



Scheme of

Learning

2016 – 17

**Year 11**

Mathematics

**Key Topics for Year 11**

|  |  |  |  |
| --- | --- | --- | --- |
| **Set 0** | **Set 1** | **Set 2** | **Set 3** |
| **Grade 7 8 9** | **Grade 4 5 6** | **Grade 3 4 5** | **Grade 1 2 3 4** |
| **September 2016** |
| * **Manipulating algebra**
 | * **Indices**
 | * **Ratio**
 |  |
| * **Functions**
 | * **Transformations**
 | * **Operations**
 |  |
|  | * **Probability**
 | * **Measures**
 |  |
|  | * **Sequences**
 | * **Solving equations**
 |  |
| **½ term** |
| * **Graphs**
 | * **Bounds**
 | * **Transformations**
 |  |
| * **Surds**
 | * **Percentages**
 | * **Graphs**
 |  |
| * **Proportion**
 | * **Iterative methods**
 | * **Percentages**
 |  |
|  | * **Similar shapes**
 |  |  |
| **January 2017** |
| * **3d Pythagoras & Trig**
 | * **Pythagoras & Trig**
 | * **Pythagoras & Trig**
 |  |
| * **Geometric Progression**
 | * **Graphs**
 | * **Indices**
 |  |
|  | * **Compound measures**
 | * **Probability**
 |  |

**11 set 0**

**Autumn term 1**

|  |
| --- |
| **Manipulating Algebra** |
| **7** | Factorising quadratics in the form $ax ^{2}+ bx + c$ | **8** | **B** |
| **7** | Simplify algebraic fractions  |  |  |
| **7** | Argue mathematically to show algebraic expressions are equivalent and use algebra in proof | **9** | **A** |
| **7** | Solve quadratic equations that need rearranging by factorising |  |  |
| **7** | Solve quadratics by using the quadratic formula | **10** | **A\*** |
| **8** | Solve quadratic equations by completing the square | **10** | **A\*** |
| **Functions** |
| **8** | Solve two linear simultaneous equations with two variables when one is a quadratic function | **9** | **A** |
| **8** | Interpret expressions as functions and interpret the reverse process as the “inverse function” |  |  |
| **8** | Interpret the succession of two functions as a “composite function” |  |  |
| **8** | Understand and use notation of $f(x) gf(x) f^{-1}(x)$ |  |  |

**Autumn term 2**

|  |
| --- |
| **Graphs** |
| **7** | Represent the solution set on a number line, using set notation and on a graph |  |  |
| **7** | Understand when graphing regions, the convention of dashed lines for strict inequalities and solid line for included inequalities |  |  |
| **7** | Recognise, sketch and interpret exponential functions y = kx for positive values of k | **10** | **A\*** |
| **7** | Recognise, sketch and interpret trigonometric functions with arguments in degrees. | **8** | **A\*** |
| **7** | Sketch translations and reflections of a given function | **8** | **A** |
| **7** | Recognise, sketch and interpret exponential graphs | **10** | **A\*** |
| **8** | Use the form y = mx + c to identify perpendicular lines | **7** | **C** |
| **8** | Deduce turning points by completing the square |  |  |
| **8** | Calculate or estimate gradients of non-linear graphs |  |  |
| **8** | Find the equation of a tangent to a circle at a given point |  |  |
| **Surds** |
| **8** | Calculate exactly with surds | **10** | **A\*** |
| **8** | Rationalise denominators | **9** | **A** |
| **8** | Simplify surd expressions involving squares e.g. √12 = √4 x √3 = 2√3 | **10** | **A\*** |
| **Proportion**  |
|  |  |  |  |
| **7** | Understand that x is inversely proportional to y is equivalent to x is proportional to1/y | **9** | **A** |
| **7** | Interpret equations that describe direct and inverse proportion | **9** | **A** |
| **7** | Construct and interpret equations that describe direct and inverse proportion | **9** | **A** |
| **7** | Recognise and interpret graphs that illustrate direct and inverse proportion | **9** | **A** |

**11 set 0**

**Spring term 1**

|  |
| --- |
| **3d Pythagoras & Trigonometry**  |
| **7** | Know and apply formula for area of a triangle to calculate the area, sides or angles of any triangle | **10** | **A\*** |
| **8** | Apply Pythagoras theorem and trigonometric ratios to find angles and length in right angled triangles in 3 dimensional figures | **8** | **A** |
| **8** | Apply Pythagoras theorem and trigonometric ratios to find angles and length in general triangles in 2 and 3 dimensional figures | **10** | **A\*** |
| **8** | Use vectors to construct geometric arguments and proofs | **10** | **A\*** |
| **Geometric Progression** |
| **8** | Recognise and use simple geometric progressions ( rn when n is an integer where r is a surd) |  |  |

**11 set 1**

**Autumn term 1**

|  |
| --- |
| **Indices** |
| **4** | Simplify expressions involving sums, products and powers including the laws of indices | **7** | **C** |
| **5** | Use and apply the laws of negative indices  | **8** | **A** |
| **7** | Calculate with fractional indices | **9** | **A** |
| **Transformations**  |
| **2** | Identify, describe and construct, on coordinate axes, using rotation, reflection translation | **5** | **D** |
| **2** | Understand and use the words congruence and similar to describe images | **6** | **D** |
| **2** | Describe translations as 2d vectors | **6** | **D** |
| **4** | Identify, describe and construct, on coordinate axes, using enlargement with positive integer scale factor | **6** | **D** |
| **4** | Identify, describe and construct and construct shapes on coordinates axes using enlargement using fractional scale factors | **7** | **C** |
| **5** | Apply addition and subtraction of vectors, multiplication of vectors by a scalar and diagrammatic and column representation of vectors | **9** | **A** |
| **6** | Identify, describe and construct and construct shapes on coordinates axes using enlargement using negative scale factors | **9** | **A** |
| **6** | Describe the changes and invariance achieved by a combination of rotations, reflections and translations. | **8** | **B** |
| **Probability** |
| **4** | Understand the empirical unbiased samples tend towards theoretical probability distributions with increasing sample size. | **7** | **C** |
| **4** | Enumerate sets and combinations of sets systematically, using probability trees | **8** | **A** |
| **5** | Calculate the probability of independent and dependent combined events using tee diagrams and other representations and knowing the underlying assumptions | **8** | **A** |
| **6** | Calculate and interpret conditional probabilities through representation using expected frequencies with two way tables, tree diagrams and Venn Diagrams | **8** | **A** |
| **6** | understand and apply And Or probability | **8** | **A** |
| **Sequences** |
| **4** | Recognise and use Fibonacci type sequences |  |  |
| **5** | Recognise and use simple geometric progressions(rn when n is an integer, r is a rational number > 0) |  |  |
| **7** | Rearrange formula to change the subject (complex) |  |  |
| **8** | Find the nth term of a quadratic sequence |  |  |

**11 set 1**

**Autumn term 2**

|  |
| --- |
| **Bounds** |
| **4** | Calculate roots and estimate square roots using understanding of square numbers | **7** | **D** |
| **4** | Apply and interpret limits of accuracy. | **7** | **C** |
| **4** | Calculations involving lower and upper bounds. | **7** | **C** |
| **5** | Use and apply error intervals and use inequality notation to specify simple error intervals due to truncation or rounding | **8** | **A** |
| **Percentages**  |
| **3** | Solve problems including percentage increase decrease | **6** | **D**  |
| **3** | Solve problems including percentage change | **6** | **C** |
| **3** | Solve problems including fining original value | **8** | **B** |
| **3** | Solve problems including simple interest in financial mathematics  | **6** | **C** |
| **3** | Work with percentages greater than 100 |  |  |
| **5** | Set up, solve and interpret the answer in growth and decay problems including compound interest (profit and loss) | **8** | **B** |
| **5** | Set up, solve and interpret the answer in growth and decay problems including compound interest and work with iterative processes | **9** | **A** |
| **6** | Application of percentage questions in real life situations |  |  |
| **6** | Change recurring decimals into their corresponding fractions and vice versa | **8** | **B** |
| **Iterative Methods** |
| **6** | Find approximate solutions to equations numerically using trial & improvement  | **7** | **C**  |
| **6** | Find approximate solutions to equations numerically using iterative methods |  |  |
| **Similar Shapes**  |
| **4** | Calculate lengths in similar shapes | **7** | **C**  |
| **7** | Apply the concepts of congruence and similarity including the relationships between lengths in similar figures | **9** | **A** |
| **7** | Apply the concepts of congruence and similarity including the relationships between area in similar figures | **9** | **A** |
| **7** | Apply the concepts of congruence and similarity including the relationships between volume in similar figures | **9** | **A** |

**11 set 1**

**Spring term 1**

|  |
| --- |
| **Pythagoras & Trigonometry**  |
| **4** | Know, use and apply the formula for Pythagoras theorem a2 = b2 + c2  | **7** | **C** |
| **4** | Apply Pythagoras theorem and trigonometric ratios to find angles and lengths in right angled triangles in 2 dimensional figures | **7-8** | **C-B** |
| **5** | Know, use and apply the trigonometric ratios | **8** | **B** |
| **5** | Know the exact values of sin θ and cos θ   for θ = 0°, θ = 30°, θ = 45°, θ = 60°, θ = 90° |  |  |
| **5** | Know the exact values of tan θ for θ = 0°, θ = 30°, θ = 45°, θ = 60°,  |  |  |
| **7** | Know and apply the sine rule | **9** | **A** |
| **7** | Know and apply the cosine rule | **9** | **A** |
| **Graphs** |
| **4** | Interpret the gradient of a straight line graph as a rate of change | **8** | **B** |
| **5** | Recognise, sketch and interpret cubic functions and the reciprocal function y = 1/x with x ≠ 0 | **8** | **B** |
| **5** | Recognise, sketch and interpret other reciprocal functions | **8** | **B** |
| **8** | Use gradients and area under graphs to interpret results of distance time graphs, velocity time graphs and graphs in financial contexts |  |  |
| **Compound Measures**  |
| **4** | Use standard compound measures - using decimals correctly where appropriate. | **7** | **C**  |
| **4** | Plot and interpret graphs of kinematic problems involving distance, speed and acceleration | **5-7** | **F-C** |
| **4** | Change freely between and use related compound units | **7** | **C**  |

**11 set 2**

**Autumn term 1**

|  |
| --- |
| **Ratio** |
| **3** | Divide a quantity into two or more parts in a given part : part  | **5** | **E-D** |
| **3** | Divide a quantity into two or more parts in a given part : whole | **5** | **E-D** |
| **3** | Apply ratio to context and problems in exchange rates | **6** | **D** |
| **3** | Express a multiplicative relationship between two quantities as a ratio or a fraction |  |  |
| **3** | Understand and use proportion as equality of ratios | **6** | **D** |
| **4** | Calculate lengths in similar shapes | **7** | **C**  |
| **4** | Change freely between and use related compound units | **7** | **C**  |
| **4** | Interpret the gradient of a straight line graph as a rate of change | **8** | **B** |
| **Operations** |
| **3** | Use and apply the four operations to positive and negative numbers | **4** | **F** |
| **3** | Use conventional notation for priority of operations (BIDMAS BODMAS) | **4** | **F** |
| **3** | Use and apply the four operations to decimals including formal written methods | **4** | **F-C** |
| **3** | Understand the effects of multiplying and dividing by numbers between 1 and 0 | **7** | **C** |
| **3** | Use and apply the four operations to fractions improper fractions and mixed numbers  | **7** | **C** |
| **3** | Calculate fractions of amounts | **5** | **F** |
| **3** | Find the reciprocal of a number | **7** | **C** |
| **3** | Calculate standard form A x 10n where 1 < A < 10, and n is an integer | **8** | **B** |
| **3** | Understand place value when calculating with very large or very small numbers | **8** | **B** |
| **Measures**  |
| **3** | Round numbers to significant figures. | **7** | **B**  |
| **3** | Round numbers and measures to appropriate degree of accuracy. | **6** | **D**  |
| **3** | Check calculations using approximation and estimation. | **7** | **C**  |
| **4** | Use standard compound measures - using decimals correctly where appropriate. | **7** | **C**  |
| **4** | Use inequality notation to specify simple error intervals due to truncation or rounding. |  |  |
| **4** | Calculations involving lower and upper bounds. | **7** | **C** |
| **Solving Equations** |
| **4** | Solve linear equations in one unknown algebraically with x on one side, both sides, brackets | **5** | **E** |
| **4** | Solve linear equations in one unknown algebraically with fractional answers |  |  |
| **4** | Construct and solve equations to problem solve | **6** | **E** |
| **4** | Simplify and manipulate algebraic expressions by expanding products of two binomials | **7** | **C** |
| **4** | Solve linear inequalities in one variable | **7** | **C**  |
| **5** | Simplify and manipulate algebraic expressions by factorising quadratic expressions  | **8** | **B** |
| **5** | Simplify and manipulate algebraic expressions by factorise using the difference of two squares | **8** | **B** |
| **5** | Solve quadratic equations algebraically by factorising | **8** | **B** |
| **4** | Solve linear inequalities in one variable | **8** | **B** |

**11 set 2**

**Autumn term 2**

|  |
| --- |
| **Transformations** |
| **2** | Identify, describe and construct, on coordinate axes, using rotation reflection translation | **5** | **D** |
| **2** | Understand and use the words congruence and similar to describe images | **6** | **D** |
| **2** | Describe translations as 2d vectors | **6** | **D** |
| **3** | Solve geometrical problems on coordinate axes |  |  |
| **4** | Identify, describe and construct, on coordinate axes, using enlargement with positive integer scale factor | **6** | **D** |
| **4** | Identify, describe and construct and construct shapes on coordinates axes using enlargement using fractional scale factors | **7** | **C** |
| **5** | Apply addition and subtraction of vectors, multiplication of vectors by a scalar and diagrammatic and column representation of vectors | **9** | **A** |
| **Graphs** |
| **4** | Use the form y = mx + c to identify parallel lines | **7** | **C** |
| **4** | Recognise, sketch and interpret graphs of linear functions and quadratic functions | **8** | **B** |
| **4** | Solve linear inequalities in one or two variables | **9** | **A** |
| **4** | Recognise, sketch and interpret reciprocal functions | **8** | **B** |
| **5** | Find the equation of the line through 2 given points | **7** | **C** |
| **5** | Find the equation of a line given 1 point and the gradient | **7** | **C** |
| **5** | Identify and interpret roots, intercepts and turning points of quadratic functions graphically | **8** | **B** |
| **5** | Recognise, sketch and interpret cubic functions and the reciprocal function y = 1/x | **8** | **B** |
| **Percentages**  |
| **2** | Calculate a percentage of a quantity | **4** | **F**  |
| **2** | Express one quantity as a percentage of another | **6** | **C** |
| **2** | Compare two quantities using percentages | **6** | **C** |
| **3** | Work with percentages greater than 100 |  |  |
| **3** | Solve problems including percentage increase decrease | **6** | **D**  |
| **3** | Solve problems including percentage change | **6** | **C** |
| **3** | Solve problems including fining original value | **8** | **B** |
| **3** | Solve problems including simple interest in financial mathematics  | **6** | **C** |
| **3** | Work with percentages greater than 100 |  |  |
| **5** | Set up, solve and interpret the answer in growth and decay problems including compound interest (profit and loss) | **8** | **B** |
| **5** | Set up, solve and interpret the answer in growth and decay problems including compound interest and work with iterative processes | **9** | **A** |

**11 set 2**

**Spring term 1**

|  |
| --- |
| **Pythagoras and Trigonometry** |
| **4** | Know, use and apply the formula for Pythagoras theorem a2 = b2 + c2  | **7** | **C** |
| **4** | Apply Pythagoras theorem and trigonometric ratios to find angles and lengths in right angled triangles in 2 dimensional figures | **7-8** | **C - B** |
| **5** | Know, use and apply the trigonometric ratios | **8** | **B** |
| **5** | Know the exact values of sin θ and cos θ   for θ = 0°, θ = 30°, θ = 45°, θ = 60°, θ = 90° |  |  |
| **5** | Know the exact values of tan θ for θ = 0°, θ = 30°, θ = 45°, θ = 60°,  |  |  |
| **Indices** |
| **4** | Calculate roots and estimate square roots using understanding of square numbers | **7** | **D** |
| **5** | Calculating with bounds | **8** | **A** |
| **4** | Use and apply the laws of positive indices  | **7** | **B** |
| **5** | Use and apply the laws of negative indices  | **8** | **A** |
| **5** | Use and apply error intervals | **8** | **A** |
| **Probability** |
| **3** | Understand and use relative frequency | **5** | **E** |
| **3** | Enumerate sets and combinations of sets systematically, using tables, grids and Venn diagrams | **6** | **D** |
| **3** | Construct theoretical probability spaces for single and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities  | **6** | **D** |
| **4** | Understand the empirical unbiased samples tend towards theoretical probability distributions with increasing sample size. | **7** | **C** |
| **4** | Enumerate sets and combinations of sets systematically, using probability trees | **8** | **A** |
| **5** | Calculate the probability of independent and dependent combined events using tee diagrams and other representations and knowing the underlying assumptions | **8** | **A** |