expanding more than two brackets, sketching graphs, graphs of circles, cubes and quadratics | 8 | 10SM1 |
| [16](#Unit16) | [a](#Unit16a) | Circle theorems  | 7 | 10SM1 |
| [b](#Unit16b) | Circle geometry | 6 | 10SM2 |
| [17](#Unit17) |  | Changing the subject of formulae (more complex), algebraic fractions, solving equations arising from algebraic fractions, rationalising surds, proof | 8 | 10SM2 |
|  |  | ASSESSMENT DURING SM2 FOR EOY |  |  |
| [18](#Unit18) |  | Vectors and geometric proof | 10  | 11A1 |
| [19](#Unit19) | [a](#Unit19a) | Reciprocal and exponential graphs; Gradient and area under graphs | 8 | 11A1 |
| [b](#Unit19b) | Direct and inverse proportion | 8 | 11A2 |

**Year 12 & 13 A Level Mathematics Overview**

**Year 1: AS Mathematics pure content; Pure Mathematics**

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **1**  |   | **Algebra and functions**  |   |
| a  | Algebraic expressions – basic algebraic manipulation, indices and surds  | **4**  |
| b  | Quadratic functions – factorising, solving, graphs  and the discriminants   | **4**  |
| c  | Equations – quadratic/linear simultaneous    | **4**  |
| d  | Inequalities – linear and quadratic (including graphical solutions)  | **5**  |
| e  | Graphs – cubic, quartic and reciprocal  | **5**  |
| f  | Transformations – transforming graphs – f(*x*) notation  | **5**  |
| **2**  |   | **Coordinate geometry in the (*x*, *y*) plane**  |   |
| a  | Straight-line graphs, parallel/perpendicular, length and area problems  | **6**  |
| b  | Circles – equation of a circle, geometric problems on a grid  | **7**  |
| **3**   |   | **Further algebra**  |   |
| a  | Algebraic division, factor theorem and proof  | **8**  |
| b  | The binomial expansion  | **7**  |
| **4**   |   | **Trigonometry**  |   |
| a  | Trigonometric ratios and graphs  | **6**  |
| b  | Trigonometric identities and equations  | **10**  |
| **5**   |   | **Vectors (2D)**  |   |
| a  | Definitions, magnitude/direction, addition and scalar multiplication  | **7**  |
| b  | Position vectors, distance between two points, geometric problems   | **7**  |
| **6**   |   | **Differentiation**  |   |
| a  | Definition, differentiating polynomials, second derivatives  | **6**  |
| b  | Gradients, tangents, normals, maxima and minima  | **6**  |
| **7**   |   | **Integration**  |   |
| a  | Definition as opposite of differentiation, indefinite integrals of *xn*  | **6**  |
| b  | Definite integrals and areas under curves  | **5**  |
| **8**  |   | **Exponentials and logarithms:** Exponential functions and natural logarithms  | **12**  |
|   |   |   | **120 hours**  |

**Year 1: AS Mathematics applied content**

**Statistics and Mechanics**

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **Section A – Statistics**  |
| **1**  |   | **Statistical sampling**  |   |
| a  | Introduction to sampling terminology; Advantages and disadvantages of sampling  | **1**  |
| b  | Understand and use sampling techniques; Compare sampling techniques in context  | **2**  |
| **2**  |   | **Data presentation and interpretation**  |   |
| a  | Calculation and interpretation of measures of location; Calculation and interpretation of measures of variation; Understand and use coding  | **4**  |
| b  | Interpret diagrams for single-variable data; Interpret scatter diagrams and regression lines; Recognise and interpret outliers; Draw simple conclusions from statistical problems  | **8**  |
| **3**  |   | **Probability:** Mutually exclusive events; Independent events  | **3**  |
| **4**  |   | **Statistical distributions:** Use discrete distributions to model real-world situations; Identify the discrete uniform distribution; Calculate probabilities using the binomial distribution (calculator use expected)  | **5**  |
| **5**  |   | **Statistical hypothesis testing**  |   |
| a  | Language of hypothesis testing; Significance levels  | **2**  |
| b  | Carry out hypothesis tests involving the binomial distribution  | **5**  |
|   |   |   | **30 hours**  |
| **Section B – Mechanics**  |
| **6**   |   | **Quantities and units in mechanics**  |   |
| a  | Introduction to mathematical modelling and standard S.I. units of length, time and mass  | **1**  |
| b  | Definitions of force, velocity, speed, acceleration and weight and displacement; Vector and scalar quantities  | **2**  |
| **7**   |   | **Kinematics 1 (constant acceleration)**  |   |
| a  | Graphical representation of velocity, acceleration and displacement  | **4**  |
| b  | Motion in a straight line under constant acceleration; *suvat* formulae for constant acceleration; Vertical motion under gravity   | **6**  |
| **8**   |   | **Forces & Newton’s laws**  |   |
| a  | Newton’s first law, force diagrams, equilibrium, introduction to **i**, **j** system   | **4**  |
| b  | Newton’s second law, ‘*F* = *ma*’, connected particles (no resolving forces or use of *F* = *μR*); Newton’s third law: equilibrium, problems involving smooth pulleys   | **6**  |
| **9**  |   | **Kinematics 2 (variable acceleration)**  |   |
| a  | Variable force; Calculus to determine rates of change for kinematics  | **4**  |
| b  | Use of integration for kinematics problems  i.e. C:\Users\dwa\Local Settings\Temporary Internet Files\Content.MSO\D294793C.tmp   | **3**  |
|   |   |   | **30 hours**  |

**Year 2: Remaining A Level Mathematics pure content**

**Pure Mathematics**

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **1**  |   | **Proof:** Examples including proof by deduction\* and proof by contradiction   | **3**  |
| **2**  |   | **Algebraic and partial fractions**  |   |
|   | a  | Simplifying algebraic fractions  | **2**  |
|   | b  | Partial fractions  | **3**  |
| **3**  |   | **Functions and modelling**   |   |
|   | a  | Modulus function  | **2**  |
|   | b  | Composite and inverse functions  | **3**  |
|   | c  | Transformations  | **3**  |
|   | d  | Modelling with functions\*   | **2**  |
|   |   | \*examples may be Trigonometric, exponential, reciprocal etc.  |   |
| **4**  |   | **Series and sequences**   |   |
|   | a  | Arithmetic and geometric progressions (proofs of ‘sum formulae’)  | **4**  |
|   | b  | Sigma notation  | **2**  |
|   | c  | Recurrence and iterations  | **3**  |
| **5**  |   | **The binomial theorem**   |   |
|   | a  | Expanding (*a* + *bx*)*n* for rational *n*; knowledge of range of validity   | **4**  |
|   | b  | Expansion of functions by first using partial fractions  | **3**  |
| **6**  |   | **Trigonometry**   |   |
|   | a  | Radians (exact values), arcs and sectors  | **4**  |
|   | b  | Small angles  | **2**  |
|   | c  | Secant, cosecant and cotangent (definitions, identities and graphs);  Inverse trigonometrical functions; Inverse trigonometrical functions  | **3**  |
|   | d  | Compound\* and double (and half) angle formulae               | **6**  |
|   |   | \*geometric proofs expected  |   |
|   | e  | *R* cos (*x*  ± *α*) or *R* sin (*x*  ± *α*)  | **3**  |
|   | f  | Proving trigonometric identities  | **4**  |
|   | g  | Solving problems in context  (e.g. mechanics)  | **2**  |
| **7**  |   | **Parametric equations**  |   |
|   | a  | Definition and converting between parametric and Cartesian forms   | **3**  |
|   | b  | Curve sketching and modelling  | **2**  |

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **8**  |   | **Differentiation**   |   |
|   | a  | Differentiating sin *x* and cos *x* from first principles  | **2**  |
|   | b  | Differentiating exponentials and logarithms  | **3**  |
|   | c  | Differentiating products, quotients, implicit and parametric functions.  | **6**  |
|   | d  | Second derivatives (rates of change of gradient, inflections)  | **2**  |
|   | e  | Rates of change problems\* (including growth and kinematics)   | **3**  |
|   |   | \*see Integration (part 2) – Differential equations  |   |
| **9**  |   | **Numerical methods\***  |   |
|   | a  | Location of roots  | **1**  |
|   | b  | Solving by iterative methods (knowledge of ‘staircase and cobweb’ diagrams)  | **3**  |
|   | c  | Newton-Raphson method  | **2**  |
|   | d  | Problem solving   | **2**  |
|   |   | **\***See Integration (part 2) for the trapezium rule  |   |
| **10**  |    | **Integration (part 1)**  |   |
|   | a  | Integrating *xn* (including when *n* = –1), exponentials and trigonometric functions  | **4**  |
|   | b  | Using the reverse of differentiation, and using trigonometric identities to manipulate integrals  | **5**  |
| **11**  |    | **Integration (part 2)**  |   |
|   | a  | Integration by substitution  | **4**  |
|   | b  | Integration by parts  | **3**  |
|   | c  | Use of partial fractions  | **2**  |
|   | d  | Areas under graphs or between two curves, including understanding the area is the limit of a sum (using sigma notation)  | **4**  |
|   | e  | The trapezium rule  | **2**  |
|   | f  | Differential equations (including knowledge of the family of solution curves)  | **4**  |
| **12**  |   | **Vectors** (**3D):** Use of vectors in three dimensions;  knowledge of column vectors and **i**, **j** and **k** unit vectors   | **5**  |
|   |   |   | **120 hours**  |

**Year 2: Remaining A Level Mathematics applied content**

**Statistics and Mechanics**

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **Section A – Statistics**   |
| **1**  |   | **Regression and correlation**  |   |
| a  | Change of variable  | **2**  |
| b  | Correlation coefficients  Statistical hypothesis testing for zero correlation  | **5**  |
| **2**  |   | **Probability**  |   |
| a  | Using set notation for probability  Conditional probability  | **5**  |
| b  | Questioning assumptions in probability  | **2**  |
| **3**  |   | **The Normal distribution**  |   |
| a  | Understand and use the Normal distribution   | **5**  |
| b  | Use the Normal distribution as an approximation to the binomial distribution   Selecting the appropriate distribution  | **5**  |
| c  | Statistical hypothesis testing for the mean of the Normal distribution  | **6**  |
|   |   |   | **30 hours**  |
| **Section B – Mechanics**  |
| **4**  |   | **Moments:** Forces’ turning effect   | **5**  |
| **5**   |   | **Forces at any angle**  |   |
| a  | Resolving forces  | **3**  |
| b  | Friction forces (including coefficient of friction *µ*)  | **3**  |
| **6**  |   | **Applications of kinematics:** Projectiles  | **5**  |
| **7**  |   | **Applications of forces**  |   |
| a  | Equilibrium and statics of a particle (including ladder problems)  | **4**  |
| b  | Dynamics of a particle  | **4**  |
| **8**  |   | **Further kinematics**  |   |
| a  | Constant acceleration (equations of motion in 2D; the **i**, **j** system)  | **3**  |
| b  | Variable acceleration (use of calculus and finding vectors r.𝒓.and r¨𝒓¨at a given time)  | **3**  |
|   |   |   | **30 hours**  |

Year 12 & 13 Further Mathematics Overview

**Core Pure Mathematics –AS content**

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **1**  |   | **Complex numbers**  |   |
| **a**  | **Introduction of complex numbers, basic manipulation**  | **3**  |
| **b**  | **Complex conjugate, division and solving polynomial equations**  | **6**  |
| **c**  | **Argand diagrams**  | **2**  |
| **d**  | **Modulus and argument**  | **6**  |
| **e**  | **Loci**  | **4**  |
| **2**  |   | **Series**  |   |
|   | **a**  | **Sums of series**  | **4**  |
| **3**  |   | **Algebra and functions**  |   |
| **a**  | **Roots of polynomial equations**  | **4**  |
| **b**  | **Formation of polynomial equations**  | **3**  |
| **4**  |   | **Calculus**  |   |
|   | **a**  | **Volumes of revolution**  | **5**  |
| **5**  |   | **Matrices**  |   |
| **a**  | **Matrix addition, subtraction and multiplication**  | **2**  |
| **b**  | **Inverse of 2×2 and 3×3 matrices**  | **6**  |
| **c**  | **Simultaneous equations**  | **8**  |
| **d**  | **Linear transformations**  | **10**  |
| **6**  |   | **Proof**  |   |
|   | **a**  | **Proof by mathematical induction**  | **6**  |
| **7**  |   | **Vectors**  |   |
| **a**  | **Vector and Cartesian equations of a line and a plane**  | **9**  |
| **b**  | **Scalar product**  | **5**  |
| **c**  | **Problems involving points, lines and planes**  | **7**  |
|   |   |   | **90 Hours**  |

**Core Pure Mathematics – Remaining A level content**

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **1**  |   | **Complex numbers**  |   |
|   | a  | Know and use *z* = *r*ei*θ* = *r*(cos *θ* + i sin  *θ*)  | 6  |
|   | b  | De Moivre’s theorem  | 6  |
|   | c  | The *n*th roots of *z* = *r*ei*θ* and complex roots of unity  | 6  |
| **2**  |   | **Further algebra and functions (series)**  |   |
|   | a  | Method of differences  | 6  |
|   | b  | Maclaurin series  | 6  |
| **3**  |   | **Further calculus**  |   |
|   | a  | Improper integrals  | 6  |
|   | b  | Mean value of a function  | 4  |
|   | c  | Integrate using partial fractions  | 4  |
|   | d  | Differentiate inverse trigonometric functions and integrate using trigonometric substitutions  | 6  |
|   | e  | Further volumes of revolutions  | 3  |
| **4**  |   | **Polar coordinates**  |   |
|   | a  | Convert between Cartesian and polar and sketch *r*(*θ*)   | 5  |
|   | b  | Area enclosed by a polar curve  | 5  |
| **5**  |   | **Hyperbolic functions**  |   |
|   | a  | sinh *x*, cosh *x*, tanh *x* and their inverses  | 5  |
|   | b  | Logarithmic forms of the inverse hyperbolic functions and integrate functions of the form (x2+ a2)− 12(x2+ a2)− 12and(x2− a2)− 12(x2− a2)− 12  | 5  |
| **6**  |   | **Differential equations**  |   |
|   | a  | Integrating factors to solve first order differential equations  | 6  |
|   | b  | Second order differential equations of the form *y*′′ + *ay′ + by* = f(*x*)   | 7  |
|   | c  | Modelling  | 4  |
|   |   |   | **90 hours**  |

**Decision Mathematics 1**

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **1**  |   | **Algorithms and graph theory**  |   |
|   | **a**  | **Introduction to algorithms**  | **4**  |
|   | **b**  | **Sorting algorithms**  | **6**  |
|   | **c**  | **Introduction to graph theory**  | **2**  |
|   | d  | Planarity algorithm  | 5  |
| **2**  |   | **Algorithms on graphs I**  |   |
|   | **a**  | **Minimum connectors (spanning trees)**  | **4**  |
|   | **b**  | **Dijkstra’s algorithm**  | **4**  |
|   | c  | Floyd’s algorithm  | 6  |
| **3**  |   | **Algorithms on graphs II**  |   |
|   | **a**  | **Route inspection problem**  | **5**  |
|   | b  | Travelling salesman problem  | 9  |
| **4**  |   | **Linear programming**  |   |
|   | **a**  | **Formulation of problems**  | **2**/3  |
|   | **b**  | **Graphical solutions**  | **6**  |
|   | c  | Simplex algorithm  | 7  |
|   | d  | Big-M and two-stage Simplex  | 7  |
| **5**  |   | **Critical path analysis**  |   |
|   | **a**  | **Activity networks; precedence tables**  | **5**  |
|   | **b**  | **Critical path algorithm; earliest and latest event times**  | **4**  |
|   | **c**  | **Total float; Gantt charts**  | **3**  |
|   | d  | Resource histograms  | 5  |
|   | e  | Scheduling  | 5  |
|   |   |   | **45 (AS)** 90 (A Level)  |

**Decision Mathematics 2**

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **1**  |   | **Transportation Problems**  |   |
|   | a  | North-west corner method  | 2  |
|   | b  | Stepping stone method  | 7  |
|   | c  | Formulation as a linear programming problem  | 2  |
| **2**  |   | **Allocation (Assignment) Problems**  |   |
|   | **a**  | **The Hungarian Algorithm**  | **12**  |
|   | b  | Formulation as a linear programming problem  | 2  |
| **3**  |   | **Flows in Networks**  |   |
|   | **a**  | **Cuts**  | **2**  |
|   | **b**  | **The labelling procedure**  | **7**  |
|   | **c**  | **Maximum Flow-Minimum Cut Theorem**  | **4**  |
|   | d  | Multiple sources and sinks  | 3  |
|   | e  | Optimal flow rates  | 2  |
| **4**  |   | **Dynamic Programming**  |   |
|   | a  | Network and table form for Dynamic Programming  | 9  |
| **5**  |   | **Game Theory**  |   |
|   | **a**  | **Two-person zero-sum games**  | **2**  |
|   | **b**  | **Play-safe strategies**  | **3**  |
|   | c  | Dominance  | 1  |
|   | **d**  | **Optimal mixed strategies using graphical methods**  | **6**  |
|   | e  | Optimal mixed strategies using the Simplex algorithm  | 4  |
| **6**  |   | **Recurrence Relations**  |   |
|   | **a**  | **Modelling using recurrence relations**  | **3**  |
|   | **b**  | **Solving first order** **recurrence relations**  | **6**  |
|   | c  | Solving second order recurrence relations  | 5  |
| **7**  |   | **Decision Analysis**  |   |
|   | a  | Decision trees  | 5  |
|   | b  | Expected monetary values (EMVs)  | 3  |
|   |   |   | **45 (AS)** 90 (A Level)  |

**Further Mechanics 1**

|  |  |  |
| --- | --- | --- |
| **Unit**  | **Title**  | **Estimated hours**  |
| **1**  |   | **Momentum and impulse**  |   |
|   | **a**  | **Momentum and impulse; derivation of units and formulae** **Impulse-momentum principle. Conservation of  momentum applied to collisions and ‘jerking’ string problems**  | **9**  |
|   | b  | Momentum as a vector (**i**, **j** problems) Impulse-momentum principle in vector form  | 7  |
| **2**  |   | **Work, energy and power**  |   |
|   | **a**  | **Work, kinetic energy; derivation of units and formulae**  | **5**  |
|   | **b**  | **Potential energy, work-energy principle, conservation of mechanical energy, problem solving**  | **8**  |
|   | **c**  | **Power; derivation of units and formula**  | **6**  |
| **3**  |   | **Elastic strings and springs and elastic energy**  |   |
|   | a  | Hooke’s law and definition of modulus of elasticity. Derivation of elastic potential energy formula.  | 7  |
|   | b  | Problem solving: equilibrium and using the work-energy principle   | 11  |
| **4**  |   | **Elastic collisions in one dimension**  |   |
|   | **a**  | **Direct impact of elastic spheres. Newton’s law of restitution. Loss of kinetic energy due to impact**  | **8**  |
|   | **b**  | **Problem solving (including ‘successive’ impacts)**  | **9**  |
| **5**  |   | **Elastic collisions in two dimensions**  |   |
|   | a  | Oblique impact of a smooth sphere with a fixed surface   Successive oblique impacts of a sphere with smooth plane surfaces   | 9  |
|   | b  | Oblique impact of two smooth spheres of equal radius   | 11  |
|   |   |   | **45 hours (AS)** **90 hours (A level)**  |