GCSE Higher *(Italics – extension work for lower higher candidates)*

Module (time)	Contents		Notes
Number (8)	Recognise triangular, square and cube numbers Recall integer squares and corresponding square roots to 15 x 15 Recall the cubes of 2,3,4,5 and 10 Find multiples, factors , primes and primes factors Find prime factor composition of positive integers Use prime factors to find HCF and LCM Round to the nearest integer, to decimal places and to significant figures Select and justify appropriate degrees of accuracy* Recognise the limitations on the accuracy of measurement* Check and estimate answers to problems Terminating and recurring decimals Find a fraction equivalent to a recurring decimal		All of this work can be reinforced through starter activities. It is important that pupils know the difference between significant figures and decimal places, and take note of the required degree of accuracy required bt the question.
Substitution and formulae (6)	Use the order of operations, and the commutative, associative and distributive laws Four rules with negative numbers Substitute into algebraic formulae Generate a formula Generate common number sequences Generate number sequences using both term to term and position to term definitions Find the nth term ~(linear expression) Use function notation		It may be appropriate to make links with skills required for the coursework. It is helpful to relate triangular numbers to investigational activities and finding nth terms.

3D shapes, volumes and surface area (5)	Find areas of plane shapes using formula Nets of regular solids Find surface area of solids with triangular and rectangular faces Develop, know and use the formula for the volume of a cuboid Find volumes of shapes made from cuboids Find volume of prisms		There is a need to constantly revise the expressions for area/volume of shapes
Data handling (8)	Design questionnaires and criticise methods of using questionnaires ***Understand frequency density**** ***Construct histograms for grouped continuous data*** Calculate a mean from simple data Calculate a moving average Complete cumulative frequency tables Plot cumulative frequency diagrams Use cumulative frequency to find the median Use cumulative frequency to find quartiles and interquartile range Drawing box plots		Emphasis the need to use a continuous scale on the horizontal scale, and to label the axes. Emphasis the need to use the upper bound of the class interval in plotting points. Emphasis that the median, and quartiles are read off values. Emphasis that it is necessary to consider both an average and a measure of spread when comparing distributions.
Powers and Standard Index Form (6)	Use index notation Use indices in expressions Use index laws for x ÷ (integer powers) Use standard index form Convert between ordinary and standard index from representation Use standard index form to make estimates Calculate with standard index form Use a calculator for standard index form		There is now a greater emphasis on manipulative algebra at KS4

GCSE Higher *(Italics – extension work for lower higher candidates)*

Pythagoras theorem (3)	Use Pythagoras to find the hypotenuse Use Pythagoras to find the shorter sides Use Pythagoras to solve problems Calculate lengths of lines on a grid		Consult GCSE papers for types of questions. The orientation of the triangle may differ. Emphasis; the hypotenuse is the longest side, The length of the hypotenuse< the sum of the two sides
Algebraic expressions, and fractions (6)	Collect like terms Remove a single pair of brackets Factorise with single brackets Simplify expressions using the rules of indices Understand the term 'identity' Add and subtract fractions X ,÷ fractions ***Simplify expressions involving algebraic fractions***		It is important to develop a logical way to set our their algebraic manipulation
Percentages (8)	Interchange between %, fractions and decimals Find % and % change Find VAT, % profit or loss Use simple interest Multiply by a number between 0 and 1 Understand % as an operator Find 100% when another amount is known Solve % problems Solve reverse % problems Solve problems involving compound interest		Money should always be rounded to the nearest penny, except where this may be premature (compound interest). Pupils tend to answer compound interest questions incorrectly, either by using simple interest or calculating over a wrong number of years. All workings should always be shown
Geometry and trigonometry (6)	Angles in polygons Tangent, sine and cosine ratios Use the three ratios Angles of elevation and depression Bearings and trigonometry		Pupils sometimes have difficulty in correctly labelling the sides and therefore do not know which ratio to use. Emphasise the importance that the calculator is in the correct mode (degree), and that scale drawings will score 0.

Algebraic equations, and rearranging formulae (7)	Use inverse operations to solve equations Linear equations with integer or fractional coefficient Equations combining operations Solve equations with unknowns on both sides Solve equations using brackets and negative solutions Set up simple equations Use algebraic equations to solve problems Use trial and improvement to solve non linear equations Use inverse operations to rearrange formulae		Pupils can leave their answers in fractional form where appropriate. In 'trial and improvement' emphasis the need to justify the final answer by considering the half way value.
Transformation (5)	Reflect 2D shapes Rotate shapes through various angles and about various centres of rotations Use translations specified by a vector Enlarge shapes using various centres of enlargement and integer & non integer scale factors Enlargement calculations		Emphasis must be given to ensure that pupils describe transformations fully.
Handling data2 (6)	Identify trends in time series Compare shapes of distributions Compare distributions using measures of average and spread Use a calculator for statistical calculations Plot and interpret scatter diagrams Describe correlation from a scatter graph Draw and use a line of best fit		When plotting points or reading off a graphs pupils should take care to interpret the axes correctly. If possible in exams pupils should choose and easy scale for each axis. Pupils should check that their answers for mean, mode and median lie within the given range of data.

Algebraic graphs (6)	Plot graphs of functions leading to a straight line Calculate gradients of straight lines and explore parallel lines Recognise the y intercept of a straight line Explore graphs of the form y=mx+c Plot linear graphs from real life problems Interpret graphs representing real life Plot the graph of a quadratic function Plot graphs of cubic, **reciprocal and exponential functions** Recognise characteristics of graphs		Links with the science department may be beneficial.
Ratio and proportion (4)	Simplify ratios Relate ratio form to fractions Divide in a given ratio Unitary method **Use direct proportion** **Use inverse proportion**		Care must be taken to ensure that pupils are able to deal with ratios that use more that two quantities **Pupils to use formal notation $y \propto x$** **$Y=kx$**
Circles (7)	Recall terms relating to a circle Understand and use right angles between tangents and radius Understand and use tangents of equal lengths Explain why the perpendicular from the centre of a chord bisects the chord Calculate circumference **Calculate lengths of arcs** Recall formulae and calculate areas of circles **Calculate areas of sectors** **Use pi in exact calculations**		Π can be 3, 3.14 or 22/7 depending on accuracy or style of answer required. Answers on a non-calculator paper can be irrational.

Quadratics (9)	Expand brackets – two linear expressions Factorising quadratic equations and solve Find the difference of two squares Solve quadratic equations by using the difference of two squares Solve quadratic equations by using the quadratic formula Simplify expressions by cancelling common factors Find approximate solutions to quadratics using graphs Find approximate solutions to problems using graphs of complex functions		There may be a need to remove the HCF of trinomial before factorising to make the factorisation more obvious. Students should be reminded that factorisation should be used before the formula is used. In problem solving one of the solutions to a quadratic may not be appropriate.
Vectors (5)	***Understand and use vector notation*** ***Calculate the sum and difference of two vectors*** ***Calculate a scalar multiple of a vector*** ***Calculate the resultant of two vectors*** ***Represent graphically the sum and difference of two vectors*** ***Represent graphically a scalar multiple of a vector*** ***Solve simple geometrical problems in 2D using vector methods***		Pupils often find the pictorial representation of vectors more difficult than the manipulation of column vectors.
Simultaneous equations and inequalities (6)	Solve simultaneous equations using elimination Solve linear inequalities in one variable Solve linear inequalities in two variables and find the solution set Solve simultaneous equations using a graphical method		Inaccurate graphs can lead to incorrect solutions. Many pupils find locating regions difficult – it is often useful to identify a point and test to see if it fits the inequality. All workings need to show how coefficients are matched and eliminated

Congruence and transformation (4)	Understand similarity and congruence ***Prove the congruence of triangle using formal arguments*** Transform 2D shapes using a combination of transformations Recognise properties which are preserved under transformations		
Probability (7)	Estimate probability from theoretical models Use relative frequency Use the vocabulary of probability to interpret results Use probability estimates to compare results Select and justify a method of sampling* Understand the effect of sample size on probability estimates Understand the concepts of mutually exclusivity and independent events Know when to add or multiply probabilities Use tree diagrams to represent outcomes of compound events		Pupils can often lose marks due to an inability to manipulate fractions. Pupils do not always appreciate that some descriptions of probabilities cover more than one outcome.
Powers and surds (8)	Understand and use reciprocals Fractional and negative powers Recognise the relationship between fractions powers and roots Recall the zero power Use index laws for x ÷ of integers, fractional and negative powers Use surds and π in exact calculations ***Rationalising a denominator – simple*** ***Use powers to explore exponential growth and decay***		Where appropriate pupils will need to be able to move between power and surd or power and reciprocal forms.

Construction (5)	Construct triangles Construct a perpendicular bisector and find the midpoint of a line segment Construct perpendiculars to a line Bisect an angle Find loci Construct graphs of simple loci		All working should be clearly presented and accurate. A sturdy pair of compasses are required. Work on loci lends itself to practical activity.
Area and volume (6)	Solve problems involving surface area of more complex solids Solve problems involving volumes of more complex solids Solve problems involving more complex shapes and solids Understand the dimensions of formulae for perimeter, area and volume Understand the effect of enlargement on area and volume Convert between area and volume measurements		The notion of approximate similarity can be discussed, for example between infants and adults.
Sine rule, cosine rule and 3D (6)	***Use the sine rule*** ***Area of a triangle using sin C*** ***Use the cosine rule*** ***Use Pythagoras' theorem in 3D problems*** ***Use trigonometric relationships in 3D problems*** ***Angle between a line and a plane***		Pupils may need to be reminded that the sine rule and cosine rule are not to be used on right angle triangles. Reminders of simple geometrical facts may be helpful. Pupils find the cosine rule more difficult for obtuse angles.
Proportion and algebraic graphs (4)	***Set up equations involving proportion*** ***Graphical representation of equations involving proportion*** ***Construct graphs of simple loci, including the circle $X^2 + Y^2 = r^2$***		

Graphical solutions of an equation (4)	*Solve by substitution a pair of simultaneous equations (one non linear)*		
	Use simultaneous equations to calculate where a straight line graph meets a circle		
	Use graphs to solve a pair of simultaneous equations (one non linear)		
	Use graphs to show where a straight-line graph intersects a circle		
Graphs of functions (4)	*Draw sketch and describe the graphs of trigonometric functions*		Investigation of simple relationships such as sin (180-x) = sin x, and sin (90-x) = cos x can help.
	Apply transformations to the function y=f(x): y = f(x) + a		
	y = f(ax) y = f(x+a) y = af(x)		
	for linear, quadratic, sine and cosine functions.		
Circle theorem (5)	Prove and use circle theorem		LOCI questions may be used to introduce circle theorems.
	The angle subtended by an arc at the centre of a circle is twice the angle subtended at any point on the circumference		
	The angle subtended at the circumference by a semi circle is a r.a.		
	Angles in the same segment are equal		
	Opposite angles of a cyclic quadrilateral add up to 180 degrees		
	Explain why the perpendicular from the centre of a chord bisects the chord		
	Prove and use the alternate segment theorem		
Using a calculator (3)	Use a calculator effectively and efficiently for complex calculations		
	Use an extended range of calculator function keys		

GCSE Higher *(Italics – extension work for lower higher candidates)*