

Sir Joseph Williamson's Mathematical School



Mathematics Department

GCSE Mathematics (9 – 1)

Scheme of Work  
2017 – 2019

Sir Joseph Williamson's Mathematical School - Mathematics Department GCSE Mathematics (9 -1) 2015 onwards

The main part of the work is based around the Edexcel GCSE (9 -1) Mathematics Higher textbook.

All staff should endeavour to introduce opportunities for students to develop competencies through any part of each lesson.

The starter or Plenary would be a good place to provide this opportunity.

The Scheme of Work is a working document.

The Problem Solving and Extend questions at the end of each chapter provide another good opportunity for some assessment for learning. Model Answers are available for students to assess each others work.

**Assessments sheets are available to be completed by the student to assess the grade at which they working**

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The table below shows an overview of topics in the Higher Scheme of Work. Estimated teaching hours are **approximate** and are a guideline only.

Topic number	Title	Estimated teaching hours	Problem Solving & Assessment
1	Number	10 – 12	5
2	Algebra	10 – 12	5
3	Interpreting and Representing Data	9 – 11	4
4	Fractions, Ratio and Percentages	7 – 9	3
5	Angles and Trigonometry	10 – 12	5
6	Graphs	11 – 13	5
7	Area & Volume	9 – 11	4
8	Transformations & Constructions	10 – 12	5
9	Equations and Inequalities	10 – 12	5
10	Probability	9 – 11	4
11	Multiplicative Reasoning	7 – 9	3
12	Similarity and Congruence	8 – 10	3
13	More Trigonometry	12 – 14	6
14	Further Statistics	9 – 11	4
15	Equations and Graphs	8 – 10	3
16	Circle Theorems	8 – 10	3
17	More Algebra	10 – 12	5
18	Vectors and Geometric Proof	8 – 10	3
19	Proportion and graphs	10 – 12	5
		215 HOURS	80 HOURS

**New Scheme of Work GCSE Mathematics (9-1)**

**Term 6 - Year 9 June 2017**

The table below shows the topics to be covered in lessons in preparation for the End of Term Test

<b>Week Beginning</b>	<b>Lessons</b>	<b>Topics Covered</b>
<b>5 June Week 1</b>	Number Section 1.1 – 1.4	Problems & reasoning, Place value & Estimating, HCF and LCM, Calculating with powers.
<b>12 June Week 2</b>	Number Section 1.5 – 1.7 Number: Check Up	Negative & Fractional Indices, Standard Form, Surds
<b>19 June Week 1</b>	Number: Strengthen Top Sets: Extension Work Consolidation Unit 1	
<b>26 June Week 2</b>	Problem Solving Unit 1 Test	
<b>3 July</b>	Day Off	
<b>5 July Week 1</b>	Algebra Section 2.1 – 2.4	Algebraic Indices, Expanding and Factorising, Equations, Formulae,
<b>10 July Week 2</b>	Algebra Section 2.5 – 2.7	Linear Sequences, Non Linear Sequences, More Expanding and Factorising.
<b>17 July Week 1</b>	Algebra: Check Up, Strengthen Top Sets: Extension Work Consolidation Unit 2 Problem Solving <b>End of Term Test tbc</b>	

**New Scheme of Work GCSE Mathematics (9-1)**  
**Term 1 & 2 - Year 10 September 2017**

The table below shows the topics to be covered in lessons in Term 1

<b>Week Beginning</b>	<b>Topic</b>	<b>Topics Covered</b>
<b>4 Sept Week 1</b>	Interpreting & Representing Data Section 3.1 – 3.4	Statistical Diagrams, Time Series,
<b>11 Sept Week 2</b>	Interpreting & Representing Data Section 3.5 – 3.6	Scatter Graphs, Line of Best Fit Averages and Range, More Statistical Diagrams
<b>18 Sept Week 1</b>	Interpreting & Representing Data: Check Up, Strengthen, Unit 3 Test	
<b>25 Sept Week 2</b>	Problem Solving Unit 3 Test	
<b>2 Oct Week1</b>	Fractions, Ratio & Percentages Section 4.1 – 4.4	Fractions, Ratios, Ratio & Proportion
<b>9 Oct Week 2</b>	Fractions, Ratio & Percentages Section 4.5 Fractions, Ratio & Percentages: Check Up, Strengthen Top Sets: Extension Work	Fractions, Decimals and Percentages
<b>16 Oct Week 1</b>	Problem Solving <b>End of Term Test tbc</b>	
<b>Half Term</b>		
<b>6 Nov Week 2</b>	Angles and Trigonometry Section 5.1 – 5.4	Angle properties of Triangles and Quadrilaterals, Interior angles of Polygons, Exterior angles of Polygons, Pythagoras' Theorem 1
<b>13 Nov Week 1</b>	Angles and Trigonometry Section 5.5 – 5.7	Pythagoras' Theorem 2, Trigonometry 1 & 2

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<b>20 Nov Week 2</b>	Angles and Trigonometry: Check Up, Strengthen, Top Sets: Extension Work Problem Solving Unit 5 Test	
<b>27 Nov Week 1</b>	Graphs Section 6.1 – 6.4	Linear Graphs More Linear Graphs, Rates of Change, Real Life Graphs
<b>4 Dec Week 2</b>	Graphs Section 6.5 – 6.8	Line Segments, Quadratic Graphs, Cubic and Reciprocal Graphs, More graphs
<b>11 Dec Week 1</b>	Graphs: Check Up, Strengthen, Top Sets: Extension Work	
<b>18 Dec Week 2</b>	Problem Solving <b>End of Term Test Units 5-6</b>	

**New Scheme of Work GCSE Mathematics (9-1)**  
**Term 3 & 4 - Year 10 January 2018**

The table below shows the topics to be covered in lessons in Terms 3 & 4

<b>Week Beginning</b>	<b>Maths Lessons:</b>	<b>Topics Covered</b>
<b>3 Jan Week 1</b>	Area and Volume Section 7.1 – 7.4	Perimeter & Area, Units of Accuracy, Prisms
<b>8 Jan Week 2</b>	Area and Volume Section 7.5 – 7.7	Circles, Sectors of Circles, Cylinders & Spheres, Pyramids and Cones
<b>15 Jan Week 1</b>	Area and Volume: Check Up, Strengthen, Top Sets: Extension Work	

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<b>22 Jan Week 2</b>	Problem Solving Unit Test 7	
<b>29 Jan Week 1</b>	Transformations and Constructions Section 8.1 – 8.4	3D Solids, Reflection & Rotation,
<b>5 Feb Week 2</b>	Transformations and Constructions Section 8.5 – 8.6	Enlargement, Combinations of Transformations
	Half Term	
<b>19 Feb Week 1</b>	Transformations and Constructions Section 8.7 – 8.8 Check Up, Strengthen,	Bearings and Scale Drawings Constructions 1 Constructions 2, Loci
<b>26 Feb Week 2</b>	Problem Solving <b>End of Term Test</b>	
<b>5 Mar Week 1</b>	Equations and Inequalities Section 9.1 – 9.4	Solving Quadratic Equations 1 & 2, Completing the Square, Solving Simultaneous Equations
<b>12 Mar Week 2</b>	Equations and Inequalities Section 9.5 – 9.7	More Simultaneous Equations, Solving Linear & Quadratic Simultaneous Equations, Solving Linear Inequalities
<b>19 Mar Week 1</b>	Equations and Inequalities: Check Up, Strengthen, Top Sets: Extension Work	
<b>26 Mar Week 2</b>	Unit 9 Test Problem Solving	

**New Scheme of Work GCSE Mathematics (9-1)**  
**Term 5 & 6 – Year 10 April 2018**

The table below shows the topics to be covered in lessons in Terms 5 & 6

<b>Week Beginning</b>	<b>Maths Lessons:</b>	<b>Topics Covered</b>
<b>16 April Week 1</b>	Probability Section 10.1 – 10.4	Combined Events, Mutually Exclusive Events, Experimental Probability, Independent Events & Tree Diagrams
<b>23 April Week 2</b>	Probability Section 10.5 – 10.6 Probability: Check Up, Strengthen, Top Sets: Extension Work Unit 10 Test Optional	Conditional Probability, Venn Diagrams
<b>30 April Week 1</b>	Multiplicative Reasoning: Section 11.1 – 11.4	Growth & Decay, Compound Measures, More Compound Measures, Ratio & Proportion
<b>7 May Week 2</b>	Multiplicative Reasoning: Check Up, Strengthen, Top Sets: Extension Work	
<b>14 May Week 1</b>	<b>Problem Solving End of Term Test tbc</b>	
<b>21 May Week 2</b>	<b>Revision</b>	
	<b>Half Term</b>	
4 June Week 1	Revision	
<b>11 June Week 2</b>	Revision	



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18 June Week 1	Revision	
<b>25 June</b> Week 2	<b>YEAR 10 EXAMS???</b>	
<b>2 July</b> Week 1	Exam Corrections	
<b>9 July</b> Week 2	Similarity and Congruence Section 12.1 – 12.4	Congruence, Geometric Proof, Similarity, More Similarity
<b>16 July</b> Week 1	Similarity and Congruence: Check Up, Strengthen, Problem Solving Unit 12 Test	Similarity in 3D

**New Scheme of Work GCSE Mathematics (9-1)**  
**Term 1 & 2 - Year 11 September 2018**

The table below shows the topics to be covered in lessons in Terms 1 & 2.

<b>Week Beginning</b>	<b>Maths Lessons:</b>	<b>Topics Covered</b>
<b>Sept Week 1</b>	More Trigonometry Section 13.1 – 13.3	Accuracy, Graph of sine Curve, Graph of Cosine Curve, Tangent Function
<b>Sept Week 2</b>	More Trigonometry Section 13.4 – 13.8	Areas and Sine Rule, Cosine Rule, Solving Problems in 3D
<b>Sept Week 1</b>	More Trigonometry Section 13.9 More Trigonometry: Check Up, Strengthen, Top Sets: Extension Work	Transforming Trigonometric Graphs
<b>Sept Week 2</b>	Problem Solving <b>End of Term Test tbc</b>	
<b>Oct Week 1</b>	Further Statistics Section 14.1 – 14.4	Sampling, Cumulative Frequency, Box Plots, Histograms
<b>Oct Week 2</b>	Further Statistics Section 14.5 – 14.6 Further Statistics: Check Up, Strengthen, Top Sets: Extension Work	Interpreting Histograms, Comparing Populations
<b>Oct Week 1</b>	Problem Solving Unit 14 Test	
	Half Term	
<b>Nov Week 2</b>	Revision	

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<b>Nov Week 1</b>	Year 11 MOCKS	
<b>Nov Week 2</b>	Year 11 MOCKS Continue.	
<b>Nov Week 1</b>	Equations & Graphs Section 15.1 – 15.4	Solving Simultaneous Equations Graphically, Inequalities Graphically, Graphs of Quadratic Functions, Solving Quadratic Equations Graphically
<b>Dec Week 2</b>	Equations & Graphs Section 15.5 Equations & Graphs: Check Up, Strengthen, Top Sets: Extension Work	Graphs of Cubic Functions
<b>Dec Week 1</b>	Problem Solving Unit 15 Test Circle Theorems Section 16.1 – 16.4	Radii and Chords, Tangents, Angles in Circles, Circle theorems
<b>Dec Week 2</b>	Circle Theorems Section 16.1 – 16.4	

**New Scheme of Work GCSE Mathematics (9-1)**  
**Draft Term 3 & 4 - Year 11 January 2019**

The table below shows the topics to be covered in lessons in Terms 3 & 4

<b>Week Beginning</b>	<b>Maths Lessons:</b>	<b>Topics Covered</b>
<b>Jan Week 1</b>	Circle Theorems Section 16.5 Circle Theorems: Check Up, Strengthen, Top Sets: Extension Work	Applying Circle Theorems
<b>Jan Week 2</b>	Problem Solving Unit 16 Test	

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<b>Jan Week 1</b>	More Algebra Section 17.1 – 17.4	Rearranging Formulae, Algebraic Fractions, Simplifying Algebraic Fractions, More Algebraic Fractions
<b>Jan Week 2</b>	More Algebra Section 17.5 – 17.8	Solving Algebraic Fractional Equations, Surds, Functions, Proof
<b>Jan Week 1</b>	More Algebra: Check Up, Strengthen Problem Solving <b>End of Term Test tbc</b>	
<b>Feb Week 2</b>	, Vectors and Geometric Proof Section 18.1 – 18.2	Vector Notation, Vector Arithmetic,
	Half Term	
<b>Feb Week 1</b>	Vectors and Geometric Proof Section 18.3 – 18.5	More Vector Arithmetic, Parallel Vectors and Collinear Points Solving Geometric Problems
<b>Feb Week 2</b>	Vectors and Geometric Proof: Check Up, Strengthen,	
<b>Mar Week 1</b>	Proportion and Graphs Section 19.1 – 19.4	Direct Proportion, More Direct Proportion, Inverse Proportion, Exponential Functions
<b>Mar Week 2</b>	Proportion and Graphs <b>Section 19.5 – 19.7</b>	Non-linear Graphs, Translating Graphs, Reflecting and Stretching Graphs
<b>Mar Week 1</b>	Proportion and Graphs: Check Up, Strengthen, Revision using Knowledge Check & Unit Tests	
<b>Mar Week 2</b>	Revision	

**New Scheme of Work GCSE Mathematics (9-1)**

**Term 5 and 6 - Year 11 April 2019**

The table below shows the topics to be covered in lessons in Term 5

<b>Week Beginning</b>	<b>Maths Lessons:</b>	<b>Comments</b>
<b>April Week 1</b>	Problem Solving & Extend Chapter 1-4 <b>Practice Exam Papers</b>	
<b>April Week 2</b>	Problem Solving & Extend Chapter 5-8 <b>Practice Exam Papers</b>	
<b>May Week 1</b>	Problem Solving & Extend Chapter 9-12 <b>Practice Exam Papers</b>	
<b>May Week 2</b>	Problem Solving & Extend Chapter 13-16 <b>Practice Exam Papers</b>	
<b>May Week 1</b>	Problem Solving & Extend Chapter 18-19 <b>Practice Exam Papers</b>	
<b>May Week 2</b>	Problem Solving & Extend <b>Practice Exam Papers</b>	
	Half Term	

Assessment will be as follows:

Paper 1

- Applying Standard Techniques
- Time allocated 1H 30
- Non-calculator paper
- 80 Marks

Paper 2

- Reasoning, Interpreting & Communicating
- Time allocated 1H 30
- Calculator paper
- 80 Marks

Paper 3

- Solving Non-Routine Problems
- Time allocated 1H 30
- Calculator paper
- 80 Marks

The specification for Edexcel (9 – 1) Mathematics can be found on the following pages

<b>Number: Structure and Calculation</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>N1</b> - order positive and negative integers, decimals and fractions; use the symbols =, ≠, &lt;, &gt;, ≤, ≥</p> <p><b>N2</b> - apply the four operations, including formal written methods, to integers, decimals and simple fractions (proper and improper), and mixed numbers – all both positive and negative; understand and use place value (e.g. when working with very large or very small numbers, and when calculating with decimals)</p> <p><b>N3</b> - recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions); use conventional notation for priority of operations, including brackets, powers, roots and reciprocals</p> <p><b>N4</b> - 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</p> <p><b>N5</b> - apply systematic listing strategies, <b>including use of the product rule for counting (i.e. if there are <math>m</math> ways of doing one task and for each of these, there are <math>n</math> ways of doing another task, then the total number of ways the two tasks can be done is <math>m \times n</math> ways)</b></p>	<p><b>Extension Activities</b></p> <p>Teachers may just want to check that students have the appropriate skills by investigative means. eg Give students five digits say 2, 5, 7, 8 and 1. They then need to find</p> <ol style="list-style-type: none"> <li>1) the largest even number</li> <li>2) the smallest number in the 5 times table</li> <li>3) the largest answer</li> <li>4) the smallest answer</li> </ol> <p>Practice long multiplication and division without using a calculator</p> <p>Estimate answers to calculations involving the four rules</p> <p>Work with mental maths problems with negative powers of 10: <math>2.5 \times 0.01</math>, <math>0.001</math></p> <p>Directed number work with two or more operations, or with decimals</p> <p>Use decimals in real-life problems</p> <p>Money calculations that require rounding answers to the nearest penny</p> <p>Multiply and divide decimals by decimals</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know that:</b></p> <ul style="list-style-type: none"> <li>• The power or index of a number shows how many times they are multiplied together</li> <li>• The correct working out of an expression is obtained by using BIDMAS</li> <li>• The reciprocal of a number</li> <li>• To multiply and divide by a decimal</li> <li>• Manipulate decimals</li> <li>• Find the HCF of two numbers (the largest number which is a factor of both numbers)</li> <li>• Find the LCM of two numbers (the smallest number which is a multiple of both numbers)</li> <li>• Use the index laws</li> <li>• Solve problems which involve several powers</li> <li>• Use multiplicative rule</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.</p> <p>Quality of Written Communication</p> <p>Vocabulary - words with correct spelling</p> <p>Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 1, 11</p> <p>MyMaths Website</p> <p>Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
	<p>Reflective learners – self/Peer assessment</p> <p>Pupils have the opportunity to mark each other's work</p>	

<b>Number Continued: Powers Roots &amp; Surds</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:  <b>N6</b> - use positive integer powers and associated real roots (square, cube and higher), recognise powers of 2, 3, 4, 5; <b>estimate powers and roots of any given positive number</b>  <b>N7</b> - calculate with roots, and with integer and <b>fractional</b> indices  <b>N8</b> - calculate exactly with fractions, <b>surds</b> and multiples of <math>\pi</math>;  <b>simplify surd expressions involving squares (e.g. <math>\sqrt{12} = \sqrt{4 \times 3} = \sqrt{4} \times \sqrt{3} = 2\sqrt{3}</math>) and rationalise Denominators</b>                      eg <math>\frac{1}{\sqrt{3}-1} = \left(\frac{\sqrt{3}+1}{2}\right)</math>, and, eg write <math>(\sqrt{18}+10) \div \sqrt{2}</math> in the form <math>p + q\sqrt{2}</math>  <b>N9</b> - calculate with and interpret standard form <math>A \times 10^N</math>, where <math>1 \leq A &lt; 10</math> and <math>N</math> is an integer</p>	<p><b>Extension Activities</b></p> <p>Use index laws to simplify algebraic expressions                      Treat index laws as formulae (state which rule is being at each stage in a calculation)                      Explain the difference between rational and irrational numbers as an introduction to surds                      Prove that <math>\sqrt{2}</math> is irrational                      Revise the difference of two squares to show why we use, for example <math>(\sqrt{3} - 2)</math> as the multiplier to rationalise <math>(\sqrt{3} + 2)</math>                      Link to work on circle measures (involving <math>\pi</math>) and Pythagoras calculations in exact form.                      Introduce standard form for very large and small numbers</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know how to:</b></p> <ul style="list-style-type: none"> <li>• Solve problems which involve several powers</li> <li>• Use law of indices to simplify and calculate expressions involving powers including fractional indices</li> <li>• Simplify expressions involving surds, including rationalising surds</li> <li>• Estimate powers and roots of any given positive number</li> <li>• Use Standard Form</li> </ul>
<p>-----</p> <p>Calculators are used only when appropriate                      Encourage student to learn square, cube, prime and common roots for the non-calculator examination</p>	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.                      Quality of Written Communication                      Vocabulary - words with correct spelling                      Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 1, 17                      MyMaths Website                      Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
	<p>Reflective learners – self/Peer assessment                      Pupils have the opportunity to mark each other's work</p>	



<b>Number continued; Fractions and Decimals</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:  <b>N10</b> - work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and <math>\frac{7}{2}</math> or 0.375 or <math>\frac{3}{8}</math>); change recurring decimals into their corresponding fractions and vice versa  <b>N11</b> - identify and work with fractions in ratio problems  <b>N12</b> - interpret fractions and percentages as operators</p>	<p><b>Extension Activities</b></p> <p>Could introduce 'hundredths' at this stage  Solve word problems involving fractions  Improper fractions can be introduced by using real-world examples, eg dividing 5 pizzas amongst 3 people  Careful differentiation is essential for this topic dependent upon the student's ability  Use a calculator to change fractions into decimals and look for patterns  Work with improper fractions and mixed numbers  Multiplication and division of fractions to link with probability  Recognising that every terminating decimal has its fraction with 2 and/or 5 as a common factor in the denominator  Solve word problems and real-world problems involving fractions, eg Find perimeter using fractional values.</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know:</b></p> <ul style="list-style-type: none"> <li>• How to find equivalent fractions</li> <li>• How to add and subtract fractions with the same or different denominators</li> <li>• How to add and subtract mixed numbers</li> <li>• How to multiply and divide fractions and mixed numbers</li> <li>• Terminating decimals can be converted to fractions and vice versa</li> <li>• How to identify and work with fractions in ratio problems</li> <li>• How to interpret fractions and percentages as operators</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.  Quality of Written Communication  Vocabulary – words with correct spelling  Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapter 4  MyMaths Website  Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
<p>Reflective learners – self/Peer assessment  Pupils have the opportunity to mark each other's work</p>		

<b>Number continued: Measures and Accuracy</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <ul style="list-style-type: none"> <li>- <b>N13</b> use standard units of mass, length, time, money and other measures(including standard compound measures) using decimal quantities where appropriate</li> <li><b>N14</b> - estimate answers; check calculations using approximation and estimation, including answers obtained using technology</li> <li><b>N15</b> - round numbers and measures to an appropriate degree of accuracy(e.g. to a specified number of decimal places or significant figures); use inequality notation to specify simple error intervals due to truncation or rounding</li> <li><b>N16</b> apply and interpret limits of accuracy, including upper and lower bounds</li> </ul>	<p><b>Extension Activities</b></p> <p>Perform calculations on a calculator by using standard form</p> <p>Use a distance, speed and time (or mass, density and volume) triangle to help students see the relationship between the variables</p> <p>Help students to recognise the problem they are trying to solve by the unit measurement given, eg km/h is a unit of speed as it is a distance divided by a time</p> <p>Use a formula triangle to help students see the relationship between the variables for density</p> <p>Look up densities of different elements from the net.</p> <p>Link converting area &amp; volume units to similar shapes</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know how to:</b></p> <ul style="list-style-type: none"> <li>• Use compound measures such as density and speed</li> <li>• Write down the upper and lower bound of a value to a given degree of accuracy</li> <li>• Work out the Upper and Lower Bounds of an expression</li> <li>• Estimate answers using approximation</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.</p> <p>Quality of Written Communication</p> <p>Vocabulary - words with correct spelling</p> <p>Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 4, 7</p> <p>MyMaths Website</p> <p>Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
<p>Reflective learners – self/Peer assessment</p> <p>Pupils have the opportunity to mark each other's work</p>	<p>Borrow a set of electronic scales and a Eureka Can from Physics for a practical density lesson.</p>	

<b>Algebra: Notation, Vocabulary and Manipulation</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>A1</b> - use and interpret algebraic manipulation, including:</p> <ul style="list-style-type: none"> <li>• <math>ab</math> in place of <math>a \times b</math></li> <li>• <math>3y</math> in place of <math>y + y + y</math> and <math>3 \times y</math></li> <li>• <math>a^2</math> in place of <math>a \times a</math>, <math>a^3</math> in place of <math>a \times a \times a</math>,</li> <li>• <math>a^2b</math> in place of <math>a \times a \times b</math></li> <li>• <math>a/b</math> in place of <math>a \div b</math></li> <li>• with coefficients written as fractions rather than as decimals</li> <li>• brackets</li> </ul> <p><b>A2</b> - substitute numerical values into formulae and expressions, including scientific formulae</p> <p><b>A3</b> - understand and use the concepts and vocabulary of expressions, equations, formulae, identities, inequalities, terms and factors</p>	<p><b>Extension Activities</b></p> <p>Use negative numbers in formulae involving indices Use investigations to lead to generalisations</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know how to:</b></p> <ul style="list-style-type: none"> <li>• Derive a formula to describe a rule or relationship</li> <li>• Substitute numbers into a formula</li> <li>• Recognise an expression, identity, equation or formula</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language. Quality of Written Communication Vocabulary - words with correct spelling Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 2 MyMaths Website Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
	<p>Reflective learners – self/Peer assessment Pupils have the opportunity to mark each other's work</p>	

<b>Algebra continued: Notation, Vocabulary and Manipulation</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>A4</b> - simplify and manipulate algebraic expressions (including those involving surds <b>and algebraic fractions</b>) by:</p> <ul style="list-style-type: none"> <li>• collecting like terms</li> <li>• multiplying a single term over a bracket</li> <li>• taking out common factors</li> <li>• expanding products of two <b>or more</b> binomials</li> <li>• factorising quadratic expressions of the form <math>x^2 + bx + c</math>, including the difference of two squares; <b>factorising quadratic expressions of the form <math>ax^2 + bx + c</math></b></li> <li>• simplifying expressions involving sums, products and powers, including the laws of indices</li> </ul> <p><b>A5</b> - understand and use standard mathematical formulae; rearrange formulae to change the subject</p> <p><b>A6</b> - know the difference between an equation and an identity; argue mathematically to show algebraic expressions are equivalent, and use algebra to support and construct arguments <b>and proofs</b></p> <p><b>A7</b> - where appropriate, interpret simple expressions as functions with inputs and outputs; <b>interpret the reverse process as the 'inverse function'; interpret the succession of two functions as a 'composite function'</b> (the use of formal function notation is expected)</p>	<p><b>Extension Activities</b></p> <p>Solve second order linear equations                  Use negative numbers in formulae involving indices                  Use investigations to lead to generalisations                  Apply changing the subject to <math>y = mx + c</math>                  Derive equations from practical situations (such as finding unknown angles in polygons or perimeter problems)                  Solve equations where manipulation of fractions (including the negative fractions) is required</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know how to:</b></p> <ul style="list-style-type: none"> <li>• Factorise algebraic expressions by taking out common factors</li> <li>• Expand the product of two/ three linear expressions</li> <li>• Simplify rational expressions by cancelling, adding, subtracting, and multiplying</li> <li>• Solve a problem by setting up an equation</li> <li>• Factorise expressions, including the difference of two squares; quadratic expressions of the form <math>ax^2 + bx + c</math></li> <li>• Change the subject of a formula</li> <li>• Substitute numbers into a formula</li> <li>• Recognise an expression, identity, equation or formula</li> <li>• Show algebraic expressions are equivalent</li> <li>• Interpret simple expressions as functions</li> <li>• Interpret the reverse process as the 'inverse function'</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.                  Quality of Written Communication                  Vocabulary - words with correct spelling                  Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 2, 17                  MyMaths Website                  Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p> <p>Reflective learners – self/Peer assessment                  Pupils have the opportunity to mark each other's work</p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>

<b>Algebra continued: Graphs</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:  <b>A8</b> - work with coordinates in all four quadrants  <b>A9</b> - plot graphs of equations that correspond to straight-line graphs in the coordinate plane; use the form <math>y = mx + c</math> to identify parallel <b>and perpendicular lines</b>; find the equation of the line through two given points or through one point with a given gradient  <b>A10</b> identify and interpret gradients and intercepts of linear functions graphically and algebraically</p>	<b>Extension Activities</b>	<b>Competencies Developed</b>
	<b>Literacy</b>	<b>Resources</b>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.                      Quality of Written Communication                      Vocabulary - words with correct spelling                      Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapter 6                      MyMaths Website                      Tenticks Worksheets</p>
	<b>Assessment for Learning</b>	<b>Cross Curricular Links (SMSCD, with other subjects)</b>
	<p>Reflective learners – self/Peer assessment                      Pupils have the opportunity to mark each other's work</p>	<p>Link to graphs and relationships in other subject areas, i.e. science, geography etc</p>

<b>Algebra continued: Graphs</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:  <b>A11</b> - identify and interpret roots, intercepts, turning points of quadratic functions graphically; deduce roots algebraically <b>and turning points by completing the square</b>  <b>A12</b> - recognise, sketch and interpret graphs of linear functions, quadratic functions, simple cubic functions, the reciprocal function, <b>exponential functions</b>  <b><math>y = k^x</math> for positive values of <math>k</math>, and the trigonometric functions (in degrees) <math>y = \sin x</math>, <math>y = \cos x</math> and <math>y = \tan x</math> for angles of any size</b>  <b>A13</b> - sketch translations and reflections of a given function</p>	<p><b>Extension Activities</b></p> <p>Explore the function <math>y = e^x</math> (perhaps relate this to <math>y = \ln x</math>)                  Find solutions to equations of the circular functions <math>y = \sin x</math> and <math>y = \cos x</math> over more than one cycle (and generalise)                  This work should be enhanced by drawing graphs on graphical calculators and appropriate software                  Complete the square for quadratic functions and relate this to transformations of the curve <math>y = x^2</math></p>	<p><b>Competencies Developed</b></p> <p><b>All students should be able to:</b></p> <ul style="list-style-type: none"> <li>• Use method of completing the square to deduce turning points</li> <li>• Recognise and use the shapes of cubic, reciprocal and exponential graphs</li> <li>• Find the values of <math>p</math> and <math>q</math> in the function <math>y = pq^x</math> given the graph of <math>y = pq^x</math></li> <li>• Recognise and use the graphs <math>y = \sin x</math> and <math>y = \cos x</math></li> <li>• Apply to the graph of <math>y = f(x)</math> the transformations <math>y = f(x) + a</math>, <math>y = f(x + a)</math>, <math>y = -f(x)</math> or <math>y = f(-x)</math> of a given function</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.                  Quality of Written Communication                  Vocabulary - words with correct spelling                  Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapter 13, 19                  MyMaths Website                  Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
<p>Reflective learners – self/Peer assessment                  Pupils have the opportunity to mark each other's work</p>	<p>Link to graphs and relationships in other subject areas, i.e. science, geography etc</p>	

<b>Algebra continued: Graphs</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>A14</b> - plot and interpret graphs (including reciprocal graphs <b>and exponential graphs</b>) 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</p> <p><b>A15</b> - calculate or estimate gradients of graphs and areas under graphs (including quadratic and other non-linear graphs), and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts (this does not include calculus)</p> <p><b>A16</b> - recognise and use the equation of a circle with centre at the origin; find the equation of a tangent to a circle at a given point</p>	<p><b>Extension Activities</b></p> <p>Explore the function <math>y = e^x</math> (perhaps relate this to <math>y = \ln x</math>)</p> <p>This work should be enhanced by drawing graphs on graphical calculators and appropriate software</p> <p>Complete the square for quadratic functions and relate this to transformations of the curve <math>y = x^2</math></p>	<p><b>Competencies Developed</b></p> <p><b>All students should be able to:</b></p> <ul style="list-style-type: none"> <li>Recognise and use the shapes of cubic, reciprocal and exponential graphs</li> <li>Find the values of <math>p</math> and <math>q</math> in the function <math>y = pq^x</math> given the graph of <math>y = pq^x</math></li> <li>Use graphs to find approximate solutions to equations</li> <li>Consider the real life applications such as simple kinematic problems</li> <li>Solve graphically or algebraically a pair of simultaneous equations, one linear and the second is a quadratic or that of a circle</li> <li>Calculate or estimate gradients of graphs and areas under graphs</li> <li>Find the equation of a circle centre (0,0)</li> <li>Find the equation of a tangent to a circle at a given point</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.</p> <p>Quality of Written Communication</p> <p>Vocabulary - words with correct spelling</p> <p>Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 6, 15, 19</p> <p>MyMaths Website</p> <p>Tenticks Worksheets</p> <p>Autograph</p>
	<p><b>Assessment for Learning</b></p> <p>Reflective learners – self/Peer assessment</p> <p>Pupils have the opportunity to mark each other's work</p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>

<b>Algebra continued: Solving Equations and Inequalities</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>A17</b> - solve linear equations in one unknown algebraically (including those with the unknown on both sides of the equation); find approximate solutions using a graph</p> <p><b>A18</b> - solve quadratic equations (<b>including those that require rearrangement</b>) algebraically by factorising, <b>by completing the square and by using the quadratic formula</b>; find approximate solutions using a graph</p> <p><b>A19</b> - solve two simultaneous equations in two variables (linear/linear <b>or linear/quadratic</b>) algebraically; find approximate solutions using a graph</p> <p><b>A20</b> - <b>find approximate solutions to equations numerically using iteration</b></p> <p><b>A21</b> - translate simple situations or procedures into algebraic expressions or formulae; derive an equation (or two simultaneous equations), solve the equation(s) and interpret the solution</p> <p><b>A22</b> - solve linear inequalities in one <b>or two variable(s), and quadratic inequalities in one variable</b>; represent the solution set on a number line, <b>using set notation and on a graph</b></p>	<p><b>Extension Activities</b></p> <p>Lots of practical type examples, eg help projectiles</p> <p>Derive the quadratic equation by completing the square</p> <p>Use graphical calculators or ICT graph package where appropriate</p> <p>Show how the value of '<math>b^2 - 4ac</math>' can be useful in determining if the quadratic factorises or not (i.e. square number)</p> <p>Students should use correct notation to show inequalities in algebra and graphs</p> <p>Extend to discriminant's properties and roots</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know how to:</b></p> <ul style="list-style-type: none"> <li>• Draw the graph of a quadratic function from a given equation</li> <li>• Use the graph of a quadratic to solve equations</li> <li>• Solve a quadratic equation by factorisation, using the quadratic formula or by completing the square</li> <li>• Solve algebraically and graphically two simultaneous equations, one quadratic and one linear</li> <li>• Find approximate solutions to equations numerically using iteration</li> <li>• Solve linear inequalities in one or two variable(s), and quadratic inequalities in one variable</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.</p> <p>Quality of Written Communication</p> <p>Vocabulary - words with correct spelling</p> <p>Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 9, 17</p> <p>MyMaths Website</p> <p>Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p> <p>Reflective learners – self/Peer assessment</p> <p>Pupils have the opportunity to mark each other's work</p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>



<b>Algebra: Sequences</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>A23</b> - generate terms of a sequence from either a term-to-term or a position-to-term rule</p> <p><b>A24</b> - recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions (<math>r_n</math> where <math>n</math> is an integer, and <math>r</math> is a rational number <math>&gt; 0</math> or a surd) and other sequences</p> <p><b>A25</b> - deduce expressions to calculate the <math>n</math>th term of linear and quadratic sequences</p>	<p><b>Extension Activities</b></p> <p>Practice factorisation where the factor may involve more than one variable</p> <p>Recognise and use sequences of triangular, square and cube numbers, simple arithmetic progressions, Fibonacci type sequences, quadratic sequences, and simple geometric progressions</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know how to:</b></p> <ul style="list-style-type: none"> <li>• Find the <math>n</math>th term of a linear or quadratic sequence</li> <li>• Recognise and use sequences of numbers</li> <li>• Recognise simple geometric progressions</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.</p> <p>Quality of Written Communication</p> <p>Vocabulary - words with correct spelling</p> <p>Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 2</p> <p>MyMaths Website</p> <p>Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
	<p>Reflective learners – self/Peer assessment</p> <p>Pupils have the opportunity to mark each other's work</p>	

<b>Ratio, Proportion and Rates of Change</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>R1</b> - change freely between related standard units (e.g. time, length, area, volume/capacity, mass) and compound units (e.g. speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts</p> <p><b>R2</b> - use scale factors, scale diagrams and maps</p> <p><b>R3</b> - express one quantity as a fraction of another, where the fraction is less than 1 or greater than 1</p> <p><b>R4</b> - use ratio notation, including reduction to simplest form</p> <p><b>R5</b> - 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)</p> <p><b>R6</b> - express a multiplicative relationship between two quantities as a ratio or a fraction</p> <p><b>R7</b> - understand and use proportion as equality of ratios</p> <p><b>R8</b> - relate ratios to fractions and to linear functions</p>	<p><b>Extension Activities</b></p> <p>Harder problems involving multi-stage calculations</p> <p>Relate ratios to real-life situations, eg investigate the proportions of the different metals in alloys (24 karat gold),</p> <p>Relate ratios to Functional Elements situations, eg investigate the proportions of the different metals in alloys and the new amounts of ingredients for a recipe for different numbers of guests</p> <p>Harder problems involving multi-stage calculations</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know:</b></p> <ul style="list-style-type: none"> <li>• Change freely between related standard units e.g. km/h to m/s</li> <li>• A ratio compares two or more quantities</li> <li>• The order of the ratio is important</li> <li>• Use and interpret maps and scale drawings</li> <li>• Read and construct scale drawings drawing lines and shapes to scale</li> <li>• How to find quantities in a given ratio</li> <li>• How to share a quantity in a given ratio</li> <li>• Express one quantity as a fraction of another</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.</p> <p>Quality of Written Communication</p> <p>Vocabulary - words with correct spelling</p> <p>Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 4, 11</p> <p>MyMaths Website</p> <p>Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
<p>Reflective learners – self/Peer assessment</p> <p>Pupils have the opportunity to mark each other's work</p>		

<b>Ratio, Proportion and Rates of Change continued</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:  <b>R9</b> - 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  <b>R10</b> - solve problems involving direct and inverse proportion, including graphical and algebraic representations  <b>R11</b> - use compound units such as speed, rates of pay, unit pricing, density and pressure</p>	<b>Extension Activities</b>	<b>Competencies Developed</b>
	<b>Literacy</b>	<b>Resources</b>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.                      Quality of Written Communication                      Vocabulary - words with correct spelling                      Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 4, 11,                      MyMaths Website                      Tenticks Worksheets</p>
	<b>Assessment for Learning</b>	<b>Cross Curricular Links (SMSCD, with other subjects)</b>
	<p>Reflective learners – self/Peer assessment                      Pupils have the opportunity to mark each other's work</p>	

<b>Ratio, Proportion and Rates of Change continued</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:  <b>R12</b> - compare lengths, areas and volumes using ratio notation; make links to similarity (including trigonometric ratios) and scale factors  <b>R13</b> - understand that <math>X</math> is inversely proportional to <math>Y</math> is equivalent to <math>X</math> is proportional to <math>1/Y</math>; <b>construct and</b> interpret equations that describe direct and inverse proportion  <b>R14</b> - interpret the gradient of a straight line graph as a rate of change; recognise and interpret graphs that illustrate direct and inverse proportion  <b>R15</b> - interpret the gradient at a point on a curve as the instantaneous rate of change; apply the concepts of average and instantaneous rate of change (gradients of chords and tangents) in numerical, algebraic and graphical contexts (<b>this does not include calculus</b>)  <b>R16</b> - set up, solve and interpret the answers in growth and decay problems, including compound interest <b>and work with general iterative processes</b></p>	<p><b>Extension Activities</b></p> <p>Perform calculations on a calculator by using standard form  Use a distance, speed and time (or mass, density and volume) triangle to help students see the relationship between the variables  Help students to recognise the problem they are trying to solve by the unit measurement given, eg km/h is a unit of speed as it is a distance divided by a time</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know how to:</b></p> <ul style="list-style-type: none"> <li>• Use compound measures such as density and speed, pressure</li> <li>• How to set up and use equations to solve problems in direct and inverse proportion</li> <li>• To recognise shapes of graphs that represent the different types of proportionality</li> <li>• How to use the relationship between enlargement and areas and volumes of simple shapes and solids</li> <li>• Interpret the gradient of a straight line graph as a rate of change</li> <li>• Interpret the gradient at a point on a curve</li> <li>• Set up, solve and interpret the answers in growth and decay problems and compound interest</li> </ul>
	<p><b>Literacy</b></p> <p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.  Quality of Written Communication  Vocabulary - words with correct spelling  Clear presentation of answers</p>	<p><b>Resources</b></p> <p>Edexcel GCSE Mathematics (9-1) Chapters 19  MyMaths Website  Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p> <p>Reflective learners – self/Peer assessment  Pupils have the opportunity to mark each other's work</p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p> <p>Borrow a set of electronic scales and a Eureka Can from Physics for a practical density lesson.</p>

<b>Geometry and Measures; Angles</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>G1</b> - 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 description</p> <p><b>G2</b> - 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); use these to construct given figures and solve loci problems; know that the perpendicular distance from a point to a line is the shortest distance to the line</p> <p><b>G3</b> - 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; derive and use the sum of angles in a triangle (e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons)</p> <p><b>G4</b> - derive and apply the properties and definitions of: special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language</p>	<p><b>Extension Activities</b></p> <p>Use triangles to find the angle sums of polygons                  Use the angle properties of triangles to find missing angles in combinations of triangles                  Harder problems involving multi-step calculations</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know:</b></p> <ul style="list-style-type: none"> <li>• The properties of all types of triangles, Quadrilaterals and Polygons</li> <li>• How to find the interior and exterior angles of a regular polygon</li> <li>• How to find missing angles of parallel and intersecting lines</li> <li>• Recall and use properties of angles of all shapes in complex problems</li> <li>• Be able to prove the exterior angle of a triangle is equal to the sum of the interior angles</li> <li>• Construct triangles, the perpendicular bisector, bisector of a line and an angle, the perpendicular from a point to or on a line</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.                  Quality of Written Communication                  Vocabulary - words with correct spelling                  Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapter 5                  MyMaths Website                  Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
<p>Reflective learners – self/Peer assessment                  Pupils have the opportunity to mark each other's work</p>		

<b>Geometry and Measures continued: Similarity and Congruence, Transformations</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>G5</b> - use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS)</p> <p><b>G6</b> - 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</p> <p><b>G7</b> - identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation and enlargement (including fractional <b>and negative</b> scale factors)</p> <p><b>G8</b> - describe the changes and invariance achieved by combinations of rotations, reflections and translations</p>	<b>Extension Activities</b>	<b>Competencies Developed</b>
	<b>Literacy</b>	<b>Resources</b>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.</p> <p>Quality of Written Communication</p> <p>Vocabulary - words with correct spelling</p> <p>Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 8, 12</p> <p>MyMaths Website</p> <p>Tenticks Worksheets</p>
	<b>Assessment for Learning</b>	<b>Cross Curricular Links (SMSCD, with other subjects)</b>
<p>Reflective learners – self/Peer assessment</p> <p>Pupils have the opportunity to mark each other's work</p>		

<b>Geometry and Measures continued: Circle Theorems</b> and 3D shapes	Timescale: see planning	
<b>Objectives</b> By the end of the topic the student should be able to: <b>G9</b> - identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference, tangent, arc, sector and segment <b>G10</b> - <b>apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results</b> <b>G11</b> - solve geometrical problems on coordinate axes <b>G12</b> - identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres <b>G13</b> - construct and interpret plans and elevations of 3D shapes	<b>Extension Activities</b> Harder problems involving multi-stage angle calculations	<b>Competencies Developed</b> <b>All students should know how to:</b> <ul style="list-style-type: none"> <li>• Apply all geometrical facts of circle theorems to problems</li> <li>• Be able to prove a circle theorem using all geometrical facts</li> <li>• Find missing angles on diagrams giving reasons for each angle found</li> <li>• Be able to find angles using tangent theorems</li> <li>• Recall the definition of a circle and identify (name) and draw the parts of a circle</li> <li>• Understand related terms of a circle</li> <li>• Draw a sketch of a solid given the front and side elevations and the plan</li> <li>• Identify properties of faces, surfaces, edges and vertices of 3D shapes</li> </ul>
	<b>Literacy</b>	<b>Resources</b>
	Literacy opportunities could arise in the Starters especially in verbal communication and using technical language. Quality of Written Communication Vocabulary - words with correct spelling Clear presentation of answers	Edexcel GCSE Mathematics (9-1) Chapter 16 MyMaths Website Tenticks Worksheets
	<b>Assessment for Learning</b>	<b>Cross Curricular Links (SMSCD, with other subjects)</b>
	Reflective learners – self/Peer assessment Pupils have the opportunity to mark each other's work	

<b>Geometry and Measures continued: Scale and Area</b>	Timescale: see planning	
<b>Objectives</b> By the end of the topic the student should be able to: <b>G15</b> - measure line segments and angles in geometric figures, including interpreting maps and scale drawings and use of bearings <b>G16</b> - know and apply formulae to calculate: area of triangles, parallelograms, trapezia; volume of cuboids and other right prisms (including cylinders) <b>G17</b> - know the formulae: circumference of a circle = $2\pi r = \pi d$ , area of a circle = $\pi r^2$ ; calculate: perimeters of 2D shapes, including circles; areas of circles and composite shapes; surface area and volume of spheres, pyramids, cones and composite solids <b>G18</b> - calculate arc lengths, angles and areas of sectors of circles <b>G19</b> - apply the concepts of congruence and similarity, including the relationships between lengths, <b>areas and volumes</b> in similar figures	<b>Extension Activities</b> Calculate areas and volumes using formulae Using compound shape methods to investigate areas of other standard shapes such as parallelograms, trapeziums and kites Emphasise the Functional Elements here with carpets for rooms, tiles for walls, turf for gardens as well as wall paper and skirting board problems Further problems involving combinations of shapes	<b>Competencies Developed</b> <b>All students should know:</b> <ul style="list-style-type: none"> <li>• Use and interpret maps and scale drawings</li> <li>• Read and construct scale drawings drawing lines and using bearings</li> <li>• All the names and properties of triangles and quadrilaterals and find their areas</li> <li>• Recall the formulae for area of triangles and quadrilaterals and find area and perimeter of compound shapes</li> <li>• How to find the circumference and area of a Circle and recall the formulae for circumference and area of a circle</li> <li>• How to find the arc length and area of a sector and recall the formulae for arc length and area of a sector</li> <li>• How to convert units of area</li> <li>• Find the surface area and volume of prisms, pyramids, spheres, cones and cylinders and compound shapes</li> <li>• Know the relationships between linear, area and volume scale factors of mathematically similar shapes and solids</li> </ul>
	<b>Literacy</b>	<b>Resources</b>
	Literacy opportunities could arise in the Starters especially in verbal communication and using technical language. Quality of Written Communication Vocabulary - words with correct spelling Clear presentation of answers	Edexcel GCSE Mathematics (9-1) Chapter 5, 7, 12 MyMaths Website Tenticks Worksheets
	<b>Assessment for Learning</b>	<b>Cross Curricular Links (SMSCD, with other subjects)</b>
	Reflective learners – self/Peer assessment Pupils have the opportunity to mark each other's work	Practical experience is essential to clarify these concepts – possible links within DT



<b>Geometry and Measures continued: Pythagoras and Trigonometry</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:  <b>G20</b> know the formulae for: Pythagoras' theorem and trigonometric ratios, <math>\sin \theta</math>, <math>\cos \theta</math>                  And <math>\tan \theta</math> ; apply them to find angles and lengths in right-angled triangles <b>and, where possible, general triangles</b> in two <b>and three</b> dimensional figures  <b>G21 - know the exact values of <math>\sin \theta</math> and <math>\cos \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math>; know the exact value of <math>\tan \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ</math> and <math>60^\circ</math></b>  <b>G22 - know and apply the sine rule and cosine rule to find unknown lengths and angles</b>  <b>G23 - know and apply <math>\text{Area} = \frac{1}{2}ab \sin C</math> to calculate the area, sides or angles of any triangle</b></p>	<p><b>Extension Activities</b></p> <p>Calculated angles should be given to at least 1 decimal place                  Look at Functional Elements exemplar material                  Harder problems involving multi-stage calculations                  Organise a practical surveying lesson to find the heights of buildings/trees around your school grounds. All you need is a set of tape measures (or trundle wheels) and clinometers</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know how to:</b></p> <ul style="list-style-type: none"> <li>• Use Pythagoras' Theorem in right angled triangles to find a missing length</li> <li>• Use Pythagoras' Theorem to find the length of a line segment</li> <li>• Use trigonometry in any right angled triangle to find a missing length or angle</li> <li>• Apply Pythagoras' Theorem and Trigonometry in more complex problems with angles of elevation or depression and bearings</li> <li>• Use Pythagoras' Theorem and Trigonometry to solve problems in 3D</li> <li>• Apply the sine and cosine rule in solving problems in non-right angled triangles</li> <li>• Find the area of non-right angled triangles</li> <li>• Know the exact values of <math>\sin \theta</math> and <math>\cos \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ</math> and <math>90^\circ</math>; know the exact value of <math>\tan \theta</math> for <math>\theta = 0^\circ, 30^\circ, 45^\circ</math> and <math>60^\circ</math></li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.                  Quality of Written Communication                  Vocabulary - words with correct spelling                  Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapters 5, 13                  MyMaths Website                  Tenticks Worksheets</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
	<p>Reflective learners – self/Peer assessment                  Pupils have the opportunity to mark each other's work</p>	

<b>Geometry and Measures continued: Vectors</b>	Timescale: see planning	
<b>Objectives</b> By the end of the topic the student should be able to: <b>G24</b> - describe translations as 2D vectors <b>G25</b> - apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors; <b>use vectors to construct geometric arguments and proofs</b>	<b>Extension Activities</b> Harder geometric proof, eg Show that the medians of a triangle intersect at a single point Illustrate use of vectors by showing 'Crossing the flowing River' example or navigation examples. Vector problems in 3-D (for the most able) Use <b>i</b> and <b>j</b> (and <b>k</b> ) notation	<b>Competencies Developed</b> <b>All students should be able to:</b> <ul style="list-style-type: none"> <li>• Understand and use the notation for a vector</li> <li>• Recognise equal vectors</li> <li>• Find the magnitude of a vector</li> <li>• Solve geometrical problems using vector methods</li> <li>• Use vectors to construct geometric arguments and proofs</li> </ul>
	<b>Literacy</b>	<b>Resources</b>
	Literacy opportunities could arise in the Starters especially in verbal communication and using technical language. Quality of Written Communication Vocabulary - words with correct spelling Clear presentation of answers	Edexcel GCSE Mathematics (9-1) Chapter 18 MyMaths Website Tenticks Worksheets
	<b>Assessment for Learning</b>	<b>Cross Curricular Links (SMSCD, with other subjects)</b>
Reflective learners – self/Peer assessment Pupils have the opportunity to mark each other's work		

<b>Probability</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>P1</b> - record, describe and analyse the frequency of outcomes of probability experiments using tables and frequency trees</p> <p><b>P2</b> - apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments</p> <p><b>P3</b> - relate relative expected frequencies to theoretical probability, using appropriate language and the 0-1 probability scale</p> <p><b>P4</b> - apply the property that the probabilities of an exhaustive set of outcomes sum to one; apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one</p> <p><b>P5</b> - understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size</p> <p><b>P6</b> - enumerate sets and combinations of sets systematically, using tables, grids, Venn diagrams and tree diagrams</p> <p><b>P7</b> - construct theoretical possibility spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities</p> <p><b>P8</b> - calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions</p> <p><b>P9</b> - calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams</p>	<p><b>Extension Activities</b></p> <p>Show that each cluster of branches adds up to 1</p> <p>Explain that if two objects are chosen, then this is the same as one event followed by another event without replacement</p> <p>Show that it is often easier to solve a problem involving multiple outcomes, by considering the <i>opposite</i> event and subtracting from 1, e.g. 'at least' two reds, 'at least' two beads of a different colour etc)</p> <p>Experiments with dice and spinners</p> <p>Binomial probabilities (H or T)</p> <p>Do a question 'with' and then repeat it 'without' replacement. Good idea to show the contents of the bag and physically remove the object to illustrate the change of probability fraction for the second select</p> <p>Fractions needed not be cancelled to their lowest terms. This makes it easier to calculate tree diagram probabilities, e.g. easier to add like denominators</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know that:</b></p> <ul style="list-style-type: none"> <li>• Probability is a measure of how likely an event will happen</li> <li>• A sample space can drawn to illustrate outcomes of two events</li> <li>• Mutually Exclusive outcomes cannot happen at the same time</li> <li>• Independent events do not affect the outcome of another event</li> <li>• Use a Tree diagram, Two-way tables or Venn diagram to illustrate all the outcomes of more than one event</li> <li>• How to find the expected number of times an event can occur</li> <li>• How to find conditional probabilities</li> </ul>
	<p><b>Literacy</b></p> <p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.</p> <p>Quality of Written Communication</p> <p>Vocabulary – words with correct spelling</p> <p>Clear presentation of answers</p>	<p><b>Resources</b></p> <p>Edexcel GCSE Mathematics (9-1) Chapter 10</p> <p>MyMaths Website</p> <p>Tenticks Worksheets</p> <p>Statistics Textbook</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
	<p>Reflective learners – self/Peer assessment</p> <p>Pupils have the opportunity to mark each other's work</p>	

<b>Statistics</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>S1</b> - infer properties of populations or distributions from a sample, while knowing the limitations of sampling</p> <p><b>S2</b> - 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 <b>time series</b> data and know their appropriate use</p> <p><b>S3 - construct and interpret diagrams for grouped discrete data and continuous data, i.e. histograms with equal and unequal class intervals and cumulative frequency graphs, and know their appropriate use</b></p>	<p><b>Extension Activities</b></p> <p>Carry out a statistical investigation of their own, including designing an appropriate means of gathering the data</p> <p>Investigation into other sampling schemes, such as cluster and quota sampling</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know:</b></p> <ul style="list-style-type: none"> <li>• How to distinguish between different types of data: Primary, Secondary, Discrete, Continuous</li> <li>• Select and justify a sampling scheme and a method to investigate a population, including random</li> <li>• How to work out frequency densities for a histogram</li> <li>• Produce an Interpret: composite bar charts, comparative and dual bar charts, pie charts, frequency polygons, time series, histograms with equal class intervals and frequency diagrams for grouped discrete data frequency polygons for grouped data, grouped frequency tables for continuous data</li> <li>• How to record data using data collection sheets, frequency tables or two way tables</li> </ul>
	<p><b>Literacy</b></p> <p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language.</p> <p>Quality of Written Communication</p> <p>Vocabulary - words with correct spelling</p> <p>Clear presentation of answers</p>	<p><b>Resources</b></p> <p>Edexcel GCSE Mathematics (9-1) Chapter 3, 14</p> <p>MyMaths Website</p> <p>Tenticks Worksheets</p> <p>Statistics Textbook</p>
	<p><b>Assessment for Learning</b></p> <p>Reflective learners – self/Peer assessment</p> <p>Pupils have the opportunity to mark each other's work</p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p> <p>Use year group data to introduce stratified sampling techniques</p> <p>Use investigations to link with future statistics topics</p>

<b>Statistics continued</b>	Timescale: see planning	
<p><b>Objectives</b></p> <p>By the end of the topic the student should be able to:</p> <p><b>S4</b> - interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:</p> <ul style="list-style-type: none"> <li>• appropriate graphical representation involving discrete, continuous and grouped data, <b>including box plots</b></li> <li>• appropriate measures of central tendency (median, mean, mode and modal class) and spread (range, including consideration of outliers, <b>quartiles and inter-quartile range</b>)</li> </ul> <p><b>S5</b> - apply statistics to describe a population</p> <p><b>S6</b> - use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends while knowing the dangers of so doing</p>	<p><b>Extension Activities</b></p> <p>Carry out a statistical investigation of their own and use an appropriate means of displaying the results Use a spreadsheet/ICT to draw different types of graphs</p>	<p><b>Competencies Developed</b></p> <p><b>All students should know:</b></p> <ul style="list-style-type: none"> <li>• How to find the Mean, Median, Mode, Range, Lower Quartile, Upper Quartile, IQR of a set of data</li> <li>• Be able to compare two distributions using median, IQR and range</li> <li>• Use cumulative frequency graphs to find median, quartiles and interquartile range</li> <li>• Draw box plots from a cumulative frequency graph</li> <li>• Compare the measures of spread between a pair of box plots/cumulative frequency graphs</li> <li>• Produce an Interpret scatter graphs</li> <li>• Distinguish between positive, negative and zero correlation using lines of best fit</li> <li>• Use a line of best fit, or otherwise, to predict values of one variable given values of the other variable</li> </ul>
	<p><b>Literacy</b></p>	<p><b>Resources</b></p>
	<p>Literacy opportunities could arise in the Starters especially in verbal communication and using technical language. Quality of Written Communication Vocabulary - words with correct spelling Clear presentation of answers</p>	<p>Edexcel GCSE Mathematics (9-1) Chapter 3, 14 MyMaths Website Tenticks Worksheets Statistics Textbook Autograph Use Excel Graph wizard</p>
	<p><b>Assessment for Learning</b></p>	<p><b>Cross Curricular Links (SMSCD, with other subjects)</b></p>
	<p>Reflective learners – self/Peer assessment Pupils have the opportunity to mark each other's work. Angles for pie charts should be accurate to within 2°. Ask students to check each others' charts</p>	<p>Collect examples of charts and graphs in the media which have been misused, and discuss the implications</p>