**Year 10**

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| Week | Strand | Topic |  |
| 1 | N8, N9 | Number 1d – Standard form and surds |  |
| 2 | Number 1d – Standard form and surds |  |
| 3 | A9, A10, A12, A17, R8, R10 | Algebra 6b – Linear graphs and coordinates |  |
| 4 | Algebra 6b – Linear graphs and coordinates |  |
| 5 | N8, N15, G12, G13, G14, G16, G17 | Geometry 7b – 3D shapes |  |
| 6 | Geometry 7b – 3D shapes |  |
| 7 | N15, N16 | Number 7c – Accuracy and bounds |  |
| 8 |  | REVIEW/ASSESS/DIRT WEEK 1 |  |
| 9 | N15, N16 | Number 7c – Accuracy and bounds |  |
| 10 | R6, G5, G6, G7, G8, G24, G25 | Geometry 8a – Transformations |  |
| 11 | Geometry 8a – Transformations |  |
| 12 | A11, A12, A16 | Algebra 6c – quadratics and graphs |  |
| 13 | Algebra 6c – quadratics and graphs |  |
| 14 | **S1, S2, S3, S4** | **Statistics 3b – averages, ranges and graphs** | Moved from year 9 (end of 2017-18 year) |
| 15 |  | REVIEW/ASSESS/DIRT WEEK 2 |  |
| 16 | **S1, S2, S3, S4** | **Statistics 3b – averages, ranges and graphs** | Moved from year 9 (end of 2017-18 year) |
| 17 | N8, A4, A9, A11, A18, A19, A21 | Algebra 9a – Solving quadratics pt 2 |  |
| 18 | Algebra 9a – Solving quadratics pt 2 |  |
| 19 | N3, N12, N13, R1, R6, R10, R11, R14, R16 | Number and Ratio 11 – Multiplicative number |  |
| 20 | Number and Ratio 11 – Multiplicative number |  |
| 21 |  | REVIEW/ASSESS/DIRT WEEK 3 |  |
| 22 | **N9, A23, A24, A25** | **Algebra 2c - Sequences** | Moved from year 9 (end of 2017-18 year) |
| 23 | **Algebra 2c - Sequences** |
| 24 | R2, G1, G2, G3, G12, G13, G15, G19 | Geometry 8b - Constructions |  |
| 25 | Geometry 8b – Constructions |  |
| 26 | N1, A22 | Algebra 9b – Inequalities |  |
| 27 |  | REVIEW/ASSESS/DIRT WEEK 4 |  |
| 28 | S1 | Statistics 14a – Collecting data |  |
| 29 | N8, A4, A11, A12, A18, A19, A20, A21, A22 | Algebra 15 – Quadratics, cubics and circles |  |
| 30 | Algebra 15 – Quadratics, cubics and circles |  |
| 31 | Algebra 15 – Quadratics, cubics and circles |  |
| 32 | R6, R12, G5, G6, G17,G19 | Geometry 12 – Similarity and congruence |  |
| 33 |  | REVIEW/ASSESS/DIRT WEEK 5 |  |
| 34 | R6, R12, G5, G6, G17,G19 | Geometry 12 – Similarity and congruence |  |
| 35 | N5, P1, P2, P3, P4, P5, P6, P7, P8, P9 | Probability 10b – Venn and tree diagrams |  |
| 36 | Probability 10b – Venn and tree diagrams |  |
| 37 |  | EXAM WEEK |  |
| 38 |  | WORK EXPERIENCE |  |
| 39 |  | WORK EXPERIENCE |  |

**Number 1d**

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * Convert large and small numbers into standard form and vice versa; * Add and subtract numbers in standard form; * Multiply and divide numbers in standard form; * Interpret a calculator display using standard form and know how to enter numbers in standard form; * Understand **surd notation**, e.g. calculator gives answer to sq rt 8 as 4 rt 2;   **Simplify surd expressions involving squares (e.g. √12 = √(4 × 3) = √4 × √3 = 2√3).**  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Number\far_-_number_1_-_standard_form_1.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Number\far_-_surds_complete.pdf) **(this has rationalising the denominator)** | **POSSIBLE SUCCESS CRITERIA**  Write 51080 in standard form.  Write 3.74 x 10–6 as an ordinary number.  Simplify √8.  Convert a ‘near miss’, or any number, into standard form; e.g. 23 × 107.  **COMMON MISCONCEPTIONS**  Some students may think that any number multiplied by a power of ten qualifies as a number written in standard form.  When rounding to significant figures some students may think, for example, that 6729 rounded to one significant figure is 7.  **NOTES**  Standard form is used in science and there are lots of cross-curricular opportunities.  Students need to be provided with plenty of practice in using standard form with calculators.  Rationalising the denominator is covered later in unit 17. |

**Algebra 6b**

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| **OBJECTIVES**  By the end of the unit, students should be able to:   * Plot and draw graphs of *y* = *a*, *x* = *a*, *y* = *x* and *y* = –*x*, drawing and recognising lines parallel to axes, plus *y* = *x* and *y* = –*x*; * Identify and interpret the gradient of a line segment; * Recognise that equations of the form *y* = *mx* + *c* correspond to straight-line graphs in the coordinate plane; * Identify and interpret the gradient and *y*-intercept of a linear graph given by equations of the form *y* = *mx* + *c*; * Find the equation of a straight line from a graph in the form *y* = *mx* + *c*; * Plot and draw graphs of straight lines of the form *y* = *mx* + *c* with and without a table of values; * Sketch a graph of a linear function, using the gradient and *y*-intercept (i.e. without a table of values); * Find the equation of the line through one point with a given gradient; * Identify and interpret gradient from an equation *ax* + *by* = *c*; * Find the equation of a straight line from a graph in the form *ax* + *by* = *c*; * Plot and draw graphs of straight lines in the form *ax* + *by* = *c*; * Interpret and analyse information presented in a range of linear graphs: * use gradients to interpret how one variable changes in relation to another; * find approximate solutions to a linear equation from a graph; * identify direct proportion from a graph; * find the equation of a line of best fit (scatter graphs) to model the relationship between quantities; * Explore the gradients of parallel lines and lines perpendicular to each other; * Interpret and analyse a straight-line graph and generate equations of lines parallel and perpendicular to the given line;   Select and use the fact that when *y* = *mx* + *c* is the equation of a straight line, then the gradient of a line parallel to it will have a gradient of *m* **and a line perpendicular to this line will have a gradient of .**  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Graphs\far_-_graphs_1_-_straight_line_graphs.pdf) | **POSSIBLE SUCCESS CRITERIA**  Find the equation of the line passing through two coordinates by calculating the gradient first.  Understand that the form *y* = *mx* + *c* or *ax* + *by* = *c* represents a straight line.  **COMMON MISCONCEPTIONS**  Students can find visualisation of a question difficult, especially when dealing with gradients resulting from negative coordinates.  **NOTES**  Encourage students to sketch what information they are given in a question – emphasise that it is a sketch. |

**Geometry 7b**

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * Find the surface area of prisms using the formulae for triangles and rectangles, and other (simple) shapes with and without a diagram; * Draw sketches of 3D solids; * Identify planes of symmetry of 3D solids, and sketch planes of symmetry; * Recall and use the formula for the volume of a cuboid or prism made from composite 3D solids using a variety of metric measures; * Convert between metric volume measures; * Convert between metric measures of volume and capacity, e.g. 1 ml = 1 cm3; * Use volume to solve problems; * Estimating surface area, perimeter and volume by rounding measurements to 1 significant figure to check reasonableness of answers. * Use *π* ≈ 3.142 or use the *π* button on a calculator; * Find the volume and surface area of a cylinder; * Recall and use the formula for volume of pyramid; * Find the surface area of a pyramid; * Use the formulae for volume and surface area of spheres and cones; * Solve problems involving more complex shapes and solids, including segments of circles and frustums of cones; * Find the surface area and volumes of compound solids constructed from cubes, cuboids, cones, pyramids, spheres, hemispheres, cylinders; * Give answers in terms of *π*;   Form equations involving more complex shapes and solve these equations.  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Measures\far_-_measure_1_-_surface_area.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Measures\far_-_measure_1_-_surface_area_cylinders_spheres___cones.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Measures\far_-_measure_1_-_volume.pdf)  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Measures\far_-_measure_1_-_volume_cylinders_spheres___cones.pdf) | **POSSIBLE SUCCESS CRITERIA**  Given dimensions of a rectangle and a pictorial representation of it when folded, work out the dimensions of the new shape.  Work out the length given the area of the cross-section and volume of a cuboid.  Understand that answers in terms of *π* are more accurate.  Given two solids with the same volume and the dimensions of one, write and solve an equation in terms of *π* to find the dimensions of the other, e.g. a sphere is melted down to make ball bearings of a given radius, how many will it make?  **COMMON MISCONCEPTIONS**  Students often get the concepts of surface area and volume confused.  **NOTES**  Encourage students to draw a sketch where one isn’t provided.  Solve problems including examples of solids in everyday use.  Scaffold drawing 3D shapes by initially using isometric paper.  Whilst not an explicit objective, it is useful for students to draw and construct nets and show how they fold to make 3D solids, allowing students to make the link between 3D shapes and their nets. This will enable students to understand that there is often more than one net that can form a 3D shape.  Formulae for curved surface area and volume of a sphere, and surface area and volume of a cone will be given on the formulae page of the examinations. |

**Number 7c**

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * **Calculate the upper and lowers bounds of numbers given to varying degrees of accuracy;** * **Calculate the upper and lower bounds of an expression involving the four operations;** * **Find the upper and lower bounds in real-life situations using measurements given to appropriate degrees of accuracy;** * **Find the upper and lower bounds of calculations involving perimeters, areas and volumes of 2D and 3D shapes;** * **Calculate the upper and lower bounds of calculations, particularly when working with measurements;**   Use inequality notation to specify an error bound.  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Number\far_number_5_bounds.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Number\far_-_number_1_rounding.pdf) | **POSSIBLE SUCCESS CRITERIA**  Round 16,000 people to the nearest 1000.  Round 1100 g to 1 significant figure.  Work out the upper and lower bounds of a formula where all terms are given to 1 decimal place.  Be able to justify that measurements to the nearest whole unit may be inaccurate by up to one half in either direction.  **COMMON MISCONCEPTIONS**  Students readily accept the rounding for lower bounds, but take some convincing in relation to upper bounds.  **NOTES**  Students should use ‘half a unit above’ and ‘half a unit below’ to find upper and lower bounds.  Encourage use a number line when introducing the concept. |

**Geometry 8a**

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * Distinguish properties that are preserved under particular transformations; * Recognise and describe rotations – know that that they are specified by a centre and an angle; * Rotate 2D shapes using the origin or any other point (not necessarily on a coordinate grid); * Identify the equation of a line of symmetry; * Recognise and describe reflections on a coordinate grid – know to include the mirror line as a simple algebraic equation, *x* = *a*, *y* = *a*, *y* = *x*, *y* = –*x* and lines not parallel to the axes; * Reflect 2D shapes using specified mirror lines including lines parallel to the axes and also *y* = *x* and *y* = –*x*; * Recognise and describe single translations using column vectors on a grid; * Translate a given shape by a vector; * Understand the effect of one translation followed by another, in terms of column vectors (to introduce vectors in a concrete way); * Enlarge a shape on a grid without a centre specified; * Describe and transform 2D shapes using enlargements by a positive integer, positive fractional, and **negative scale factor;** * Know that an enlargement on a grid is specified by a centre and a scale factor; * Identify the scale factor of an enlargement of a shape; * Enlarge a given shape using a given centre as the centre of enlargement by counting distances from centre, and find the centre of enlargement by drawing; * Find areas after enlargement and compare with before enlargement, to deduce multiplicative relationship (area scale factor); given the areas of two shapes, one an enlargement of the other, find the scale factor of the enlargement; * Use congruence to show that translations, rotations and reflections preserve length and angle, so that any figure is congruent to its image under any of these transformations; * Describe and transform 2D shapes using combined rotations, reflections, translations, or enlargements;   **Describe the changes and invariance achieved by combinations of rotations, reflections and translations.**  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Transformations\far_-_enlargements.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Transformations\far_-_transformations_-_translations.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Transformations\far_-_transformations_1_-_reflection_in_a_line.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Transformations\far_-_transformations_2_-_rotation.pdf) | **POSSIBLE SUCCESS CRITERIA**  Recognise similar shapes because they have equal corresponding angles and/or sides scaled up in same ratio.  Understand that translations are specified by a distance and direction (using a vector).  Recognise that enlargements preserve angle but not length.  Understand that distances and angles are preserved under rotations, reflections and translations so that any shape is congruent to its image.  Understand that similar shapes are enlargements of each other and angles are preserved.  **COMMON MISCONCEPTIONS**  Students often use the term ‘transformation’ when describing transformations instead of the required information. Lines parallel to the coordinate axes often get confused. |

**Algebra 6c**

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * Recognise a linear, quadratic, cubic, reciprocal and circle graph from its shape; * Generate points and plot graphs of simple quadratic functions, then more general quadratic functions; * Find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function; * Interpret graphs of quadratic functions from real-life problems; * Draw graphs of simple cubic functions using tables of values; * Interpret graphs of simple cubic functions, including finding solutions to cubic equations; * Draw graphs of the reciprocal function  with *x* ≠ 0 using tables of values;   Draw circles, centre the origin, equation *x*2 + *y*2 = *r*2.  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Graphs\far_-_graphs_1_-_circle_equations.pdf) | **POSSIBLE SUCCESS CRITERIA**  Select and use the correct mathematical techniques to draw linear, quadratic, cubic and reciprocal graphs.  Identify a variety of functions by the shape of the graph.  **COMMON MISCONCEPTIONS**  Students struggle with the concept of solutions and what they represent in concrete terms.  **NOTES**  Use lots of practical examples to help model the quadratic function, e.g. draw a graph to model the trajectory of a projectile and predict when/where it will land.  Ensure axes are labelled and pencils used for drawing.  Graphical calculations or appropriate ICT will allow students to see the impact of changing variables within a function. |

Statistics 3b

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * Know which charts to use for different types of data sets; * Produce and interpret composite bar charts; * Produce and interpret comparative and dual bar charts; * Produce and interpret pie charts: * find the mode and the frequency represented by each sector; * compare data from pie charts that represent different-sized samples; * Produce and interpret frequency polygons for grouped data: * from frequency polygons, read off frequency values, compare distributions, calculate total population, mean, estimate greatest and least possible values (and range); * Produce frequency diagrams for grouped discrete data: * read off frequency values, calculate total population, find greatest and least values; * Produce histograms with equal class intervals: * estimate the median from a histogram with equal class width or any other information, such as the number of people in a given interval; * Produce line graphs: * read off frequency values, calculate total population, find greatest and least values; * Construct and interpret time–series graphs, comment on trends; * Compare the mean and range of two distributions, or median or mode as appropriate;   Recognise simple patterns, characteristics relationships in bar charts, line graphs and frequency polygons. | **POSSIBLE SUCCESS CRITERIA**  Use a time–series data graph to make a prediction about a future value.  Explain why same-size sectors on pie charts with different data sets do not represent the same number of items, but do represent the same proportion.  Make comparisons between two data sets.  **NOTES**  Interquartile range is covered in unit 16.  Misleading graphs are a useful activity for covering AO2 strand 5: Critically evaluate a given way of presenting information.  When doing time–series graphs, use examples from science, geography.  NB Moving averages are not explicitly mentioned in the programme of study but may be worth covering too. |

**Algebra 9a**

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * **Solve quadratic equations by completing the square;** * **Solve quadratic equations that need rearranging;** * Set up and solve quadratic equations; * Solve exactly, by elimination of an unknown, two simultaneous equations in two unknowns: * linear / quadratic; * linear / *x*2 + *y*2 = *r*2; * Set up and solve a pair of simultaneous equations in two variables for each of the above scenarios, including to represent a situation;   Interpret the solution in the context of the problem;  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_1_-_difference_of_two_squares.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_-_2_simultaneous_quadratic_equations.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_-_1_simultaneous_linear_equations.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_-_3_graphical_simultaneous_equations.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_-_7_solving_quadratics_by_factorising.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_3_completing_the_square.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_-_8_completing_the_square.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_algebra_2_-_factorise_quadratics_with_cooefficients.pdf) | **POSSIBLE SUCCESS CRITERIA**  Solve 3*x*2 + 4 = 100.  Know that the quadratic formula can be used to solve all quadratic equations, and often provides a more efficient method than factorising or completing the square.  Have an understanding of solutions that can be written in surd form.  **COMMON MISCONCEPTIONS**  Using the formula involving negatives can result in incorrect answers.  If students are using calculators for the quadratic formula, they can come to rely on them and miss the fact that some solutions can be left in surd form.  **NOTES**  Remind students to use brackets for negative numbers when using a calculator, and remind them of the importance of knowing when to leave answers in surd form.  Link to unit 2, where quadratics were solved algebraically (when *a* = 1).  The quadratic formula must now be known; it will not be given in the exam paper.  Reinforce the fact that some problems may produce one inappropriate solution which can be ignored.  Clear presentation of working out is essential.  Link with graphical representations. |

**Number and Ratio 11**

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| **OBJECTIVES**  By the end of the unit, students should be able to:   * Express a multiplicative relationship between two quantities as a ratio or a fraction, e.g. when *A*:*B* are in the ratio 3:5, *A* is *B*. When 4*a* = 7*b*, then *a* =  or *a*:*b* is 7:4; * Solve proportion problems using the unitary method; * Work out which product offers best value and consider rates of pay; * Work out the multiplier for repeated proportional change as a single decimal number; * Represent repeated proportional change using a multiplier raised to a power, use this to solve problems involving compound interest and depreciation; * Understand and use compound measures and: * convert between metric speed measures; * convert between density measures; * convert between pressure measures; * Use kinematics formulae from the formulae sheet to calculate speed, acceleration, etc (with variables defined in the question); * Calculate an unknown quantity from quantities that vary in direct or inverse proportion; * Recognise when values are in direct proportion by reference to the graph form**, and use a graph to find the value of *k* in *y* = *kx*;** * **Set up and use equations to solve word and other problems involving direct proportion** (this is covered in more detail in unit 19); * Relate algebraic solutions to graphical representation of the equations; * Recognise when values are in inverse proportion by reference to the graph form;   **Set up and use equations to solve word and other problems involving inverse proportion, and relate algebraic solutions to graphical representation of the equations.**  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Ratio\Units%20and%20Proportion\far_-_direct_proportion.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Ratio\Units%20and%20Proportion\far_-_inverse_proportion.pdf) | **POSSIBLE SUCCESS CRITERIA**  Change g/cm3 to kg/m3, kg/m2 to g/cm2, m/s to km/h.  Solve word problems involving direct and inverse proportion.  Understand direct proportion as: as *x* increases, *y* increases.  Understand inverse proportion as: as *x* increases, *y* decreases.  **NOTES**  Include fractional percentages of amounts with compound interest and encourage use of single multipliers.  Amounts of money should be rounded to the nearest penny, but emphasise the importance of not rounding until the end of the calculation if doing in stages.  Use a formula triangle to help students see the relationship for compound measures – this will help them evaluate which inverse operations to use.  Help students to recognise the problem they are trying to solve by the unit measurement given, e.g. km/h is a unit of speed as it is speed divided by a time.  Kinematics formulae involve a constant acceleration (which could be zero).  Encourage students to write down the initial equation of proportionality and, if asked to find a formal relating two quantities, the constant of proportionality must be found. |

Algebra 2c

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * Recognise simple sequences including at the most basic level odd, even, triangular, square and cube numbers and Fibonacci-type sequences; * Generate sequences of numbers, squared integers and sequences derived from diagrams; * Describe in words a term-to-term sequence and identify which terms cannot be in a sequence; * Generate specific terms in a sequence using the position-to-term rule and term-to-term rule; * Find and use (to generate terms) the *n*th term of an arithmetic sequence; * Use the *n*th term of an arithmetic sequence to decide if a given number is a term in the sequence, or find the first term above or below a given number; * Identify which terms cannot be in a sequence by finding the *n*th term; * Continue a quadratic sequence and use the *n*th term to generate terms; * **Find the *n*th term of quadratic sequences;** * Distinguish between arithmetic and geometric sequences; * Use finite/infinite and ascending/descending to describe sequences; * Recognise and use simple geometric progressions (*rn* where *n* is an integer, and *r* is a rational number > 0 **or a surd**); * Continue geometric progression and find term to term rule, including negative, fraction and decimal terms; * Solve problems involving sequences from real life situations.   [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_algebra_10_sequences.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_algebra_12_quadratic_sequences.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_3_quadratic_sequences.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_algebra_11_geometric_sequences.pdf) | **POSSIBLE SUCCESS CRITERIA**  Given a sequence, ‘which is the 1st term greater than 50?’  Be able to solve problems involving sequences from real-life situations, such as:   * 1 grain of rice on first square, 2 grains on second, 4 grains on third, etc (geometric progression), or person saves £10 one week, £20 the next, £30 the next, etc; * What is the amount of money after *x* months saving the same amount, or the height of tree that grows 6 m per year; * Compare two pocket money options, e.g. same number of £ per week as your age from 5 until 21, or starting with £5 a week aged 5 and increasing by 15% a year until 21.   **COMMON MISCONCEPTIONS**  Students struggle to relate the position of the term to “*n*”.  **NOTES**  Emphasise use of 3*n* meaning 3 x *n*.  Students need to be clear on the description of the pattern in words, the difference between the terms and the algebraic description of the *n*th term. |

**Geometry 8b**

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * Draw 3D shapes using isometric grids; * Understand and draw front and side elevations and plans of shapes made from simple solids; * Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid; * Use and interpret maps and scale drawings, using a variety of scales and units; * Read and construct scale drawings, drawing lines and shapes to scale; * Estimate lengths using a scale diagram; * Understand, draw and measure bearings; * Calculate bearings and solve bearings problems, including on scaled maps, and find/mark and measure bearings * Use the standard ruler and compass constructions: * bisect a given angle; * construct a perpendicular to a given line from/at a given point; * construct angles of 90°, 45°; * perpendicular bisector of a line segment; * Construct: * a region bounded by a circle and an intersecting line; * a given distance from a point and a given distance from a line; * equal distances from two points or two line segments; * regions which may be defined by ‘nearer to’ or ‘greater than’; * Find and describe regions satisfying a combination of loci, including in 3D; * Use constructions to solve loci problems including with bearings;   Know that the perpendicular distance from a point to a line is the shortest distance to the line.  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Geometry\far_-_geometry_1_accurate_drawing_construction_and_loci.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Geometry\far_-_bearings.pdf) | **POSSIBLE SUCCESS CRITERIA**  Able to read and construct scale drawings.  When given the bearing of a point *A* from point *B*, can work out the bearing of *B* from *A*.  Know that scale diagrams, including bearings and maps, are ‘similar’ to the real-life examples.  Able to sketch the locus of point on a vertex of a rotating shape as it moves along a line, of a point on the circumference and at the centre of a wheel.  **COMMON MISCONCEPTIONS**  Correct use of a protractor may be an issue.  **NOTES**  Drawings should be done in pencil.  Relate loci problems to real-life scenarios, including mobile phone masts and coverage.  Construction lines should not be erased. |

**Algebra 9b**

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * Show inequalities on number lines; * Write down whole number values that satisfy an inequality; * Solve simple linear inequalities in one variable, and represent the solution set on a number line; * Solve two linear inequalities in *x*, find the solution sets and compare them to see which value of *x* satisfies both solve linear inequalities in two variables algebraically;   Use the correct notation to show inclusive and exclusive inequalities.  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_1_writing___solving_inequalities_1.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_-_5_number_line_inequalities.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_-_4_solving_linear_inequalities.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_-_6_graphical_inequalities.pdf) | **POSSIBLE SUCCESS CRITERIA**  Use inequality symbols to compare numbers.  Given a list of numbers, represent them on a number line using the correct notation.  Solve equations involving inequalities.  **COMMON MISCONCEPTIONS**  When solving inequalities students often state their final answer as a number quantity, and exclude the inequality or change it to =.  Some students believe that –6 is greater than –3.  **NOTES**  Emphasise the importance of leaving their answer as an inequality (and not changing it to =).  Link to units 2 and 9a, where quadratics and simultaneous equations were solved.  Students can leave their answers in fractional form where appropriate.  Ensure that correct language is used to avoid reinforcing misconceptions: for example, 0.15 should never be read as ‘zero point fifteen’, and 5 > 3 should be read as ‘five is greater than 3’, not ‘5 is bigger than 3’. |

**Statistics 14a**

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| **OBJECTIVES**  By the end of the sub-unit, students should be able to:   * Specify the problem and plan: * decide what data to collect and what analysis is needed; * understand primary and secondary data sources; * consider fairness; * Understand what is meant by a sample and a population; * Understand how different sample sizes may affect the reliability of conclusions drawn; * Identify possible sources of bias and plan to minimise it;   Write questions to eliminate bias, and understand how the timing and location of a survey can ensure a sample is representative (see note); | **POSSIBLE SUCCESS CRITERIA**  Explain why a sample may not be representative of a whole population.  Carry out their own statistical investigation and justify how sources of bias have been eliminated.  **NOTES**  Emphasise the difference between primary and secondary sources and remind students about the difference between discrete and continuous data.  Discuss sample size and mention that a census is the whole population (the UK census takes place every 10 years in a year ending with a 1 – the next one is due in 2021).  Specifying the problem and planning for data collection is not included in the programme of study, but is a prerequisite to understanding the context of the topic.  Writing a questionnaire is also not included in the programme of study, but remains a good topic for demonstrating bias and ways to reduce bias in terms of timing, location and question types. |

**Algebra 15**

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| **OBJECTIVES**  By the end of the unit, students should be able to:   * Sketch a graph of a quadratic function, by factorising or by using the formula, identifying roots and *y*-intercept, **turning point**; * Be able to identify from a graph if a quadratic equation has any real roots; * Find approximate solutions to quadratic equations using a graph; * **Expand the product of more than two linear expressions**; * Sketch a graph of a quadratic and a linear, identifying intersection points; * Sketch graphs of simple cubic functions, given as three linear expressions; * Solve simultaneous equations graphically: * **find approximate solutions to simultaneous equations formed from one linear function and one quadratic function using a graphical approach;** * **find graphically the intersection points of a given straight line with a circle;** * **solve simultaneous equations representing a real-life situation graphically, and interpret the solution in the context of the problem;** * **Solve quadratic inequalities in one variable, by factorising and sketching the graph to find critical values;** * **Represent the solution set for inequalities using set notation, i.e. curly brackets and ‘is an element of’ notation;** * **for problems identifying the solutions to two different inequalities, show this as the intersection of the two solution sets, i.e. solution of *x*² – 3*x* – 10 < 0 as {*x*: –3 < *x* < 5};** * Solve linear inequalities in two variables **graphically**; * **Show the solution set of several inequalities in two variables on a graph;**   **Use iteration with simple converging sequences.**  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_expanding_2-3_brackets.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Algebra\far_-_algebra_2_-_3_graphical_simultaneous_equations.pdf) | **POSSIBLE SUCCESS CRITERIA**  Expand *x*(*x* – 1)(*x* + 2).  Expand (*x* – 1)3.  Expand (*x* + 1)(*x* + 2)(*x* – 1).  Sketch *y* = (*x* + 1)2(*x* – 2).  Interpret a pair of simultaneous equations as a pair of straight lines and their solution as the point of intersection.  Be able to state the solution set of *x*² – 3*x* – 10 < 0 as {*x*: *x* < -3}  {*x*: *x* > 5}.  **COMMON MISCONCEPTIONS**  When estimating values from a graph, it is important that students understand it is an ‘estimate’.  It is important to stress that when expanding quadratics, the *x* terms are also collected together.  Quadratics involving negatives sometimes cause numerical errors.  **NOTES**  The extent of algebraic iteration required needs to be confirmed.  You may want to extend students to include expansions of more than 3 linear expressions.  Practise expanding ‘double brackets’ with all combinations of positives and negatives.  Set notation is a new topic. |

**Geometry 12**

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| **OBJECTIVES**  By the end of the unit, students should be able to:   * Understand and use SSS, SAS, ASA and RHS conditions to prove the congruence of triangles using formal arguments, and to verify standard ruler and pair of compasses constructions; * Solve angle problems by first proving congruence; * Understand similarity of triangles and of other plane shapes, and use this to make geometric inferences; * Prove that two shapes are similar by showing that all corresponding angles are equal in size and/or lengths of sides are in the same ratio/one is an enlargement of the other, giving the scale factor; * Use formal geometric proof for the similarity of two given triangles; * Understand the effect of enlargement on angles, perimeter, area and volume of shapes and solids; * Identify the scale factor of an enlargement of a similar shape as the ratio of the lengths of two corresponding sides, using integer or fraction scale factors; * Write the lengths, areas and volumes of two shapes as ratios in their simplest form; * Find missing lengths, areas and volumes in similar 3D solids; * **Know the relationships between linear, area and volume scale factors of mathematically similar shapes and solids;** * **Use the relationship between enlargement and areas and volumes of simple shapes and solids;**   **Solve problems involving frustums of cones where you have to find missing lengths first using similar triangles.** | **POSSIBLE SUCCESS CRITERIA**  Recognise that all corresponding angles in similar shapes are equal in size when the corresponding lengths of sides are not.  Understand that enlargement does not have the same effect on area and volume.  Understand, from the experience of constructing them, that triangles satisfying SSS, SAS, ASA and RHS are unique, but SSA triangles are not.  **COMMON MISCONCEPTIONS**  Students commonly use the same scale factor for length, area and volume.  **NOTES**  Encourage students to model consider what happens to the area when a 1 cm square is enlarged by a scale factor of 3.  Ensure that examples involving given volumes are used, requiring the cube root being calculated to find the length scale factor.  Make links between similarity and trigonometric ratios. |

**Probability 10b**

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| **OBJECTIVES**   * **Work out probabilities from Venn diagrams to represent real-life situations and also ‘abstract’ sets of numbers/values;** * **Use union and intersection notation;** * Find a missing probability from a list or two-way table, including algebraic terms; * **Understand conditional probabilities and decide if two events are independent;** * Draw a probability tree diagram based on given information, and use this to find probability and expected number of outcome; * Understand selection with or without replacement; * Calculate the probability of independent and dependent combined events; * **Use a two-way table to calculate conditional probability**; * **Use a tree diagram to calculate conditional probability;** * **Use a Venn diagram to calculate conditional probability**; * Compare experimental data and theoretical probabilities;   Compare relative frequencies from samples of different sizes.  [**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Venn%20Diagrams\far_-_venn_diagram_sets.pdf)[**Purple box DIRT**](file:///N:\NRC%2014.12.15\NRC%2014.12.15\Schemes%20of%20work\KS4%209-1%20SOL\NEW%203%20year%20Scheme%20of%20Learning\Access%20Maths%20Resources\Venn%20Diagrams\far_-_venn_diagram_solving_equations.pdf) | **POSSIBLE SUCCESS CRITERIA**  If the probability of outcomes are *x*, 2*x*, 4*x*, 3*x*, calculate *x*.  Draw a Venn diagram of students studying French, German or both, and then calculate the probability that a student studies French given that they also study German.  **COMMON MISCONCEPTIONS**  Probability without replacement is best illustrated visually and by initially working out probability ‘with’ replacement.  Not using fractions or decimals when working with probability trees.  **NOTES**  Encourage students to work ‘across’ the branches, working out the probability of each successive event. The probability of the combinations of outcomes should = 1.  Use problems involving ratio and percentage, similar to:   * A bag contains balls in the ratio 2 : 3 : 4. A ball is taken at random. Work out the probability that the ball will be … ; * In a group of students 55% are boys, 65% prefer to watch film *A*, 10% are girls who prefer to watch film *B*. One student picked at random. Find the probability that this is a boy who prefers to watch film *A* (P6).   Emphasise that, were an experiment repeated, it will usually lead to different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics. |