

Mathematics

Scheme of Work

Two Tier Syllabus

Higher GCSE

Note :

All Chapters Refer to the Collins Edexcel Higher GCSE Two Tier Text

YEAR 10 : AUTUMN TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Number 1	2	<ul style="list-style-type: none"> The ability to order numbers. Appreciation of place value. Experience of the 4 operations using whole numbers. Knowledge of integer complements to 10 and 100 Knowledge of multiplication facts to 10×10 Knowledge of strategies for multiplying and dividing whole numbers by 10 	<ul style="list-style-type: none"> Understand and order integers Add, subtract, multiply and divide integers Round whole numbers to the nearest, 10, 100, 1000, ... Multiply and divide whole numbers by a given multiple of 10 Check their calculations by rounding, e.g. $29 \times 31 \approx 30 \times 30$ 	<ul style="list-style-type: none"> More work on long multiplication and division without using a calculator. Estimating answers to calculations involving the four rules. Consideration of mental maths problems with negative powers of 10: 2.5×0.01, 0.001 Directed number work with two or more operations, or with decimals. 	1: Number	
Number 2	3	<ul style="list-style-type: none"> Number 1. The concepts of a fraction and a decimal. 	<ul style="list-style-type: none"> Put digits in the correct place in a decimal number Write decimals in ascending order of size Approximate decimals to a given number of decimal places or significant figures Multiply and divide decimal numbers by whole numbers and decimal numbers (up to 2 dp), e.g. $266.22 \div 0.34$ Know that e.g. $13.5 \div 0.5 = 135 \div 5$ Check their answer by rounding, know that e.g. $2.9 \times 3.1 \approx 3.0 \times 3.0$ 	<ul style="list-style-type: none"> Use decimals in real-life problems. Use standard form for vary large/small numbers. Money calculations that require rounding answers to the nearest penny. Multiply and divide decimals by decimals (more than 2 dp). 	1: Number	
Fractions 1	2	<ul style="list-style-type: none"> Multiplication facts. Ability to find common factors. A basic understanding of fractions as being 'parts of a whole unit'. Use of a calculator with fractions. 	<ul style="list-style-type: none"> Write a fraction in its simplest form and recognise equivalent fractions Compare the sizes of fractions using a common denominator Add and subtract fractions by using a common denominator Write an improper fraction as a mixed number, and visa versa Add and subtract mixed numbers 	<ul style="list-style-type: none"> Careful differentiation is essential for this topic dependent upon the student's ability. Relating simple fractions to remembered percentages and vice-versa. Using a calculator to change fractions into decimals and looking for patterns. Working with improper fractions and mixed numbers. Solve word problems involving fractions (and in real-life problems eg find perimeter using fractional values). 	2: Fractions & percentages	
Fractions 2	2	<ul style="list-style-type: none"> Fractions 1. 	<ul style="list-style-type: none"> Convert a fraction to a decimal, or a decimal to a fraction Find the reciprocal of whole numbers, fractions, and decimals Multiply and divide a fraction by an integer, by a unit fraction and by a general fraction (expressing the answer in its simplest form) Convert a fraction to a recurring decimal (and visa versa) Use fractions in contextualised problems 	<ul style="list-style-type: none"> Use a calculator to find fractions of given quantities. Use combinations of the four operations with fractions (and in real-life problems, eg to find areas using fractional values). For very able students algebraic fractions could be considered. 	2: Fractions & percentages	

YEAR 10 : AUTUMN TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Coordinates	2	<ul style="list-style-type: none"> Directed numbers. Parallel and perpendicular lines. 	<ul style="list-style-type: none"> Plot and reading coordinates on a coordinate grid (in all four quadrants) Understand that one coordinate identifies a point on a line, two coordinates identify a point in a plane and three coordinates identify a point in space, and use the terms '1-D', '2-D' and '3-D' Find the coordinates of the fourth vertex of a parallelogram Identify the coordinates of the vertex of a cuboid on a 3-D grid Writing down the coordinates of the midpoint of the line connecting two points Calculate the length of the line segment joining to point in the plane (all four quadrants) 	<ul style="list-style-type: none"> Find the coordinates of the point if intersection of the medians of a triangle, and explore further. Identify the coordinates of the mid-point of a line segment in 3-D. 	16: Linear graphs & equations	
Algebra 1	2	<ul style="list-style-type: none"> Experience of using a letter to represent a number. Ability to use negative numbers with the four operations. Recall and use BIDMAS. 	<ul style="list-style-type: none"> Simplify algebraic expressions in one or more like terms by addition and subtraction Multiply and divide with letters and numbers Multiply and divide powers of the same letter Understand and use the index rules to simplify algebraic expressions Use brackets to expand and simplify simple algebraic expressions 	<ul style="list-style-type: none"> Examples where all the skills above are required. Factorising where the factor may involve more than one variable. Use index rules with negative numbers (and fractions). 	5: Algebra 1 10: Powers, standard form & surds 12: Algebra 2	
Angles	3	<ul style="list-style-type: none"> An understanding of angle as a measure of turning. The ability to use a protractor to measure angles. Understanding of the concept of parallel lines. 	<ul style="list-style-type: none"> Distinguish between acute, obtuse, reflex and right angles Use angle properties on a line and at a point to calculate unknown angles Use angle properties of triangles and quadrilaterals to calculate unknown angles Use parallel lines to identify alternate and corresponding angles Calculate interior and exterior angles in a polygon Understand and use bearings 	<ul style="list-style-type: none"> Find the rule for the sum of the interior/exterior angles of an n sided polygon. 	7: Geometry	
Collecting Data	3	<ul style="list-style-type: none"> An understanding of why data needs to be collected. Experience of simple tally charts. Experience of inequality notation. 	<ul style="list-style-type: none"> Design a suitable question for a questionnaire Understand the difference between: primary and secondary data; discrete and continuous data Design suitable data capture sheets for surveys and experiments Understand about bias in sampling Choose and justify an appropriate sampling scheme, including random and systematic sampling Deal with practical problems in data collection, such as non-response, missing and anomalous data 	<ul style="list-style-type: none"> Carry out a statistical investigation of their own including – designing an appropriate means of gathering the data. An investigation into other sampling schemes, such as cluster and quota sampling. 	11: Statistics 1	
Displaying Data 1	2	<ul style="list-style-type: none"> An understanding of the different types of data: continuous; discrete; categorical. Experience of inequality notation. Ability to multiply a number by a fraction. Use a protractor to measure and draw angles. 	<ul style="list-style-type: none"> Represent data as: <ul style="list-style-type: none"> - Pie charts (for categorical data) - Bar charts and histograms (equal class intervals) - Frequency polygons Choose an appropriate way to display discrete, continuous and categorical data Understand the difference between a bar chart and a histogram Compare distributions shown in charts and graphs 	<ul style="list-style-type: none"> Carry out a statistical investigation of their own and use an appropriate means of displaying the results. Use a spreadsheet to draw different types of graphs. Collect examples of charts and graphs in the media which have been misused, and discuss the implications. 	11: Statistics 1 18: Statistics 2	

YEAR 10 : AUTUMN TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Drawing & Construction 1	2	<ul style="list-style-type: none"> An ability to use a pair of compasses. The special names of triangles (and angles). Understanding of the terms perpendicular, parallel and arc. 	<ul style="list-style-type: none"> An equilateral triangle with a given side The mid-point and perpendicular bisector of a line segment The perpendicular from a point on a line The bisector of an angle the angles 60°, 30° and 45° A regular hexagon inside a circle, etc A region bounded by a circle and an intersecting line A path equidistant from 2 points or 2 line segments, etc 	<ul style="list-style-type: none"> Solve loci problems that require a combination of loci. Construct combinations of 2-D shapes to make nets. Investigate tessellation. 	9: Constructions	
Geometry 1	3	<ul style="list-style-type: none"> Recall the names of special types of triangle, including equilateral, right-angled and isosceles. Know that angles on a straight line sum to 180°. Know that a right angle = 90°. 	<ul style="list-style-type: none"> Mark parallel lines in a diagram Find missing angles using properties of corresponding angles and alternate angles, giving reasons Find the three missing angles in a parallelogram when one of them is missing Identify and list the properties of quadrilaterals (including kites) Name all quadrilaterals that have a pair of opposite sides that are equal 	<ul style="list-style-type: none"> Harder problems involving multi-stage calculations. 	7: Geometry	
Number 3	2	<ul style="list-style-type: none"> Number complements to 10 and multiplication/division facts. Use a number line to show how numbers relate to each other. Recognise basic number patterns. Experience of classifying integers. 	<ul style="list-style-type: none"> Find: squares; cubes; square roots; cube roots of numbers, with and without a calculator (including the use of trial and improvement) Understand odd and even numbers, and prime numbers Find the HCF and the LCM of numbers Write a number as a product of its prime factors, e.g. $108 = 2^2 \times 3^3$ 	<ul style="list-style-type: none"> Calculator exercise to check factors of larger numbers. Further work on indices to include negative and/or fractional indices. Use prime factors to find LCM. Use a number square to find primes (sieve of Eratosthenes). Calculator exercise to find squares, cubes and square roots of larger numbers (using trial and improvement). 	1: Number 10: Powers, standard form & surds	
Mensuration 1	6	<ul style="list-style-type: none"> Names of triangles, quadrilaterals and polygons. Concept of perimeter and area. Units of measurement. Substitute numbers into formulae. Ability to give answers to a degree of accuracy. 	<ul style="list-style-type: none"> Use Pythagoras' theorem to find unknown lengths, eg the height of an isosceles triangle given the lengths of all three sides Find the perimeter and area of shapes made up from triangles and rectangles Find when numbers are given to a specific degree of accuracy, the upper and lower bounds of perimeters and areas Convert between units of area. 	<ul style="list-style-type: none"> Calculating areas and volumes using formulae. Using compound shape methods to investigate areas of other standard shapes such as parallelograms, trapeziums and kites. 	1: Number 4: Shape 23: Number & limits of accuracy	9.1 – 9.7 9.13 16.1 – 16.3 19.1 – 19.4

34 Lessons

YEAR 10 : SPRING TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Patterns & Sequences	3	<ul style="list-style-type: none"> Know about odd and even numbers. Recognise simple number patterns eg 1, 3, 5, ... Writing simple rules algebraically. Raise numbers to positive whole number powers. 	<ul style="list-style-type: none"> Find the missing numbers in a number pattern or sequence Find the nth term of a number sequence as an algebraic expression Explain why a number is, or is not, a member of a given sequence Use a calculator to produce a sequence of numbers 	<ul style="list-style-type: none"> Match-stick problems. Sequences of triangle numbers, Fibonacci numbers, etc. 	20: Algebra 3	
Percentages	4	<ul style="list-style-type: none"> 4 operations of number. The concepts of a fraction and a decimal. Awareness that percentages are used in everyday life. 	<ul style="list-style-type: none"> Understand that a percentage is a fraction in hundredths Write a percentage as a decimal; or as a fraction in its simplest terms Write one number as a percentage of another number Calculate the percentage of a given amount Find a percentage increase/decrease of an amount Find a reverse percentage, e.g. find the original cost of an item given the cost after a 10% deduction Use a multiplier to increase by a given percent, e.g. 1.1×64 increases 64 by 10% Calculate simple and compound interest for two, or more, periods of time 	<ul style="list-style-type: none"> Fractional percentages of amounts (non-calculator). Combine multipliers to simplify a series of percentage changes. Percentages which convert to recurring decimals (eg $33 \frac{1}{3} \%$), and situations which lead to percentages of more than 100%. Problems which lead to the necessity of rounding to the nearest penny (eg real-life contexts). Comparisons between simple and compound interest calculations. Formulae in simple interest/compound interest methods. 	2: Fractions & percentages	
Solving Linear Equations	4	<ul style="list-style-type: none"> Experience of finding missing numbers in calculations. The idea that some operations are 'opposite' to each other. An understanding of balancing. Experience of using letters to represent quantities. Understand and recall BIDMAS. 	<ul style="list-style-type: none"> Solve linear equations with one, or more, operations (including fractional coefficients) Solve linear equations involving a single pair of brackets 	<ul style="list-style-type: none"> Use of inverse operations and rounding to 1 sig. fig. could be applied to more complex calculations. Derive equations from practical situations (such as finding unknown angles in polygons). Solve second order linear equations. 	5: Algebra 1 12: Algebra 2 20: Algebra 3	
Drawing & Constructing 2	2	<ul style="list-style-type: none"> Drawing and construction 1. 	<ul style="list-style-type: none"> Count the vertices, faces and edges of 3-D shapes Draw nets of solids and recognise solids from their nets Draw and interpret plans and elevations Draw planes of symmetry in 3-D shapes Recognise and name examples of solids, including prisms, in the real world 	<ul style="list-style-type: none"> Make solids using equipment such as clixi or multi-link. Draw shapes made from multi-link on isometric paper. Build shapes from cubes that are represented in 2-D. Work out how many small boxes can be packed into a larger box. 	4: Shape	
Algebra 2	2	<ul style="list-style-type: none"> Algebra 1. 	<ul style="list-style-type: none"> Expand or factorise algebraic expressions involving one pair of brackets Expand and simplify expressions involving two pairs of brackets Factorise quadratic expressions (including the difference of two squares) 	<ul style="list-style-type: none"> Expand algebraic expressions involving three pairs of brackets. Further examples in factorising quadratic expression with non-unitary values of a (including fractional values). Simplification of algebraic fractions by first factorising and then cancelling common factors. 	5: Algebra 1 12: Algebra 2	

YEAR 10 : SPRING TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Displaying Data 3	3	<ul style="list-style-type: none"> • Experience of plotting points. • Ability to work out an average. • Displaying data 1. 	<ul style="list-style-type: none"> • Represent data as a time series • Identify trends in data over time • Calculate a moving average 	<ul style="list-style-type: none"> • Make predictions by considering trends of line graphs for time series. • Additional work on making predictions based on current trends, using time series and/or moving averages. • Collect data from the internet (eg RPI) and analyse it for trend. 	11: Statistics 1 18: Statistics 2	
Formulae	4	<ul style="list-style-type: none"> • Understanding of the mathematical meaning of the words expression, simplifying, formulae and equation. • Experience of using letters to represent quantities. • Substituting into simple expressions using words. • Using brackets in numerical calculations and removing brackets in simple algebraic expressions. 	<ul style="list-style-type: none"> • Use letters or words to state the relationship between different quantities • Substitute positive and negative numbers into simple algebraic formulae • Substitute positive and negative numbers into algebraic formulae involving powers • Find the solution to a problem by writing an equation and solving it • Change the subject of a formula, e.g. convert the formula for converting Centigrade into Fahrenheit into a formula that converts Fahrenheit into Centigrade • Generate a formula from given information, e.g. find the formula for the perimeter of a rectangle given its area A and the length of one side 	<ul style="list-style-type: none"> • Use negative numbers in formulae involving indices. • Various investigations leading to generalisations. • Further problems in generating formulae from given information. 	5: Algebra 1 20: Algebra 3	
Circle Theorem	3	<ul style="list-style-type: none"> • Recall the words centre, radius, diameter and circumference. • Have practical experience of drawing circles with compasses. 	<ul style="list-style-type: none"> • Understand, prove and use circle theorems • Use circle theorems to find unknown angles and explain their method- quoting the appropriate theorem(s) 	<ul style="list-style-type: none"> • Harder problems involving multi-stage calculations. 	7: Geometry	
Linear Functions 1	6	<ul style="list-style-type: none"> • substitute positive and negative numbers into algebraic expressions • plot coordinates in the first quadrant • rearrange to change the subject of a formula. 	<ul style="list-style-type: none"> • Substitute values of x into linear functions to find corresponding values of y • Plot points for linear functions on a coordinate grid and draw the corresponding straight lines • Interpret m and c as gradient and y-intercept in linear functions • Understand that the graphs of linear functions are parallel if they have the same value of m • Know that the line perpendicular to $y = mx + c$ has gradient $-1/m$ • Understand linear functions in practical problems, e.g. distance-time graphs 	<ul style="list-style-type: none"> • Find the equation of the line through two given point. • Find the equation of the perpendicular bisector of the line segment joining two given points. 	16: Linear graphs & equations	
Mensuration 2	3	<ul style="list-style-type: none"> • Names of triangles, quadrilaterals and polygons. • Concept of perimeter and area. • Units of measurement. • Substitute numbers into formulae. • Ability to give answers to a degree of accuracy. 	<ul style="list-style-type: none"> • Find the perimeter and area of shapes made up from triangles, rectangles and parts of circles • Use and recall formulae to calculate perimeters and areas of circles, and parts of circles 	<ul style="list-style-type: none"> • Practical investigation to find an approximate value for π, eg wrapping string around a bottle. 	4: Shape	

34 Lessons

YEAR 10 : SUMMER TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Similar Shapes	4	<ul style="list-style-type: none"> Use ruler and compasses to construct triangles with given dimensions. Some concept of enlargement (magnification). 	<ul style="list-style-type: none"> Use integer and non-integer scale factors to find the length of a missing side in each of two similar shapes, given the lengths of a pair of corresponding sides Know the relationship between linear, area and volume scale factors of similar shapes Prove formally geometric properties of triangles, e.g. that the base angles of an isosceles triangle are equal Prove formally that two triangles are congruent 	<ul style="list-style-type: none"> Find algebraic formulae for the areas and volumes of similar shapes. Harder problems in congruence. Relate this unit to circle theorems. 	14: Similarity 27: Proof	
Displaying Data 4	3	<ul style="list-style-type: none"> Plotting coordinates. An understanding of the concept of a variable. Recognition that a change in one variable can affect another. 	<ul style="list-style-type: none"> Draw and produce a scatter graph Appreciate that correlation is a measure of the strength of association between two variables Distinguish between positive, negative and zero correlation using a line of best fit Appreciate that zero correlation does not necessarily imply 'no correlation' but merely 'no linear relationship' Draw a line of best fit by eye and understand what it represents Use a line of best fit to interpolate/ extrapolate 	<ul style="list-style-type: none"> Vary the axes required on a scatter graph to suit the ability of the class. Carry out a statistical investigation of their own including; designing an appropriate means of gathering the data, and an appropriate means of displaying the results. Use a spreadsheet, or other software, to produce scatter diagrams/lines of best fit. Investigate how the line of best fit is affected (visually) by the choice of scales on the axes. 	18: Statistics 2	
Fractions 3	2	<ul style="list-style-type: none"> Fractions 1. 	<ul style="list-style-type: none"> Appreciate that e.g. the ratio 1:2 represents $\frac{1}{3}$ and $\frac{2}{3}$ of a quantity Divide quantities in a given ratio, e.g. divide £20 in the ratio 2:3 Solve word problems involving ratios, e.g. Find the cost of 8 pencils given that 6 cost 78p Work out the real distance from a map, e.g. Find the real distance represented by 4 cm on a map with scale 1:25 000 Work out the distance on a map for a given real distance and scale 	<ul style="list-style-type: none"> Currency calculations using currency exchange rates. Harder problems involving multi-stage calculations. Relate ratios to real-life situations, eg Investigate the proportions of the different metals in alloys. 	3: Ratios & proportion	
Direct & Inverse Proportion	6	<ul style="list-style-type: none"> Substitute numbers into algebraic formulae Rearrange the subject of a formula. 	<ul style="list-style-type: none"> Interpret direct and inverse proportions as algebraic functions, e.g. $y \propto x^2$ as $y = kx^2$ Use given information to find the value of the constant of proportionality Use algebraic functions for direct and inverse proportionality, with their value of k, to find unknown values Recognise and sketch the graphs for direct and inverse proportions ($y \propto x$, $y \propto x^2$, $y \propto x^3$, $y \propto 1/x$, $y \propto 1/x^2$) 	<ul style="list-style-type: none"> Problems involving other types of proportionality (eg surface area to volume of a sphere). 	3: Ratios & proportion 22: Variation	
Statistical Measure 1	2	<ul style="list-style-type: none"> Knowledge of finding the mean for small data sets. Ability to find the mid point of two numbers. 	<ul style="list-style-type: none"> Recall how to find the mean, mode and median for small data sets Recall how to use and interpret a stem and leaf diagram Calculate the mean of data given in a frequency distribution Use the mid interval value to find an estimate for the mean of data given in a grouped frequency distribution Understand and use the sigma notation for the mean of ungrouped, and grouped, data. 	<ul style="list-style-type: none"> Use statistical functions on calculators and spreadsheets. Use statistical software to calculate the mean for grouped data sets. Estimate the mean for data sets with ill defined class boundaries. Investigate the affect of combining class intervals on estimating the mean for grouped data sets. 	11: Statistics 1 18: Statistics 2	

YEAR 10 : SUMMER TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Linear Functions 2	4	<ul style="list-style-type: none"> Algebra 1. Linear functions 1. 	<ul style="list-style-type: none"> Solve algebraically two simultaneous equations Interpret the solution of two simultaneous equations as the point of intersection the corresponding lines 	<ul style="list-style-type: none"> Solve two simultaneous equations with fractional coefficients. Solve two simultaneous equations with second order terms, eg equations in x and y^2. 	5: Algebra 1	
Numbers 4	2	<ul style="list-style-type: none"> Rounding decimals to a given number of decimal places or significant figure. Multiplying decimal numbers with, and without, a calculator. Some experience with powers of 10, eg know that $10^2 = 100$, $10^3 = 1000$, $10^{-1} = 0.1$ Numbers 3 	<ul style="list-style-type: none"> Understand the standard form convention Convert numbers to, and from, standard form Calculate with numbers given in standard form with, and without, a calculator Round numbers given in standard form to a given number of significant figures 	<ul style="list-style-type: none"> Use standard index form in real-life situations, eg Stellar distances, sizes of populations, atomic distances. 	10: Powers, standard form & surds	
Numbers 5	5	<ul style="list-style-type: none"> Knowledge of squares, square roots, cubes and cube roots. Fractions 1 and 2. Algebra 1. 	<ul style="list-style-type: none"> Use index rules to simplify and calculate numerical expressions involving powers, e.g. $(2^3 \times 2^5) \div 2^2$, 4^0, $8^{-2/3}$ Know that e.g. $x^3 = 64 \Rightarrow x = 8^{1/3}$ Rationalise the denominator of fractions, e.g. $1/(\sqrt{3}-1) = (\sqrt{3}+1)/2$, and e.g. write $(\sqrt{18}+10) \div \sqrt{2}$ in the form $p + q\sqrt{2}$ 	<ul style="list-style-type: none"> Use index rules to simplify algebraic expressions. Treat index rules formulae (state which rule is being at each stage in a calculation). Harder problems in rationalising denominators (including algebra). 	10: Powers, standard form & surds	
Linear Functions 3	3	<ul style="list-style-type: none"> Ability to solve simple linear equations. Some experience with inequality notation. Linear functions 1. 	<ul style="list-style-type: none"> Rearrange and solve linear inequalities in one variable and show the solution set on a number line, or to write down all the integer solutions. Draw the graphs of linear inequalities in two variables and interpret the solution sets given by regions in the coordinate plane, or to identify all the integer coordinates with crosses 	<ul style="list-style-type: none"> Find graphical solutions to problems involving linear and quadratic functions. Find graphical solution to problems involving lines and circles, parabolas and circles. 	24: Inequalities & regions	
Quadratics Functions	6	<ul style="list-style-type: none"> Graphs 1. Algebra 2. 	<ul style="list-style-type: none"> Plot the graphs of quadratic functions for positive and negative values of x Find graphically the solutions of quadratic equations by considering the intercept on the x-axis Solve quadratic equations by factorising (including values of a not equal to 1) Use the quadratic formula to solve quadratic equations giving the answers to 1 dp Use the quadratic formula to solve quadratic equations leaving the answer in surd form Complete the square of a quadratic function (using this to write down the max/min of the function) 	<ul style="list-style-type: none"> Solve equations involving algebraic fractions which lead to quadratic equations. Solve quadratic equations by completing the square. Derive the quadratic equation by completing the square. Use graphical calculators where appropriate to enable students to get through examples more rapidly. 	12: Algebra 2 17: More graphs & equations	

36 Lessons

YEAR 11 : AUTUMN TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Compound Measures	4	<ul style="list-style-type: none"> • Knowledge of metric units, eg 1 m = 100 cm, etc. • Know that 1 hour = 60 mins, 1 min = 60 seconds. • Experience of multiply by powers of 10, eg. $100 \times 100 = 10\,000$ 	<ul style="list-style-type: none"> • Use the relationship between distance, speed and time to solve problems • Convert between metric units of speed e.g. km/h to m/s • Know that density is found by mass \div volume • Use the relationship between density, mass and volume to solve problems, e.g. find the mass of an object with a given volume and density • Convert between metric units of density e.g. kg/m to g/cm 	<ul style="list-style-type: none"> • Perform calculations on a calculator by using standard form. • Convert imperial units to metric units, eg mph into km/h. 	3: Ratios & proportion 13: Real-life graphs	
Geometry 2	3	<ul style="list-style-type: none"> • Geometry 1. 	<ul style="list-style-type: none"> • Calculate and use the sums of the interior angles of convex polygons of sides 3, 4, 5, 6, 8, 10 • Know, or work out, the relationship between the number of sides of a polygon and the sum of its interior angles • Know that the sum of the exterior angles of any polygon is 360 degrees • Find the size of each exterior/interior angle of a regular polygon 	<ul style="list-style-type: none"> • Harder problems involving multi-step calculations. 	7: Geometry	
Mensuration 3	4	<ul style="list-style-type: none"> • Mensuration – perimeter and area 1 and 2. • Concept of volume. • Ability to give answers to a degree of accuracy. • Experience of changing the subject of a formula. 	<ul style="list-style-type: none"> • Find volumes of shapes by counting cubes • Use formulae to calculate the surface areas and volumes of cuboids, right-prisms and cylinders • Solve a range of problems involving surface area and volume, e.g. given the volume and length of a cylinder find the radius • Convert between units of volume 	<ul style="list-style-type: none"> • Additional work using symbolic expressions. • Find surface area and volume of a sphere or cone (using standard formulae). • Convert between less familiar units eg cm^3 to mm^3, cm^3 to litres. 	4: Shape	
Transformations 1	7	<ul style="list-style-type: none"> • Recognition of basic shapes. • An understanding of the concept of rotation, reflection and enlargement. • Coordinates in four quadrants. • Linear equations parallel to the coordinate axes. 	<ul style="list-style-type: none"> • Understand translation as a combination of a horizontal and vertical shift including signs for directions • Understand rotation as a (clockwise) turn about a given origin • Reflect shapes in a given mirror line; parallel to the coordinate axes and then $y = x$ or $y = -x$ • Enlarge shapes by a given scale factor from a given point; using positive and negative scale factors greater and less than one • Understand that shapes produced by translation, rotation and reflection are congruent to its image 	<ul style="list-style-type: none"> • The tasks set can be extended to include combinations of transformations. 	8: Transformation geometry	
Probability	7	<ul style="list-style-type: none"> • Understand that a probability is a number between 0 and 1 • Know how to add, and multiplying fractions and decimals. • Experience of expressing one number as a fraction of another number. • Recognise the language of statistics, eg words such as likely, certain, impossible. 	<ul style="list-style-type: none"> • List all the outcomes from mutually exclusive events, e.g. from two coins, and sample space diagrams • Write down the probability associated with equally likely events, e.g. the probability of drawing an ace from a pack of cards • Know that if the probability of an event occurring is p then the probability of it not occurring is $1 - p$ • Find the missing probability from a list or table • Know that the probability of A or B is $P(A) + P(B)$ • Know that the probability of A and B is $P(A) \times P(B)$ • Draw and use tree diagrams to solve probability problems (including examples of non-replacement) • Find estimates of probabilities by considering relative frequency in experimental results (including two-way tables) • Know that the more an experiment is repeated the better the estimate of probability 	<ul style="list-style-type: none"> • Binomial probabilities. 	19: Probability	

YEAR 11 : AUTUMN TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Statistical Measure 2	10	<ul style="list-style-type: none"> • Experience of inequality notation. • Ability to plot points. • Understand how to find the median and range for small data sets. • Understand the difference between discrete and continuous data. 	<ul style="list-style-type: none"> • Find the median and quartiles for large sets of ungrouped data • Draw a cumulative frequency table for grouped data (using the upper class boundary) • Draw a cumulative frequency curve for grouped data • Use a cumulative frequency diagram to find estimates for the median and quartiles of a distribution • Use a cumulative frequency diagram to solve problems, e.g. how many greater than a particular value • Draw a box plot to summarise information given in cumulative frequency diagrams • Compare cumulative frequency diagrams and box plots to make inferences about distributions 	<ul style="list-style-type: none"> • Understand the distinction between a cumulative frequency curve and a cumulative frequency polygon. • Compare more than three distributions. • Use statistical software to produce cumulative frequency diagrams and box plots. • Identify and represent outliers for box plots. 	11: Statistics 1 18: Statistics 2	

35 lessons

YEAR 11 : SPRING TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Trigonometry 1	6	<ul style="list-style-type: none"> Some understanding of similar triangles. Able to use a calculator to divide numbers. Mensuration – perimeter and area 1. Formulae 	<ul style="list-style-type: none"> Use trigonometric ratios (sin, cos and tan) to calculate angles in right-angled triangles Use the trigonometric ratios to calculate unknown lengths in right-angled triangles 	<ul style="list-style-type: none"> Use these ratios to solve problems in 3-D. 	6: Pythagoras & trigonometry	
Trial & Improvement	2	<ul style="list-style-type: none"> Substituting numbers into algebraic expressions. Dealing with decimals on a calculator. Ordering decimals 	<ul style="list-style-type: none"> Solve cubic functions by successive substitution of values of x 	<ul style="list-style-type: none"> Solve functions of the form $1/x = x^2 - 5$ 	5: Algebra 1	
Further Functions	6	<ul style="list-style-type: none"> Linear functions 1. Quadratic functions. 	<ul style="list-style-type: none"> Plot and recognise cubic, reciprocal, exponential and circular functions (see above) Use the graphs of these functions to find approximate solutions to equations, e.g. given x find y (and visa versa) Find the values of p and q in the function $y = pq^x$ given the graph of $y = pq^x$ Match equations with their graphs Sketch graphs of given functions 	<ul style="list-style-type: none"> Explore the function $y = e^x$ (perhaps relate this to $y = \ln x$). Explore the function $y = \tan x$. Find solutions to equations of the circular functions $y = \sin x$ and $y = \cos x$ over more than one cycle (and generalise). 	17: More graphs & equations	
Trigonometry 2	4	<ul style="list-style-type: none"> Trigonometry 1. Formulae. 	<ul style="list-style-type: none"> Find the unknown lengths, or angles, in non right-angle triangles using the sine and cosine rules Find the area of triangles given two lengths and an included angle 	<ul style="list-style-type: none"> Use these ratios to solve problems in 3-D. 	15: Trigonometry	
Trigonometry 3	6	<ul style="list-style-type: none"> Trigonometry 1 and 2. 	<ul style="list-style-type: none"> Calculate the length of a diagonal of a rectangle given the lengths of the sides of the rectangle Calculate the diagonal through a cuboid, or across the face of a cuboid Find the angle between the diagonal through a cuboid and the base of the cuboid Find the angle between a sloping edge of a pyramid and the base of the pyramid Identify when to use the sine or cosine rule and adapt the relevant formula to the given triangle 	<ul style="list-style-type: none"> Harder problems involving multi-stage calculations. 	15: Trigonometry	
Further Simultaneous Equations	6	<ul style="list-style-type: none"> Linear functions 2. Quadratic functions. 	<ul style="list-style-type: none"> Find graphically the approximate solutions of linear and quadratic simultaneous equations Find the exact solutions of linear and quadratic simultaneous equations Draw a circle of radius r centred at the origin Find graphically the approximate solutions of linear and circular simultaneous equations Find the exact solutions of linear and circular simultaneous equations 	<ul style="list-style-type: none"> Find graphically the approximate solutions of quadratic and circular simultaneous equations. Find the exact solutions of quadratic and circular simultaneous equations. 	12: Algebra 2 20: Algebra 3	

YEAR 11 : SPRING TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Mensuration 4	4	<ul style="list-style-type: none"> • Mensuration – perimeter and area 1 and 2. • Mensuration – surface area and volume 1. 	<ul style="list-style-type: none"> • Find the surface area and the volume of more complex shapes, e.g. find the volume of an equilateral triangular prism • Solve more complex problems, e.g. given the surface area of a sphere find the volume • Understand formulae for perimeters, areas and volumes by their dimensions, know that e.g. $4\pi r^2$ cannot represent the volume of a sphere 	<ul style="list-style-type: none"> • Find the volume of a cylinder given its surface area, leaving the answer in terms of l. • Find the volume of a right hexagonal cone of side x and height h (researching the method for finding the volume of any cone). 	4: Shape 21: Dimensional analysis	

34 Lessons

YEAR 11 : SUMMER TERM

GENERAL TOPIC	HOURS	PRIOR KNOWLEDGE	OBJECTIVES – by the end of this module the student should be able to :	EXTENSION	CHAPTER	SECTION
Displaying Data 2	6	<ul style="list-style-type: none"> • Displaying data 1. 	<ul style="list-style-type: none"> • Complete a histogram from a frequency table • Complete a frequency table from a histogram • Use a histogram to work out the frequency in part of a class interval 	<ul style="list-style-type: none"> • Carry out a statistical investigation of their own and use an appropriate means of displaying the results. • Investigate how the choice of class width affects the shape of a distribution. 	11: Statistics 1	
Vectors	6	<ul style="list-style-type: none"> • Vectors to describe translations. • Algebra 1. 	<ul style="list-style-type: none"> • Understand that $2\mathbf{a}$ is parallel to \mathbf{a} and twice its length • Understand that \mathbf{a} is parallel to $-\mathbf{a}$ and in the opposite direction • Use and interpret vectors as displacements in the plane (with an associated direction) • Use standard vector notation to combine vectors by addition, e.g. $\mathbf{AB} + \mathbf{BC} = \mathbf{AC}$ and $\mathbf{a} + \mathbf{b} = \mathbf{c}$ • Represent vectors, and combinations of vectors, in the plane • Solve geometrical problems in 2-D, e.g. show that joining the mid-points of the sides of any quadrilateral forms a parallelogram 	<ul style="list-style-type: none"> • Harder geometric proof, eg Show that the medians of a triangle intersect at a single point. • Vector problems in 3-D (for the most able). • Use \mathbf{i} and \mathbf{j} (and \mathbf{k}) notation. 	25: Vectors	
Transformations 2	4	<ul style="list-style-type: none"> • Transformations 1. 	<ul style="list-style-type: none"> • Represent translations in the x and y direction, reflections in the x-axis and the y-axis, and stretches parallel to the x-axis and the y-axis • Sketch the graph of $y = 3 \sin 2x$, given the graph of $y = \sin x$ • Sketch the graph of $y = f(x + 2)$, $y = f(x) + 2$, $y = 2f(x)$, $y = f(2x)$ given the shape of the graph $y = f(x)$ • Find the coordinates of the minimum of $y = f(x + 3)$, $y = f(x) + 3$ given the coordinates of the minimum of $y = x^2 - 2x$ 	<ul style="list-style-type: none"> • Complete the square of quadratic functions and relate this to transformations of the curve $y = x^2$. • Use a graphical calculator/software to investigate transformations. • Investigate curves which are unaffected by particular transformations. • Investigations of the simple relationships such as $\sin(180 - x) = \sin x$, and $\sin(90 - x) = \cos x$. 	26: Transformation of graphs	

16 Lessons