Hampshire Services
HIAS SCHOOL IMPROVEMENT

HIAS Maths Team

Year 11 Autumn Term 2020 Scheme of Learning

An outline plan designed to take account of the national school closures between March 2020 and June 2020.

May 2020
Final version

Introduction

This learning schedule is based on the Hampshire Mathematics Scheme of Learning and is designed to take account of the national school closures between March 2020 and July 2020. Learners will begin a new academic year in need of catch-up and consolidation, together with some new learning from the previous academic year that has been missed. This document focusses on the core skills , knowledge and understanding that an 'on-track' learner would be expected to bring to the next stage of their learning and acknowledges that, for many, the habits of learning and the facility to recall previously embedded knowledge will need attention. For this reason, the first elements of this Autumn Term plan address the end of year objectives from the previous year. As the term progresses, the plan seeks to integrate expected prior learning, previously assumed and now no longer can be, into the standard units from the original scheme. In this way, the aim is to build on what is known and recalled in a moderately accelerated way to help learners get back on track for the end of the 20/21 academic year.

Teachers will need to adapt this schedule to the needs of their learners and to the number of hours study allocated in the timetable to mathematics.

The Hampshire Mathematics team full scheme of learning for KS3 (Y7-Y9) offers long and medium-term maps plus linked units of work with key tasks and teaching points. This is available to schools subscribing to Moodle Plus (for further information, please click here).

The KS4 scheme of learning will be the GCSE schedule from a school's chosen examination board. This overview is developed using a blend of the three-year and two- year GCSE planning from AQA and Edexcel, taking gaps in learning and experience from missed lessons in Y9 into account. KS3 objectives are in black and any new KS4 objectives are in blue. It should be noted that there is considerable overlap with KS3 and the foundation tier objectives.
The use of past GCSE questions, initially at foundation level, will provide familiarisation and pitch for students and it is recommended that these resources from your exam board should be used as anchor questions to provide a secure start to a lesson as appropriate.

There is no distinction is this overview plan between foundation and higher tier topics.

It is not expected that all students will require, or cover, all suggested content.

It is for teachers to select from the schedule for individual students and groups of students as appropriate.

Year 11

Week commencing	Area of study	Objectives	Key teaching points/ facts focus/ 'Big Ideas'
Use past GCSE questions as starters or anchor tasks to build a lesson around so that students become familiar with appropriate format, pitch and expectations. Ensure that you model answers and use a variation of the original problem to build confidence and understanding.			
Thurs 03-09-2020	**START OF NEW ACADEMIC YEAR**		
Mon 07-09-2020	**Measure:** **Compound units**	**Convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts**	Density = mass / volume Speed = distance / time Pressure = force / area Develop understanding of the multiplicative relationships to support efficient strategies, including using an inverse and rearranging formulae.
Mon 14-09-2020	**Number:** **Approximation** **Accuracy** **Standard Form**	**Interpret, compare and calculate with numbers in standard form** **Convert between standard form and ordinary numbers.** **Apply and interpret limits of accuracy when rounding or truncating {including upper and lower bounds}**	Review fluency with conversion between ordinary and standard form Calculate areas and round to a given number of decimal places and significant figures Contextual word problems to introduce min/max area of a rectangle and then develop into more complex shapes. Allow students to find all possibilities rather than directing them to max/min values.

			Ensure examples/formula that involve division, exploring the 4 possible answers based on the upper and lower bounds
	Transformations	**Interpret and use fractional and negative scale factors for enlargements** **Describe the changes and invariance achieved by combinations of rotations, reflections and translations**	Ensure that students can describe transformations accurately (equation of line of reflection; centre/angle and direction of rotation; centre/ scale factor of enlargement; direction of translation either in words or with vectors as appropriate) Explore the effect of enlarging by negative and fractional scale factors.
Mon 21-09-2020	**Vectors**	**Describe translations as vectors** **Apply addition and subtraction of vectors, multiplication of vectors by a scalar, and diagrammatic and column representations of vectors** **Use vectors to construct geometric arguments and proofs.**	Model with diagrams, the effect of adding and subtracting two vectors and of multiplying a vector by a scalar Introduce vectors that are not on a coordinate grid, but rather describe a 'journey' (could be around a shape such as a regular hexagon). Explore simple arguments and proofs.

	Geometry: **Pythagoras** **Trigonometry**	**Use Pythagoras' Theorem and trigonometric ratios in similar triangles to solve problems involving right-angled triangles** **Apply angle facts, triangle congruence, similarity and properties of quadrilaterals to derive results about angles and sides, including Pythagoras' Theorem, and use known results to obtain simple proofs**	Revise Pythagoras' Theorem Explore a range of geometric and algebraic proofs and demonstrations. Use technology to model dynamic versions of this. Solve a range of abstract and real-life problems using Pythagoras' Theorem Explore Pythagoras in 3-D as appropriate Revise trigonometric ratios and the use of *SoHCaHToA* in right-angled triangles to find missing angles and sides if this has been covered in Y9. For some students, this may be an introduction, in which case spend more time exploring the relationship between the ratios of the sides and how this links to the angles before introducing sine, cosine and tangent ratios. Solve a range of abstract and real-life problems using right-angled triangles
Mon 28-09-2020	**Geometry:** **Circles** **Circle Theorems**	**Identify and apply circle definitions and properties, including centre, radius, chord, diameter, circumference, tangent, arc, sector and segment.**	Revise vocabulary associated with circles and introduce any new words (sector/segment/chord)

		Calculate arc lengths, angles and areas of sectors of circles **Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results**	Revise circle theorems: • Angle at the centre is twice the angle subtended at the circumference • Angle in a semi-circle is a right angle (special case of angle at the centre) • Angles in the same segment are equal • Cyclic quadrilaterals (opposite angels sum to 180^0) • Radius to a tangent • Tangents from a point to a circle • Alternate segment Integrate theorems with proof and problem solving to build up competency gradually
Mon 05-10-2020	**Geometry:** **Constructions** **Plans and elevations** **Bearings**	**Construct and interpret plans and elevations of 3-D shapes** **Interpret and use bearings**	Model the use of compasses and ruler to construct bisectors and angles Explore the construction of a kite using geometric reasoning about the diagonals Ensure that conventions for labelling angles, sides, equality and parallel are used consistently and accurately. Use both 180^0 and 360^0 protractors to solve problems involving bearings. Ensure students are clear on how the points of the compass link to bearings and that the 'North' line is always the starting point at 0^0

Mon 12-10-2020	**Algebra:** **Functions and graphs**	**Interpret and construct tables and line graphs for time series data** **Interpret the gradient of a straight-line graph as a rate of change.** **Recognise and interpret graphs and equations that illustrate direct and inverse proportion** **Interpret simple expressions as functions with inputs and outputs** **Interpret the reverse process as the 'inverse' function' and the succession of two functions as a 'composite function'**	Let students consider real-life scenarios represented as graphs and ask them to describe the 'story' of the graph. Use piece-wise functions to describe situations in which a rule or relationship changes as the input value crosses defined boundaries. Interpret the gradient and the y-intercept in the context of the problem. Explore and connect direct and inverse proportion graphs and equations. Solve problems involving proportion. Develop the use of function notation using f(x) (=y) through function machines and then and understanding of inverse and compound operations. Link to graphs of functions
Mon 19-10-2020	**Number:** **Integers, powers and roots** **Surds**	**Calculate with roots, integer and fractional indices** **Calculate exactly with fractions, surds and multiples of π**	Explore the equivalence of roots and fractional powers. Ensure $a^0 = 1$ is embedded. Explore the relationship between reciprocals and negative powers.

		Simplify surd expressions involving squares and rationalise denominators	For higher tier students, work with surds as exact values and model how the laws in indices and arithmetic still apply
	Geometry: **Area and volume**	**Calculate surface areas and volumes of spheres, pyramids, cones and composite solids.** **Apply the concepts of congruence and similarity, including the relationships between lengths, areas and volumes in similar figures.** **Compare lengths, areas and volumes using ratio notation and/or scale factors; make links to similarity**	Although it is not required to memorise all shape formulae, it is useful to gain familiarity with them and ensure that students can rearrange and substitute accurately into formulae Link similarity to enlargement Ensure that it is known that: • ASF = $(LSF)^2$ • VSF = $(LSF)^3$ Explore this idea in the context of lines, squares and cubes and allow students to build models to satisfy themselves that the scale factor relationship is proportional.
Mon 26-10-2020	**HALF TERM**		
Mon 02-11-2020	**Probability**	**Apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one.** **Use a probability model to predict the outcomes of future experiments; understand that empirical unbiased samples tend towards theoretical**	Review notation for Venn diagrams Ensure that the connection between experimental and theoretical probability is understood in terms of the number of trials. Construct sample space diagrams and tree diagrams using theoretical scenarios.

		probability distributions, with increasing sample size **Calculate the probability of independent and dependent combined events, including tree diagrams and other representations, and know the underlying assumptions** **Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables, tree diagrams and Venn diagrams**	Solve probability problems involving mutually exclusive and independent events. Solve probability problems involving mutually exclusive and independent events. For higher tier students , continue work on conditional probability and support understanding using tree diagrams to demonstrate how the probabilities change.
Mon 09-11-2020	**Statistics:** **Averages, charts and calculations**	**Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:** • **Appropriate graphical representation involving discrete, continuous and grouped data (including box plots)** • **Appropriate measures of central tendency (including modal class) and spread (including quartiles and inter-quartile range)**	Know when it is appropriate to group data Distinguish between categorical and numerical data Explore the same data represented on different charts or with different scales and discuss which is best and why Calculate and interpret mean, median, mode and quartiles for different data sets Calculate and interpret range and IQR for different data sets

	Statistics: **Stem and leaf, frequency tables** **Scatter graphs**	**Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:** • **Appropriate graphical representation involving discrete, continuous and grouped data (including box plots)** • **Appropriate measures of central tendency (including modal class) and spread (including quartiles and inter-quartile range)** **Use and interpret scatter graphs of bivariate data; recognise correlation and know that it does not indicate causation; draw estimated lines of best fit; make predictions; interpolate and extrapolate apparent trends whilst know the dangers of doing so.**	Model how to order data to construct the stem and leaf diagram, including the use of the key. Use this to identify measures of central tendency including quartiles Construct box plots and compare distributions using box plots Interpret scatter diagrams in the context of their correlation , ensuring that students can use the line of best fit to predict data points within the current range and beyond.
Mon 16-11-2020	**Statistics** **Sampling** **Cumulative frequency** **Histograms**	**Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling** **Construct and interpret diagrams for grouped discrete and continuous data i.e. histograms with equal and unequal class intervals**	Explore sampling a population in different ways and discuss how to make it as fair and representative as possible. For higher tier students, offer histograms with unequal class sizes where the frequency density scale is not given. Introduce ‘counting squares’ as an initial strategy for establishing the vertical (fd) scale

		and cumulative frequency graphs, and know their appropriate use **Interpret, analyse and compare the distributions of data sets from univariate empirical distributions through:** • **Appropriate graphical representation involving discrete, continuous and grouped data (including box plots)** • **Appropriate measures of central tendency(including modal class) and spread (including quartiles and inter-quartile range)**	
Mon 23-11-2020	**Algebra:** **Factorising, expanding and manipulation**	**Simplify and manipulate algebraic expressions, including those involving surds and algebraic fractions by:** • **Factorising quadratic expressions, including the difference of two squares and use the quadratic formula** • **Simplifying expressions involving sums, products and powers** **Know the difference between an equation and an identity**	Use the grid method to factorise linear equations and bar modelling to solve equations with unknowns on both sides for those students who are not yet secure with these procedures. Use algebra tiles to simplify and manipulate algebraic expressions and equations. (www.ncetm.org.uk/resources/53609) Use this idea to substitute into formulae and expressions. Problem-solve using compound measure formulae that need to be rearranged (since this always comes up in GCSE!) such as density= mass/volume and pressure = force/area

		Use algebra to support and construct arguments and proofs **Solve two simultaneous equations in two variables (linear and quadratic) using graphical and algebraic methods**	Review arithmetic with negative number and apply to algebraic arithmetic Review BIDMAS when substituting into formulae Ensure students know and can use the quadratic formula: $x = \frac{-b +/- \sqrt{(b^2 - 4ac)}}{2a}$ to solve quadratics $ax^2 + bx + c = 0$
Mon 30-11-2020	**Pythagoras** **Trigonometry**	**Apply Pythagoras' Theorem and trigonometric ratios to find angles and lengths in right-angled triangles and general triangles in two- and three-dimensional figures** **Know the exact values of sin θ and cos θ for θ = 0^0, 30^0,45^0,60^0,90^0** **Know the exact values of tan θ for θ = 0^0, 30^0,45^0,60^0** **Know and apply the sine rule and cosine rule to find unknown lengths and angles**	Sine rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ Cosine rule: $a^2 = b^2 + c^2 - 2bc \cos A$ Area: ½ ab sin C Ensure students can construct the (1,1, √2) right-angled triangle for 45^0 and the (2,2,2) equilateral triangle with perpendicular height of √3 for 30^0 and 60^0 For higher tier students, link ½ bh to ½ ab sin C as simple proof

		Know and apply the area rule to calculate the area sides or angles of any triangle.	
Mon 07-12-2020	**MOCKS**		
Mon 14-12-2020	**MOCKS**		
Mon 21-12-2020	**CHRISTMAS**		
Spring Term	**<u>Topics still to be covered in more depth (mainly higher tier)</u>** ***For foundation tier students January to April 2021 is an opportunity to build on and consolidate prior learning based on the outcomes of the mock examinations or teacher assessment.*** • **Equations of circles** • **Sequences and nth term of quadratics** • **Direct and indirect proportion (development work)** • **Iteration** • **Growth and decay problems** • **Area under a graph** • **Sketching and transformation of functions** • **Trigonometric graphs and transformation of trig graphs** • **Vector proofs (development work)** • **Simultaneous equations (development work)** • **Inequalities**		
May 2021	**GCSE Examinations**		

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