

Draft Schemes of Work – Edexcel Lower Secondary Curriculum

May 2011

Dear Centre,

The Schemes of Work in this booklet have been prepared to provide teachers with an overview of the coverage provided by the Edexcel Lower Secondary Curriculum for Mathematics. Centres which register for the Lower Secondary Curriculum will receive the final version of this document.

In addition to these Schemes of Work centres which register for the Edexcel Lower Secondary Curriculum will receive six completed units, including unit tests and mark schemes, for English and Mathematics for Years 7-9 and three completed units, including unit tests and mark schemes, for Science for Years 7-9. They will also have the opportunity to purchase Achievement Tests for English, Mathematics and Science for Year 9 and Progress Tests for each of Years 7-9 for English, Mathematics and Science. The Achievement Tests will be externally marked by Edexcel. The Progress Tests will be internally assessed by centres. Further information about the availability of Achievement Tests and Progress Tests will be provided to centres as soon as it is available.

Draft sample units for Mathematics for Year 6 and draft sample units for Mathematics for Year 9 are available on the Edexcel web site for the Edexcel Primary Curriculum and the Edexcel Lower Secondary Curriculum.

Further information about the Edexcel Primary Curriculum and the Edexcel Lower Secondary Curriculum is available from the Edexcel Regional Development Manager for your region. Details of international Regional Development Managers are available on the Edexcel website: www.edexcel.com



Mathematics Scheme of Work Year 7 – Overview

| Term One | Objectives |
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| Unit 1 (Algebra 1) | <ul style="list-style-type: none"> ● Generate and describe simple integer sequences ● Generate terms of a simple sequence, given a rule (eg finding a term from the previous term, finding a term given its position in the sequence) ● Generate terms of a linear sequence using term-to-term definitions of the sequence, on paper and using a spreadsheet or graphical calculator ● Generate sequences from practical contexts and describe the general term in simple cases ● Begin to use linear expressions to describe the nth term of an arithmetic sequence ● Express simple functions in words, then using symbols ● Represent simple functions in mappings ● Use letter symbols to represent unknown numbers or variables ● Begin to distinguish the different roles played by letter symbols in equations, formulae and functions ● Know the meanings of the words 'term', 'expression', 'equation', 'formula' and 'function' ● Know that algebraic operations follow the same conventions and order as arithmetic operations ● Use index notation for small positive powers ● Simplify linear algebraic expressions by collecting like terms |
| Unit 2 (Number 1) | <ul style="list-style-type: none"> ● Understand and use decimal notation and place value ● Compare and order decimals in different contexts ● Know that when comparing measurements they must be in the same units ● Understand negative numbers (integers) as positions on a number line ● Add and subtract integers ● Order, add and subtract positive and negative integers in context ● Add, subtract, multiply and divide integers ● Consolidate the rapid recall of number facts, including positive integer complements to 100 ● Use standard column procedures to add and subtract whole numbers and decimals up to two decimal places ● Use standard column procedures to add and subtract integers and decimals of any size, including a mixture of large and small numbers with a differing number of decimal places |



| Term One | Objectives |
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| Unit 2 (Number 1) <i>continued</i> | <ul style="list-style-type: none"> ● Understand addition and subtraction of whole numbers and decimals ● Extend written methods to: $HTU \times U$, $TU \times TU$ ● Know how to use the laws of arithmetic and inverse operations ● Use known facts to derive unknown facts, including products such as 0.7 and 6, and 0.03 and 8 ● Consider if an answer is realistic, and check it by working the problem backwards ● Know squares to at least 10×10 ● Work out squares of numbers beyond 10×10 and the corresponding roots ● Use the square root key ● Consolidate and extend mental methods of calculation, working with squares and square roots ● Use squares and positive and negative square roots ● Round up or down after division, depending on the context ● Consolidate the rapid recall of number facts, including multiplication facts to 10×10, and quickly derive associated division facts ● Extend written methods to $HTU \div U$ ● Divide three-digit by two-digit whole numbers |
| Unit 3 (Geometry and measures 1) | <ul style="list-style-type: none"> ● Calculate perimeters or side lengths of polygons or shapes made from rectangles ● Use names and abbreviations of units of measurement to measure, estimate and solve problems involving length and time ● Find the area of rectangles and triangles ● Find the area of shapes made from rectangles and triangles ● Deduce and use formulae for the area of a triangle, parallelogram and trapezium ● Measure and draw lines to the nearest millimetre ● Recognise metric units of measure and convert between them ● Solve problems involving units of measure ● Make simple scale drawings |



| Term One | Objectives |
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| Unit 4 (Number 2) | <ul style="list-style-type: none"> ● Use fraction notation to describe parts of a shape and use a diagram to compare two or more simple fractions ● Simplify fractions using common factors and identify equivalent fractions ● Convert terminating decimals to fractions, eg $0.23 = \frac{23}{100}$ ● Use mental methods and suitable jottings to calculate fractions ● Add and subtract simple fractions and add and subtract fractions by writing them with a common denominator ● Consolidate and extend mental methods of calculation to include fractions, accompanied where appropriate, by suitable jottings, solve simple word problems using mental methods ● Change an improper fraction into a mixed number ● Check a result by working the problem backwards ● Calculate simple fractions of quantities and measurements ● Multiply and divide an integer by a fraction ● Understand effects of multiplying and dividing by numbers from 0 and 1 ● Understand percentage as the 'number of parts per 100' ● Recognise the equivalence of percentages, fractions and decimals ● Know that a recurring decimal can be written as a fraction ● Use division to convert fractions to decimals and recall conversions ● Write fractions in order of size by writing them with a common denominator or by converting them to decimals |
| Unit 5 (Statistics 1) | <ul style="list-style-type: none"> ● Find the mode and range for a small set of discrete data ● Find the modal class for grouped discrete data and continuous data ● Calculate the mean for a simple frequency table ● Find the median ● Recognise when it is appropriate to use range, mean, median or mode in simple cases or in more complex cases ● Draw conclusions from simple statistics for a simple distribution ● Find the mode from any bar chart ● Draw and interpret data from compound and comparative bar charts ● Interpret data and draw conclusions from bar charts and line graphs |



| Term One | Objectives |
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| Unit 5 (Statistics 1) <i>continued</i> | <ul style="list-style-type: none"> ● Interpret data in population pyramids ● Interpret conversion graphs ● Use the vocabulary of probability ● Use a probability scale with words ● Understand and use the probability scale 0 to 1 ● Find the probabilities of equally likely outcomes ● Identify all possible mutually exclusive outcomes of a single event ● Collect data from a simple experiment and record in a frequency table ● Estimate probabilities based on data from simple experiments ● Use relative frequency as an estimate of probabilities ● Compare experimental and theoretical probabilities |
| Unit 6 (Algebra 2) | <ul style="list-style-type: none"> ● Express simple functions in words, and then in symbols ● Represent algebraic expressions using simple mapping diagrams ● Know that algebraic operations follow the same conventions and order as arithmetic operations ● Use index notation for small positive powers ● Understand that algebraic operations follow the same conventions and order as arithmetic operations ● Simplify linear algebraic expressions by collecting like terms ● Multiply a single term over a bracket ● Use simple formulae from mathematics and other subjects ● Substitute integers into simple linear expressions and formulae, including examples that lead to an equation to solve, and positive integers into expressions involving small powers (eg $3x^2 + 4$ or $2x^3$) ● In routine cases, derive a simple formula |



| Term One | Objectives |
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| Unit 7 (Geometry and measures 2) | <ul style="list-style-type: none"> ● Use the correct vocabulary for notation and labelling conventions of lines, angles and shapes ● Use angle measure; distinguish between and estimate the size of acute, obtuse and reflex angles ● Identify parallel and perpendicular lines ● Know the sum of angles at a point, on a straight line and in a triangle and recognise vertically opposite angles ● Identify alternate and corresponding angles ● Understand a proof that i) the sum of the angles of a triangle is 180° and of a quadrilateral is 360°, and ii) the exterior angle of a triangle is equal to the sum of the two interior opposite angles ● Read and plot coordinates in the first quadrant ● Use conventions and notation for 2-D coordinates in all four quadrants; find coordinates of points determined by geometric information ● Given the coordinates of points A and B, find the mid-point of the line segment AB |

| Term Two | Objectives |
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| Unit 8 (Statistics 2) | <ul style="list-style-type: none"> ● Identify different nets for an open cube ● Use 2-D representations to visualise 3-D shapes and their properties ● Measure and draw lines to the nearest millimetre ● Record estimates and readings from scales to a suitable degree of accuracy ● Use names and abbreviations of units of measurements to measure, estimate and solve problems in everyday contexts involving length and area ● Make simple scale drawings ● Understand that area is measured in square centimetres ● Understand, measure and calculate perimeters of rectangles and regular polygons ● Know and use the formula for the area of a rectangle; calculate the perimeter and area of shapes made from rectangles ● Deduce and use formula for the area of a triangle, parallelogram and trapezium ● Use nets to calculate the surface area of simple cuboids ● Know and use the formula for the volume of a cuboid |



| Term Two | Objectives |
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| Unit 9 (Number 3) | <ul style="list-style-type: none"> ● Round positive whole numbers to the nearest 10, 100 or 1000 and to any given power of 10 ● Read and write positive integer powers of 10 ● Round decimals to the nearest whole number or to one or two decimal places ● Write decimals in order of size, and compare and write decimals in order of size in different contexts ● Give solutions in context, using appropriate degrees of accuracy ● Understand where to position the decimal point by considering equivalent calculations ● Consolidate and extend mental methods of calculation, working with decimals and squares, accompanied where appropriate by suitable jottings ● Multiply and divide integers and decimals by 0.1 and 0.01 ● Multiply and divide three-digit by two-digit whole numbers ● Extend to multiplying or dividing decimals with one or two places by single-digit whole numbers ● Multiply and divide integers and decimals including by decimals such as 0.6 and 0.06 ● Make and justify estimates and approximations of calculations ● Consider if an answer is realistic, and check it by working the problem backwards ● Know and use the order of operations, including brackets ● Develop calculator skills and use a calculator effectively, use the appropriate calculator key to square numbers and use the square root and sign change keys ● Enter numbers and interpret the display in different contexts (decimals, money, metric measures, time) ● Use the 'brackets' and the 'memory' functions on the calculator for calculations with more than one step |
| Unit 10 (Algebra 3) | <ul style="list-style-type: none"> ● Generate terms of a simple sequence, given a rule (eg find a term from the previous term, find a term given its position in the sequence) ● Generate terms of a linear sequence using term-to-term definitions of the sequence ● Begin to use linear expressions to describe the nth term of an arithmetic sequence ● Use an activity or practical context to generate, and justify, an nth term |



| Term Two | Objectives |
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| Unit 10 (Algebra 3) <i>continued</i> | <ul style="list-style-type: none"> ● Express simple functions in symbols, represent algebraic expressions using simple mappings ● Generate coordinate pairs that satisfy a simple linear rule ● Plot the graphs of linear functions, where y is given explicitly in terms of x ● Recognise straight-line graphs parallel to the x-axis or y-axis ● Generate points in all four quadrants and plot the graphs of linear functions ● Plot the graphs of linear functions, where y is given explicitly in terms of x |
| Unit 11 (Geometry and measures 3) | <ul style="list-style-type: none"> ● Use a ruler to measure and draw lines, to the nearest millimetre, and a protractor to measure angles, including reflex angles, to the nearest degree ● Use a ruler and protractor to construct a triangle given two sides and the included angle (SAS) or two angles and the included side (ASA) ● Use a ruler and compasses to construct: <ul style="list-style-type: none"> – the perpendicular bisector of a line segment – the bisector of an angle – a triangle given three sides (SSS) ● Use a ruler and protractor to construct simple nets of 3-D shapes, using squares, rectangles and triangles; for example regular tetrahedron, square-based pyramid, triangular prism ● Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals ● Use bearings to specify direction |



| Term Two | Objectives |
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| Unit 12 (Number 4) | <ul style="list-style-type: none"> ● Understand percentage as the 'number of parts per 100' ● Find simple percentages of whole-number quantities and express one given number as a percentage of another ● Use fraction notation to express a smaller whole number as a fraction of a larger one ● Solve simple problems using ideas of ratio ('one for every ...') ● Use ratio notation and reduce a ratio to its simplest form ● Divide a quantity into two or more parts in a given ratio ● Understand the relationship between ratio and proportion ● Solve simple problems on ratio and proportion using informal strategies ● Use direct proportion in simple contexts ● Recognise the equivalence of percentages, fractions and decimals ● Use percentages to compare simple proportions ● Understand the relationship between ratio and proportion and use the equivalence of fractions, decimals and percentages to compare proportions ● Consider if an answer is realistic, and check it by working the problem backwards ● Interpret solutions in the context of the original problem ● Use the unitary method to solve simple word problems involving ratio and direct proportion |



| Term Two | Objectives |
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| Unit 13 (Statistics 2) | <ul style="list-style-type: none"> • Construct and solve simple linear equations with integer coefficients (unknown on one side only) using an appropriate method (eg inverse operations) • Solve linear equations of the form $ax \pm b = c$ • Construct and solve linear equations of the form $ax \pm b = cx \pm d$ |

| Term Three | Objectives |
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| Unit 14 (Geometry and measures 4) | <ul style="list-style-type: none"> • Understand and use language associated with translations, reflections, rotation and enlargement • Recognise and visualise a reflection in a given line of reflection and the translation of a 2-D shape • Recognise and visualise the transformation of a 2-D shape after a rotation • Transform 2-D shapes by simple combinations of rotations • Describe and carry out rotations on a four-quadrant coordinate grid • Solve problems to find an angle of rotation • Make generalisations and work algebraically • Recognise and visualise line and rotation symmetry of 2-D shapes • Identify all the symmetries of 2-D shapes • Know and understand the term 'congruent' • Identify congruent shapes and know that corresponding sides and angles are equal • Transform 2-D shapes by simple and complex combinations of rotations, reflections and translations • Enlarge 2-D shapes, given a centre of enlargement and a positive whole number scale factor • Solve problems to find areas and which link perimeter or area to other topics in mathematics • Write algebraic expressions for side lengths or areas |



| Term Two | Objectives |
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| Unit 15 (Statistics 3) | <ul style="list-style-type: none"> • Find the mode and range and mean for a small set of discrete data • Find the modal class for a small set of grouped discrete data • Calculate the mean from a simple frequency table and from a set of data using an assumed mean • Draw conclusions from simple statistics for a single distribution • Construct on paper simple pie charts using categorical data • Interpret and/or compare bar graphs and frequency diagrams which are misleading • Identify which graphs are the most useful in the context of the problem • Compare two simple distributions using the range and either the mode or the median or the mean and using the shape of the distributions • Choose and justify appropriate diagrams, graphs and charts to illustrate a short report of a statistical enquiry • Recognise when modal class is most appropriate for grouped data • Select statistics most appropriate to the problem – selecting range and choosing mean or median – using and applying the measures appropriately • Compare two distributions given summary statistics in more complex cases • Construct and use stem-and-leaf diagrams • Use simple and then more complex two-way tables, • Make inferences about data through extracting information from a two-way table • Construct and interpret simple scatter graphs (no line of best fit) • Understand and use a probability scale with words and from 0 to 1 • Find and justify probabilities based on equally likely outcomes in simple contexts • Know that if the probability of an event is p, the probability of it not occurring is $1 - p$ • Identify all possible mutually exclusive outcomes of a single event; for two successive events with two outcomes in each event and for two successive events with three outcomes in each event • Calculate the probability of the final event of a set of |



| Term Two | Objectives |
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| Unit 15 (Statistics 3) <i>continued</i> | <ul style="list-style-type: none"> ● mutually exclusive events ● Use the vocabulary of probability to assign a probability to a complex event |
| Unit 16 (Number 5) | <ul style="list-style-type: none"> ● Make and justify estimates and approximations of calculations ● Extend mental calculations to squares, square root, cubes and cube roots ● Read and write positive integer powers of 10 ● Use index notation for small positive integer powers ● For calculations with more than one step, use the 'brackets' and the 'memory' functions on the calculator ● Use the calculator keys for square roots and change of sign ● Know how to enter complex calculations using the function keys of a calculator for powers and roots ● Identify factors of two-digit numbers ● Recognise and use multiples, factors (divisors), common factor, highest common factor and lowest common multiple and primes (less than 100) ● Use simple tests of divisibility ● Recognise prime numbers ● Find the prime factor decomposition of a number ● Consolidate and extend mental methods to include decimals, fractions and percentages, accompanied where appropriate by suitable jottings ● Recall known facts, including fraction to decimal conversions ● Calculate fractions of quantities and measurements (whole number and fraction answers); multiply and divide an integer by a fraction ● Multiply a fraction by an integer ● Add and subtract fractions by writing them with a common denominator ● Use efficient methods to add, subtract, multiply and divide fractions, interpreting division as a multiplicative inverse ● Cancel common factors before multiplying ● Approximate first and use informal pencil and paper methods to support addition and subtraction ● Consider if an answer is realistic, and check it by working the problem backwards ● Use written methods for multiplying decimals |



| Term Two | Objectives |
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| Unit 16 (Number 5) <i>continued</i> | <ul style="list-style-type: none"> ● Enter numbers and interpret the display of a calculator in different contexts (negative numbers, fractions, decimals, percentages, money, metric measures, time) ● Know that a recurring decimal is a fraction ● Understand where to position the decimal point by considering equivalent calculations ● Use known facts to derive unknown facts, including products such as 0.7 and 6, and 0.03 and 8 ● Multiply and divide integers and decimals, including by decimals such as 0.6 and 0.06 |
| Unit 17 (Algebra 5) | <ul style="list-style-type: none"> ● Generate sequences from practical contexts ● Describe the general term in simple cases ● Begin to use linear expressions to describe the nth term of an arithmetic sequence ● Construct and solve linear equations of the form $ax \pm b = c$ ● Construct and solve linear equations of the form $ax \pm b = cx \pm d$ ● Construct and solve equations of the form $a(x \pm b) = c(x \pm d)$ ● Construct and solve equations of the form $a(bx \pm c) = d(ex \pm f)$ ● Use formulae from mathematics and other subjects ● Substitute numbers into expressions and formulae ● Derive a formula ● Read and plot coordinates in all four quadrants ● Plot and interpret the graphs of simple linear functions arising from real-life situations ● Begin to use graphs and set up equations to solve simple problems involving direct proportion |
| Unit 18 (Geometry and measures 5) | <ul style="list-style-type: none"> ● Use a ruler and protractor to measure and draw acute and obtuse angles to the nearest degree ● Calculate angles in a triangle and angles around a point ● Use a ruler and protractor to construct a triangle given two angles and the included side (ASA) and given two sides and the included angle (SAS) ● Use a straight edge and compasses to construct a triangle given three sides (SSS), the bisector of an angle and the mid-point and perpendicular bisector of a line segment ● Visualise a wide range of 2-D representations of 3-D objects |



| Term Two | Objectives |
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| Unit 18 (Geometry and measures 5) <i>continued</i> | <ul style="list-style-type: none"> ● Begin to use plans and elevations ● Analyse 3-D shapes through informal 2-D representations ● Know and use the geometric properties of cuboids ● Identify and construct simple nets of 3-D shapes – cubes and cuboids ● Deduce properties of simple 2-D representations of 3-D shapes ● Identify simple nets of 3-D regular polyhedra and accurately construct simple nets of 3-D shapes: regular tetrahedron, square-based pyramid, triangular prism ● Calculate surface area of simple cuboids, with and without the use of nets ● Calculate the surface areas of shapes made from cuboids for lengths given as whole numbers ● Use units of measurement to solve problems in everyday contexts involving surface area and volume ● Know and use the formulae for the volume of a cube and cuboid ● Calculate the volumes of shapes made from cubes and cuboids ● Suggest the appropriate units and methods to measure a volume |



Mathematics Scheme of Work Year 8 – Overview

| Term One | Objectives |
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| Unit 1 (Number / Algebra 1) | <ul style="list-style-type: none"> ● Add, subtract, multiply and divide integers ● Recognise squares of numbers to at least 12 x 12 and the corresponding roots ● Use squares, positive and negative square roots, cubes and cube roots, and index notation for small positive integer powers ● Use known facts to derive unknown facts ● Strengthen and extend mental methods of calculation, working with squares and square roots, cubes and cube roots ● Use index notation for integer powers and simple instances of index laws ● Recognise and use multiples, factors (divisors), common factors, highest common factors, lowest common multiples and primes numbers ● Find the prime factor decomposition of a number ● Use the prime factor decomposition of a number ● Generate and describe sequences using integers ● Generate terms of a linear sequence using term-to-term rules ● Generate sequences from practical contexts ● Generate terms of a sequence using term-to-term and position-to-term rules, on paper and using ICT ● Find the next term of quadratic sequences |
| Unit 2 (Geometry and measures 1) | <ul style="list-style-type: none"> ● Understand a proof that: the sum of the angles of a triangle is 180°; and of a quadrilateral is 360°; and the exterior angle of a triangle is equal to the sum of the two interior opposite angles ● Distinguish between conventions, definitions and derived properties ● Use a ruler and protractor to measure and draw angles, including reflex angles, to the nearest degree; and to construct a triangle, given two sides and the included angle (SAS) or two angles and the included side (ASA) ● Use a straight edge and a pair of compasses to construct triangles, given the right angle, hypotenuse and side (RHS) ● Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles, and special quadrilaterals, explaining reasoning with diagrams and text; classify quadrilaterals by their geometrical properties |



| Term One | Objectives |
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| Unit 2 (Geometry and measures 1) <i>continued</i> | <ul style="list-style-type: none"> ● Solve problems using the properties of angles, of parallel and intersecting lines, and of triangles and other polygons ● Use a straight edge and a pair of compasses to construct: a perpendicular bisector of a line segment; a bisector of an angle; a perpendicular from a point above or below a line; a perpendicular from a point on a line ● Know the definition of a circle and the names of its parts ● Explain how to find, calculate and use the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons; and the interior and exterior angles of regular polygons |
| Unit 3 (Statistics 1) | <ul style="list-style-type: none"> ● Understand and use the probability scale from 0 to 1; find and justify probabilities based on equally likely outcomes in simple contexts ● Know that if the probability of an event occurring is P, then the probability of it not occurring is $1 - P$ ● Identify all the mutually exclusive outcomes of an experiment; know that the sum of probabilities of all mutually exclusive outcomes is 1, and use this when solving problems ● Use the vocabulary of probability when interpreting the results of an experiment; appreciate that random processes are unpredictable ● Use the vocabulary of probability in interpreting results involving uncertainty and prediction ● Find and record all the possible mutually exclusive outcomes for single events and two successive events in a systematic way using diagrams and tables ● Collect data from a simple experiment and record in a frequency table; estimate probabilities based on this data ● Estimate probabilities from experimental data; understand that: if an experiment is repeated there may be, and usually will be, different outcomes; increasing the number of times an experiment is repeated generally leads to better estimates of probability ● Estimate probabilities from experimental data ● Compare experimental and theoretical probabilities in a range of contexts; appreciate the difference between mathematical explanation and experimental evidence |



| Term One | Objectives |
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| Unit 4 (Number 2) | <ul style="list-style-type: none"> ● Use fraction notation to express a smaller whole number as a fraction of a larger whole number ● Use division to convert a fraction into a decimal ● Know that a recurring decimal can be written as a fraction ● Write fractions in order of size by using a common denominator or by converting the fractions into decimals ● Add and subtract fractions by writing them with a common denominator ● Understand addition and subtraction of fractions ● Use the laws of arithmetic and inverse operations ● Calculate fractions of quantities ● Multiply and divide fractions, interpreting division as a multiplicative inverse; cancel common factors before multiplying or dividing ● Interpret percentage as the operator 'so many hundredths of' and express one given number as a percentage of another ● Use the equivalence of fractions, decimals and percentages to compare proportions ● Calculate percentages ● Find the outcome of a given percentage increase or decrease ● Solve problems involving percentage change ● Recall equivalent fractions, decimals and percentages; use known facts to derive unknown facts, including products involving numbers such as 0.7 and 0.6, and 0.03 and 8 ● Know where to position the decimal point by considering equivalent calculations ● Recap and extend mental methods of calculation, working with decimals, fractions and percentages; solve problems using mental methods |
| Unit 5 (Algebra 2) | <ul style="list-style-type: none"> ● Express simple functions in symbols and then algebraically; and represent them in mappings ● Find the inverse of a linear function ● Recognise straight-line graphs parallel to the x-axis or y-axis ● Generate points in all four quadrants and plot the graphs of linear functions, where y is given explicitly in terms of x, on paper and using ICT ● Understand the meaning of m and c in linear functions of the form $y = mx + c$ ● Find the gradient of a straight-line graph |



| Term One | Objectives |
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| Unit 5 (Algebra 2) <i>continued</i> | <ul style="list-style-type: none"> • Construct linear functions arising from real-life problems and plot their corresponding graphs • Discuss and interpret graphs arising from real situations, eg distance–time graphs |
| Unit 6 (Geometry and measures 2) | <ul style="list-style-type: none"> • Convert one metric unit to another, eg grams to kilograms • Know rough metric equivalents of imperial measures in common use, such as feet, miles, pounds, pints and gallons • Convert between area measures (eg mm^2 to cm^2, cm^2 to m^2, and vice versa) and between volume measures (e.g. mm^3 to cm^3, cm^3 to m^3, and vice versa) • Calculate the perimeter and area of shapes made from rectangles • Derive and use formulae for the area of a triangle, parallelogram and trapezium • Calculate areas of compound shapes made from triangles and rectangles • Know and use the formulae for the circumference and area of a circle • Know and use the formula for the volume of a cuboid • Calculate volumes and surface areas of cuboids and shapes made from cuboids • Calculate the surface area and volume of right prisms • Choose and use units of measurement to measure, estimate, calculate and solve problems in a range of contexts |

| Term Two | Objectives |
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| Unit 7 (Algebra 3) | <ul style="list-style-type: none"> • Use letter symbols to represent unknown numbers or variables; know the meanings of ‘term’, ‘expression’ and ‘equation’ • Know the meanings of ‘formula’ and ‘function’ • Distinguish the different roles played by letter symbols in equations, identities, formulae and functions • Know that algebraic operations follow the same conventions and order as arithmetic operations; use index notation for small positive integer powers • Evaluate expressions using the correct order of operations • Collect like terms by applying the distributive law • Know that expressions with repeated multiplication can be written as powers • Simplify simple expressions with powers by collecting like terms |



| Term Two | Objectives |
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| Unit 7 (Algebra 3) <i>continued</i> | <ul style="list-style-type: none"> • Know and use the general forms of the rules of powers for multiplication and division of positive integer powers • Simplify expressions by multiplying out brackets and collecting like terms • Substitute integers into formulae with powers • Factorise expressions with a single bracket • Substitute numbers into expressions and formulae • Derive expressions and formulae |
| Unit 8 (Number 3) | <ul style="list-style-type: none"> • Consolidate and extend mental methods of calculation to include negative integers • Consolidate standard column procedures for addition and subtraction of integers and decimals with up to two decimal places • Use efficient written methods to add and subtract integers and decimals of any size, including numbers with different decimal places • Multiply and divide decimals by 10, 100 and 1000 • Read and write positive integer powers of 10; multiply and divide integers and decimals by 0.1, 0.01 • Round positive numbers to any given power of 10; round decimals to the nearest whole number or one or two decimal places • Write decimals in order of size • Extend knowledge of integer powers of 10; recognise the equivalence of 0.1, $\frac{1}{10}$ and 10^{-1} • Strengthen and extend mental methods of calculation, working with decimals, squares and square roots, and cubes and cube roots • Multiply and divide integers and decimals by 0.1, 0.01 • Solve problems mentally • Understand where to position the decimal point by considering equivalent calculations • Multiply three-digit by two-digit whole numbers; extend to multiplying decimal numbers with one or two decimal places by single-digit whole numbers • Use efficient written methods for multiplication of integers and decimals, including by decimals such as 0.6 or 0.06 • Recognise that a recurring decimal can be written as a fraction • Make and justify estimates and approximations of calculations • Consider if an answer is realistic, and check it by working the problem backwards |



| Term Two | Objectives |
|------------------------------------|--|
| Unit 8 (Number 3) <i>continued</i> | <ul style="list-style-type: none"> • Use rounding to make estimates • Select from a range of checking methods, including estimating in context and using inverse operations • Carry out more difficult calculations effectively and efficiently using the function keys of a calculator for sign change, powers, roots and fractions; use brackets and the memory function keys of a calculator • Enter numbers and interpret the display of a calculator in different contexts (extend to negative numbers, fractions) • Carry out calculations with more than one step using brackets and the memory • Use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation |
| Unit 9 (Geometry and measures 3) | <ul style="list-style-type: none"> • Know that if two 2-D shapes are congruent, corresponding sides and angles are equal • Know that translations, rotations and reflections preserve length and angle; map objects on to congruent images • Identify all the symmetries of 2-D shapes and reflection symmetry in 3-D shapes • Transform 2-D shapes by more complex combinations of rotations, reflections and translations, for example a reflection, followed by a rotation, reflection in $y = x$, $x = -3$ and rotations about points other than the origin • Understand the relationship between ratio and proportion • Solve simple problems about ratio and proportion using informal strategies • Use proportional reasoning to solve problems; interpret and use ratio in a range of contexts • Understand and use the language and notation associated with enlargement • Enlarge 2-D shapes, given a centre of enlargement and a positive integer scale factor • Enlarge 2-D shapes, given a centre of enlargement and negative integer scale factor, on paper • Identify the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments • Recognise that enlargements preserve angle but not length, and understand the implications of enlargement for perimeter |
| Unit 10 (Algebra 4) | <ul style="list-style-type: none"> • Describe the meaning of letters in an expression • Construct expressions and equations from worded descriptions • Solve simple linear equations • Represent equations using area diagrams • Solve one- and two-step equations where the solutions might be positive, negative or fractions |



| Term Two | Objectives |
|--------------------------------------|---|
| Unit 10 (Algebra 4) <i>continued</i> | <ul style="list-style-type: none"> ● Recognise equivalent equations ● Given an equation with x on both sides, generate an equivalent equation which has x on one side only ● Solve an equation with x on both sides ● Write an equation involving brackets ● Solve an equation with brackets on one or both sides, including multiplying a bracket by a negative number ● Substitute values into a formula and use the correct order of operations ● Use a formula and find the value of a variable that is not the subject of the formula ● Change the subject of a formula ● Generalise, using letters for variables ● Write formulae |
| Unit 11 (Statistics 2) | <ul style="list-style-type: none"> ● Discuss a problem that can be addressed by statistical methods and identify related questions to explore ● Decide which data to collect to answer a question, and the degree of accuracy needed; identify possible sources; consider appropriate sample size ● Discuss how different sets of data relate to the problem; identify possible primary or secondary sources ● Plan how to collect the data; construct two-way tables for recording discrete data ● Gather data from specified secondary sources, including printed tables and lists, and ICT-based sources, including the internet ● Calculate statistics for sets of discrete data: find the mode, median and range; calculate the mean, including from a simple frequency table, using a calculator for a larger number of items ● Recognise when it is appropriate to use the range, mean, median and mode ● Construct and use stem-and-leaf diagrams ● Interpret tables, graphs and diagrams for discrete data, relating summary statistics and findings to the questions being explored ● Construct graphical representations and identify which are most useful in the context of the problem; including pie charts for categorical data; bar charts and frequency diagrams for discrete data; line graphs for time series |



| Term Three | Objectives |
|---------------------|--|
| Unit 12 (Number 4) | <ul style="list-style-type: none"> • Calculate fractions of quantities • Use efficient methods to add, subtract, multiply and divide fractions, interpret division as the inverse of multiplication; cancel common factors before multiplying or dividing • Make and justify estimates and approximations of calculations • Understand and use the laws of arithmetic and inverse operations in the context of integers and fractions • Multiply and divide integers and decimals by 0.1, 0.01 • Understand the effects of multiplying and dividing by numbers between 0 and 1 • Strengthen and extend mental methods of calculation, working with decimals, fractions, percentages, squares and square roots, and cubes and cube roots • Understand the order of operations, including powers • Use efficient written methods to add and subtract integers and decimals of any size; multiply by decimals; divide by decimals by transforming to division by an integer • Know where to position the decimal point by considering equivalent calculations • Convert one metric unit to another, eg grams to kilograms • Choose and use units of measurement to measure, estimate, calculate and solve problems in a range of contexts; know rough metric equivalents of imperial measures in common use, such as feet, miles, pounds and pints • Convert between area measures (eg mm^2 to cm^2, cm^2 to m^2, and vice versa) • Enter numbers and interpret the display in different contexts (money, metric measures, time) • Use a calculator efficiently and appropriately; use the function keys for fractions |
| Unit 13 (Algebra 5) | <ul style="list-style-type: none"> • Read and plot coordinates in all four quadrants • Generate coordinate pairs that satisfy a linear rule • Recognise linear functions where y is given implicitly in terms of x • Rearrange linear functions into the form $y = mx + c$ • Understand what it means for two variables to be in direct proportion • Use graphs to solve problems involving direct proportion • Recognise straight-line graphs parallel to the x-axis or y-axis |



| Term Three | Objectives |
|--------------------------------------|---|
| Unit 13 (Algebra 5) <i>continued</i> | <ul style="list-style-type: none"> • Understand that if variables are in direct proportion, their ratios are equal • Use algebra to solve problems involving variables in direct proportion • Construct and solve linear equations with integer coefficients and where the unknowns may be on both sides • Solve simple equations involving x^2 • Construct and solve equations that involve brackets and division • Explore alternative ways of solving equations • Solve problems involving number and algebra • Break complex problems into simpler steps • Choose and use efficient techniques for algebraic manipulation • Use trial and improvement methods where a more efficient method is not obvious |
| Unit 14 (Solving problems) | <ul style="list-style-type: none"> • Use proportional reasoning to solve problems; interpret and use ratio in a range of contexts • Apply understanding of the relationship between ratio and proportion; simplify ratios, including those expressed in different units • Divide a quantity into two or more parts in a given ratio • Use logical argument to interpret the mathematics in a given context or to establish the truth of a statement; give accurate solutions appropriate to the context or problem • Understand the significance of a counter-example • Solve more demanding problems and investigate in a range of contexts: number and measures • Choose and use units of measurement to measure, estimate, calculate and solve problems in a range of contexts • Identify the mathematical features of a context or problem; select appropriate procedures and tools • Break down substantial tasks to make them more manageable; represent problems and synthesise information in algebraic, geometrical or graphical form |



| Term Three | Objectives |
|-----------------------------------|--|
| Unit 15 (Geometry and measures 4) | <ul style="list-style-type: none"> ● Use 2-D representations to visualise 3-D shapes and deduce some of their properties ● Know and use geometric properties of cuboids and shapes made from cuboids ● Visualise and use 2-D representations of 3-D objects; analyse 3-D shapes through 2-D projections, including plans and elevations ● Begin to use plans and elevations ● Use ruler and protractor to construct simple nets of 3-D shapes, eg cuboid, regular tetrahedron, square-based pyramid, triangular prism ● Use a ruler and protractor to construct a triangle, given two sides and the included angle (SAS) or two angles and the included side (ASA) ● Use straight edge and compass to construct a triangle, given three sides (SSS) or right angle, hypotenuse and side (RHS) ● Make simple accurate scale drawings; use and interpret maps and scale drawings ● Use a ruler and protractor to measure and draw lines to the nearest millimetre and draw angles to the nearest degree ● Use bearings to specify direction and solve problems, including making simple scale drawings ● Use conventions and notation for 2-D coordinates in all four quadrants; find coordinates of points determined by geometric information ● Given the coordinates of points A and B, find the mid-point of the line segment AB ● Find loci by reasoning and produce shapes and paths ● Solve problems: shape, space and measures ● Use logical argument |



| Term Three | Objectives |
|------------------------|--|
| Unit 16 (Statistics 3) | <ul style="list-style-type: none"> • Decide which data to collect to answer a question, and the degree of accuracy needed; identify possible sources; consider appropriate sample size • Design a data collection sheet or questionnaire to use in a simple survey; construct frequency tables for gathering discrete or continuous data, grouped where appropriate in equal class intervals • Design a survey or experiment to capture the necessary data from one or more sources; design, trial and if necessary refine data collection sheets; construct tables for gathering large discrete and continuous sets of raw data, choosing suitable class intervals • Calculate statistics for sets of data, including with a calculator; recognise when it is appropriate to use the range, mean, median and mode and, for grouped data, the modal class • Calculate a mean using an assumed mean • Collect data using a suitable method (e.g. observation, controlled experiment, data logging using ICT, questionnaire) • Interpret tables, graphs and diagrams for discrete and continuous data, relating summary statistics and findings to the questions being explored • Select, construct and modify, on paper and using ICT, suitable graphical representation to progress an enquiry, and identify the key features present in the data; including bar charts and frequency diagrams for discrete data, pie charts for categorical data and simple scatter graphs • Compare two or more distributions and make inferences, using the shape of the distributions, the range of data and appropriate statistics • Write a short report of a statistical enquiry, including appropriate diagrams, graphs and charts, using ICT as appropriate; justify the choice of presentation and the methods used • Compare experimental and theoretical probabilities in a range of contexts; appreciate the difference between mathematical explanation and experimental evidence |



Mathematics Scheme of Work Year 9 – Overview

| Term One | Objectives |
|----------------------|--|
| Unit 1 (Algebra 1–2) | <ul style="list-style-type: none"> ● Generate terms of a linear sequence using term-to-term rules ● Generate terms of a linear sequence using position-to-term definitions ● Generate terms of a quadratic sequence given a rule for finding each term from the position ● Use linear expressions to describe the nth term in an arithmetic sequence ● Use the pattern in the first difference to find the nth term in an arithmetic sequence ● Justify the form of the nth term by reference to the structure of the context in which it is generated ● Find any term in a quadratic sequence given the rule for the nth term ● Find the nth term of a quadratic sequence where the rule is of the form $T(n) = an^2$, $T(n) = an^2 \pm b$ or $T(n) = an^2 \pm bn \pm c$ ● Justify the nth term of a quadratic sequence ● Explore fraction sequences ● Explore spatial patterns ● Generate terms and sequences from spatial patterns ● Find the general term for a spatial pattern ● Find the sum of a series generated from spatial patterns ● Express functions in symbols ● Draw mapping diagrams for algebraic expressions ● Find the inverse of linear functions ● Draw graphs of linear functions ● Know the properties of quadratics ● Plot a simple straight-line graph ● Discuss and interpret line graphs and graphs of functions from a range of sources ● Draw and use graphs to solve distance–time problems ● Calculate average speed from a travel graph |
| Unit 2 (Algebra 3) | <ul style="list-style-type: none"> ● Describe what letters stand for in formulae and functions ● Distinguish between expressions, equations and identities ● Expand brackets and simplify expressions ● Write expressions ● Construct and solve equations with x on one side only in order to solve problems |



| Term One | Objectives |
|-------------------------------------|--|
| Unit 2 (Algebra 3) <i>continued</i> | <ul style="list-style-type: none"> ● Construct and solve equations with a positive number of x on both sides in order to solve simple practical problems ● Identify equivalent equations ● Solve equations with x on both sides and which include negative signs and brackets on one or both sides ● Use ICT and trial and improvement to solve quadratic and cubic equations ● Draw a straight-line graph ● Find the point of intersection of two straight-line graphs and link this to the solution to simultaneous equations ● Recognise that two parallel lines have no point of intersection ● Solve simultaneous equations with two variables algebraically |
| Unit 3 (Number 1) | <ul style="list-style-type: none"> ● Order decimals; order fractions by writing them with a common denominator or by converting them to decimals ● Express a smaller whole number as a fraction of a larger one ● Use division to convert a fraction to a decimal ● Understand and use the rules of arithmetic and inverse operations in the context of fractions; use efficient methods to add, subtract, multiply and divide fractions, interpreting division as an inverse of multiplication; cancel common factors before multiplying or dividing ● Add simple algebraic fractions ● Recognise and use reciprocals; understand 'reciprocal' as a multiplicative inverse; know that any number multiplied by its reciprocal is 1 ● Understand the effects of multiplying and dividing by numbers between 0 and 1 ● Express one given number as a percentage of another ● Calculate percentages and find the outcome of a given percentage increase or decrease; solve problems involving percentage changes ● Recognise when fractions or percentages are needed to compare proportions ● Use a multiplier raised to a power to represent and solve problems involving repeated proportional change, for example compound interest ● Use proportional reasoning to solve problems, by making the correct number 100% or a whole |



| Term One | Objectives |
|------------------------------------|--|
| Unit 3 (Number 1) <i>continued</i> | <ul style="list-style-type: none"> • Understand and use proportionality and calculate the result of any proportional change using multiplicative methods • Divide a quantity into two or more parts in a given ratio; compare two ratios; interpret and use ratio in a range of contexts, including solving word problems • Understand and use the effects of enlargement on areas and volumes of shapes and solids • Understand the order of precedence of operations • Extend mental methods of calculation, working with decimals, fractions, percentages, powers and roots; solve word problems mentally • Use known facts to derive unknown facts • Multiply and divide integers and decimals by 0.1, 0.01 • Use rounding to make estimates; round to a given number of significant figures • Make and justify estimates and approximations of calculations by rounding numbers to one significant figure and multiplying or dividing mentally |
| Unit 4 (Geometry and measures 1) | <ul style="list-style-type: none"> • Distinguish between conventions, definitions and derived properties, and distinguish between practical demonstration and proof • Identify alternate angles and corresponding angles • Understand a proof that the sum of the angles of a triangle is 180° and of a quadrilateral is 360°; the exterior angle of a triangle is equal to the sum of the two interior opposite angles • Solve geometrical problems using side and angle properties of special triangles and quadrilaterals • Classify quadrilaterals by their geometric properties • Explain how to find, calculate and use: the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons, the interior and exterior angles of regular polygons • Solve problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons, justifying inferences and explaining reasoning (diagrams and text) • Know, understand and apply Pythagoras' theorem • Understand and apply Pythagoras' theorem to find one of the two shorter sides in a right-angled triangle • Use a straight edge and a pair of compasses to construct a triangle, given right angle, hypotenuse and side (RHS) • Draw triangles accurately using a ruler and protractor; construct them using compasses and a ruler |



| Term One | Objectives |
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| Unit 4 (Geometry and measures 1) <i>continued</i> | <ul style="list-style-type: none"> ● Know from experience of constructing triangles, that those given SSS, SAS, ASA or RHS are unique, but triangles given SSA or AAA are not ● Know the definition of a circle, and the names of its parts; explain why inscribed regular polygons can be constructed by equal divisions of a circle ● Know that the tangent at any point on a circle is perpendicular to the radius at that point; explain why the perpendicular from the centre to the chord bisects the chord |
| Unit 5 (Statistics 1) | <ul style="list-style-type: none"> ● Discuss how to relate data to a problem; identify possible sources, including primary and secondary sources; identify possible sources of bias ● Construct tables for large discrete and continuous sets of raw data, choosing suitable class intervals ● Design and use two-way tables ● Calculate statistics, including with a calculator; recognise when it is appropriate to use the range, mean, median and mode ● Find summary values that represent the raw data, and select the statistics most appropriate to the problem ● Construct and use stem-and-leaf diagrams ● Compare two or more distributions and make inferences, using the shape of the distributions, the range of data and appropriate statistics ● Select, draw and modify, on paper and using ICT, suitable graphical representation to progress an enquiry, including line graphs for time series and frequency polygons; identify key features presented in the data ● Interpret tables, graphs and diagrams for both discrete and continuous data, and draw inferences that relate to the problem being discussed; relate summarised data to the questions being explored ● Draw bar charts and frequency diagrams for discrete and continuous data |



| Term Two | Objectives |
|----------------------------------|---|
| Unit 6 (Geometry and measures 2) | <ul style="list-style-type: none"> ● Use units of measurement to calculate, estimate, measure and solve problems ● Convert between area measures and volume measures ● Calculate upper and lower bounds ● Recognise that measurements given to the nearest whole unit may be inaccurate by up to half a unit in either direction ● Understand and use measures of speed (and other compound measures such as density and pressure) to solve problems ● Calculate upper and lower bounds of compound measures ● Know and use the formulae for the circumference and area of a circle ● Know and use the formulae for length of arcs and area of sectors of circles ● Find areas of compound shapes ● Deduce and use the formula for the area of a triangle, parallelogram and trapezium ● Know and use the formula for the volume of a cuboid; calculate volumes and surface area of cuboids and shapes made from cuboids and prisms ● Calculate lengths, areas and volumes in prisms, including cylinders |
| Unit 7 (Number 2) | <ul style="list-style-type: none"> ● Round decimals to the nearest whole number or to one or two decimal places; round to a given number of significant figures; use rounding to make estimates and to give solutions to problems to an appropriate degree of accuracy ● Know that a recurring decimal can be written as an exact fraction ● Distinguish between fractions with denominators that have only prime factors 2 or 5 (terminating decimals), and other fractions (recurring decimals) ● Use an algebraic method to convert a recurring decimal to a fraction ● Use the function keys on a calculator for fractions, powers and roots; use the brackets and the memory function; use an extended range of function keys, including the reciprocal ● Recognise and use reciprocals; know that any number multiplied by its reciprocal is 1 ● Understand upper and lower bounds ● Use standard index form, expressed in conventional notation and on a calculator display; know how to enter numbers in standard index form |



| Term Two | Objectives |
|------------------------------------|--|
| Unit 7 (Number 2) <i>continued</i> | <ul style="list-style-type: none"> • Calculate with standard index form, using a calculator as appropriate • Use efficient written methods to add and subtract integers and decimals • Multiply by decimals; divide by decimals by transforming to division by an integer • Use a calculator efficiently and appropriately to perform complex calculations with numbers of any size, knowing not to round during intermediate steps of a calculation • Use known facts to derive unknown facts • Break down substantial tasks to make them more manageable • Represent problems through moving between algebraic, geometrical or graphical forms of the problem in order to gain a different perspective on the problem • Make accurate mathematical diagrams, graphs and constructions on paper and using ICT • Manipulate numbers, algebraic expressions and equations, and apply routine algorithms • Record methods, solutions and conclusions |
| Unit 8 (Algebra 4) | <ul style="list-style-type: none"> • Find the HCF and LCM of three numbers less than 100 • Find the prime factor decomposition of any whole number; use the prime factor decomposition to find the HCF and LCM of a group of numbers • Solve problems using factors and multiples • Simplify algebraic fractions such as $\frac{a}{b} + \frac{c}{d} = \frac{ad + bc}{bd}$ • Find square roots and cube roots using factors • Know and use the index laws for multiplication and division of positive powers; know and use the index law for raising a power to another power; know that any number or variable to the power zero is 1 • Apply index laws to negative and fractional powers of numbers and variables; know that when a number is raised to a negative power it is smaller than 1 • Plot graphs of linear functions in four quadrants • Find out if a point lies on a straight line • Know that all linear functions in y and x can be rearranged in the form $y = mx + c$; understand the meaning of m and c in $y = mx + c$ • Explain the difference between straight lines of the form $y = mx + c$ when the gradient m or intercept c changes |



| Term Two | Objectives |
|--------------------------------------|--|
| | <ul style="list-style-type: none"> • Compare the properties of straight-line graphs of the form $y = mx + c$ without drawing the graphs • Know that for $y = mx + c$, increasing the value of x by 1 increases y by m • Work out the gradient of a straight-line graph • Identify parallel and perpendicular lines on a graph; know that parallel lines have the same gradient; know the gradient of a line perpendicular to $y = mx + c$ • Construct a table of values, including negative numbers, for a quadratic function and draw its graphs; construct a table of values, including negative numbers, for a cubic function of the form $y = ax^3$ and draw its graph • Recognise graphs of the form $y = ax^2 + b$ and $y = x^3$ and know their properties • Create functions to model real-life situations; plot and draw graphs for real-life situations • Interpret linear and non-linear line graphs • Sketch a line graph for the approximate relationship between two variables • Interpret graphs including points of intersection of pairs of lines |
| Unit 9 (Statistics 2) | <ul style="list-style-type: none"> • Talk about the likelihood of different outcomes occurring • Work out if a game is fair • Identify mutually exclusive outcomes of an experiment • Write the probability of event n as $P(n)$ • Know that the sum of the probabilities of all the mutually exclusive outcomes is 1 • Calculate probabilities using the fact that the sum of mutually exclusive probabilities is 1 • Draw and use tree diagrams • Use probabilities from experimental data to predict outcomes • Understand relative frequency • Use relative frequency to compare experiments • Plot and use relative frequency diagrams |
| Unit 10 (Geometry and measures 3) | <ul style="list-style-type: none"> • Distinguish between practical demonstration and proof • Understand congruence • Apply the conditions SSS, SAS, ASA or RHS to establish the congruence of triangles • Know that if two 2-D shapes are similar, corresponding angles are equal and corresponding sides are in the same ratio |



| Term Two | Objectives |
|--|---|
| Unit 10 (Geometry and measures 3) <i>continued</i> | <ul style="list-style-type: none"> ● Transform 2-D shapes by combinations of translations, rotations and reflections ● Know that translations, rotations and reflections preserve length and angle, and map objects onto congruent images ● Draw diagrams to scale ● Use and interpret maps using proper map scales ● Use and interpret scale drawings in a range of contexts ● Given the coordinates of points A and B, find the mid-point of the line segment AB ● Recognise that enlargements preserve angle but not length ● Use proportional reasoning to solve a problem; interpret and use ratio in a range of contexts ● Use sine, cosine and tangent in right-angled triangles to solve problems in two dimensions |

| Term Three | Objectives |
|---------------------|--|
| Unit 11 (Algebra 5) | <ul style="list-style-type: none"> ● Simplify expressions by multiplying out single brackets and collecting like terms ● Factorise expressions involving a single bracket ● Multiply out double brackets ● Use the difference of two squares to do mental calculations ● Factorise a quadratic expression ● Use factorisation to simplify algebraic fractions ● Substitute integers into formulae and use the correct order of operations ● Write expressions and construct formulae ● Use a formula and find the value of a letter which is not the subject of a formula ● Change the subject of a formula ● Understand inequality signs ● Identify and represent inequalities on a number line ● Solve inequalities ● Show inequalities graphically and link to practical problems |



| Term Three | Objectives |
|----------------------------|--|
| Unit 12 (Solving problems) | <ul style="list-style-type: none"> ● Pose questions and make convincing arguments to justify generalisations or solutions; recognise the impact of constraints or assumptions ● Use a range of forms to communicate findings effectively to different audiences ● Work through the entire data handling cycle to explore relationships within bivariate data ● Break down substantial tasks to make them more manageable ● Calculate accurately, selecting mental methods or calculating devices as appropriate ● Justify and explain solutions to problems involving an unfamiliar context ● Make progress by exploring mathematical tasks, developing and following alternative approaches; examine and extend generalisations ● Produce simple proofs ● Generate fuller solutions by presenting a concise, reasoned argument using symbols, diagrams, graphs and related explanations ● Solve problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons, justifying inferences and explaining reasoning with diagrams and text ● Use graphs and set up equations to solve simple problems involving direct proportion; use algebraic methods to solve problems involving direct proportion; relate algebraic solutions to graphs of the equations ● Understand and use proportionality and calculate the result of any proportional change using multiplicative methods ● Use a multiplier raised to a power to represent and solve problems involving repeated proportional change, for example, compound interest ● Represent problems and synthesise information in algebraic, geometrical or graphical form; move from one form to another to gain a different perspective on the problem; compare and evaluate representations ● Use connections with related contexts to improve the analysis of a situation ● Plot the graphs of linear functions, where y is given explicitly in terms of x and where y is given implicitly in terms of x ● Explore ways of constructing models of real-life situations by drawing graphs and constructing algebraic equations and inequalities |



| Term Three | Objectives |
|-----------------------------------|---|
| Unit 13 (Statistics 3) | <ul style="list-style-type: none"> ● Discuss how data relates to a problem; identify possible sources, including primary and secondary sources ● Identify possible sources of bias ● Identify bias in questionnaires ● Estimate the mean and median of a large set of grouped data ● Construct cumulative frequency tables ● Construct cumulative frequency charts ● Estimate the median, upper and lower quartiles and interquartile range of a set of grouped data using a cumulative frequency chart ● Select, construct and modify suitable graphical representation to progress an enquiry, including scatter graphs to develop further understanding of correlation; identify key features presented in the data ● Identify misleading graphs and statistics ● Interpret graphs and charts, drawing conclusions by using a variety of statistical measures ● Recognise the limitations of the conclusions drawn from data interpretation ● Compare two distributions using appropriate statistics ● Compare two distributions using the shape of the distributions |
| Unit 14 (Geometry and measures 4) | <ul style="list-style-type: none"> ● Solve geometrical problems using side and angle properties of equilateral, isosceles and right-angled triangles and special quadrilaterals; explaining reasoning with diagrams and text ● Understand and apply Pythagoras' theorem ● Solve problems using properties of angles, parallel and intersecting lines, and of triangles and other polygons, justifying inferences and explaining reasoning with diagrams and text ● Visualise and use 2-D representations of 3-D objects, including plans and elevations ● Analyse 3-D shapes through 2-D projections, including plans and elevations ● Use and interpret maps and scale drawings ● Know and use the formula for the volume of a cuboid; calculate volumes and surface areas of cuboids and shapes made from cuboids ● Calculate the surface area and volume of prisms ● Calculate lengths, areas and volumes in prisms, including cylinders |



| Term Three | Objectives |
|--|--|
| Unit 14 (Geometry and measures 4) <i>continued</i> | <ul style="list-style-type: none"><li data-bbox="660 394 1342 456">• Begin to use sine, cosine and tangent in right-angled triangles to solve problems in two dimensions |



| Term Three | Objectives |
|------------------------|--|
| Unit 15 (Statistics 4) | <ul style="list-style-type: none"> ● Use the vocabulary of probability in interpreting results involving uncertainty and prediction ● Find and record all the possible mutually exclusive outcomes for single and two successive events in a systematic way using diagrams and tables ● Identify all the mutually exclusive outcomes of an experiment; know that the sum of mutually exclusive outcomes is 1 and use this when solving problems ● Estimate probabilities from experimental data ● Understand relative frequency as an estimate of probability and use this to compare outcomes of experiments ● Draw tree diagrams of complex independent events ● Draw tree diagrams for events where the probability of a second event depends on the outcome of the first event ● Compare experimental and theoretical probabilities in a range of contexts ● Appreciate the difference between mathematical explanation and experimental evidence ● Solve problems involving probability ● Interpret results involving uncertainty and prediction |