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 June 2020. Learners will complete one academic year and begin the next in need of catch-up and consolidation, together with some new learning from the previous months 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 latter part of the Summer Term focusses on units of work that have not yet been addressed from the Scheme of Learning due to school closures. To facilitate smooth transition and continuity and to provide an opportunity for consolidation, 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 KS1, 2 and 3 (Y1-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 the Moodle Plus

https://maths.hias.hants.gov.uk/

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.

Week commencing	Unit	Area of study	Objectives	Key teaching points/ facts focus/ 'Big Ideas'
Mon 25-05-2020			**HALF TERM**	
Mon 01-06-2020	**9.0**	**Number and calculation**	**Select and use appropriate calculation strategies to solve problems** **Use the four operations, including formal written methods, applied to integers, decimals and fractions**	Review and practise basic arithmetic. Use contextual and real-life scenarios and encourage the use of visual diagrams to represent problems alongside calculations Ensure students can represent numbers as fractions, decimals and percentages and are able to use the concept of equivalence effectively.
Mon 08-06-2020	**9.13**	**Number** **Powers and roots** **Standard form**	**Use integer powers and roots to solve problems** **Represent numbers in prime factor form** **Introduce fractional and negative powers** **Calculate and solve problems involving numbers in both ordinary and standard form**	Review and practise representing numbers in prime factor form, establishing that students know the prime numbers up to 100 Ensure students know or can derive square and cube numbers and associated roots Explore roots and fractional powers Explore negative powers / reciprocals Link work on indices to standard form representation Use 'the size of the solar system/world' type activity to explore using standard form (multiplying, dividing, converting from ordinary numbers)

				Show in full x10 x100 x1000 etc to show where the index number comes from. Link with science department including use of prefixes e.g. kilo, mega, giga, terra, milli, micro, nano Use Gattegno charts to support multiplying and dividing by powers of ten.
Mon 15-06-2020	**9.13**	**Number Accuracy**	**Apply appropriate calculation strategies and degrees of accuracy to increasingly complex problems** **Round numbers and measures to an appropriate degree of accuracy [for example, to a number of decimal places or significant figures].** **Use approximation through rounding to estimate answers and calculate possible resulting errors expressed using inequality notation a ≤ x< b**	Revise and practise approximations to calculations using rounding and significant figures. Discuss and compare when it is appropriate to use these representations. Start with More or Less from Nrich: https://nrich.maths.org/6145 which explores whether estimates of physical quantities are accurate? NCETM Teaching for Mastery document, https://www.ncetm.org.uk/news/51079 includes: The population in England is 53 million, rounded to the nearest million. – What is the largest that the population could be? – What is the smallest that the population could be? – Explain how you decided. Then onto a more traditional approach for resulting errors using Rough Rectangle: https://nrich.maths.org/13715 Ensure you have examples/formula that involve division, exploring the 4 possible answers based on the upper and lower bounds.

Mon 22-06-2020	**9.11**	**Algebra Graphs and Functions**	**Work with all four quadrants** **Model situations or procedures by translating them into algebraic expressions or formulae and by using graphs.** **Recognise, sketch and produce graphs of linear and quadratic functions in one variable.** **Find contextual approximate solutions to problems from the given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs.**	Ensure that students are secure with the general forms of a straight line (y=mx+c) and a quadratic function ($y= ax^2+ bx + c$) and can generate a table of values from which to plot graphs We use piecewise functions to describe situations in which a rule or relationship changes as the input value crosses certain "boundaries." Give students the opportunity to consider real life graphs discussing the context and asking 'What do you notice? What do you wonder?' Introduce exponential and reciprocal graphs as appropriate.
Mon 29-06-2020	**9.12**	**Pythagoras**	**Use Pythagoras' Theorem in similar triangles to solve problems involving right-angled triangles** **Reason deductively in geometry** **Apply elementary knowledge to multi-step ad increasingly sophisticated problems.** **Introduce Pythagoras' Theorem in 3-D**	Practise squaring and square rooting different numbers with a calculator. Discuss when it is appropriate to round an answer and what impact that will have on the accuracy of the final solution. Ensure students know and can use Pythagoras' Theorem to find missing sides in right-angled triangles. Solve contextual problems to find missing lengths. Including 3-D work as appropriate.

Mon 06-07-2020	**9.12**	**Trigonometry**	**Use trigonometric ratios in similar triangles to solve problems involving right-angled triangles** **Introduce trigonometric function graphs (y=sin x ; y=cos x; y = tan x)** **Introduce exact trigonometric values using a right-angled isosceles triangle and an equilateral triangle**	Revisit SoH CaH ToA Ensure students are able to find missing sides and angles using sine, cosine and tangent functions in right angled triangles Explore trig values using a calculator and use this to construct the three graphs As appropriate, model how to find exact values using triangles.
Mon 13-07-2020	**9.14**	**Probability**	**Enumerate sets and unions / intersections of sets systematically, using tables, grids and Venn diagrams** **Solve probability problems and calculate theoretical probabilities using sample space and tree diagrams for mutually exclusive and independent events**	Ensure students can use the notation for Venn diagrams. Spend time working through questions where the information is presented in tables and Venn diagrams including finding the probability of an event. Further challenges can be found at mathsvenns.com. Review theoretical probability and discuss the connection between the number of trials and experimental probability outcomes. Work on questions that involve drawing sample space and simple tree diagrams from given examples. Solve probabilities for mutually exclusive and independent events, sing every day contexts where possible.
Mon 20-07-2020	**SUMMER HOLIDAY COMMENCES THURS 23-07-2020**			

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:** **Ratio and proportion** **Compound units**	**Change freely between standard units such as time, length, area, volume/capacity and mass.** **Use compound units such as density to solve problems** **Convert between related compound units (speed, rates of pay, prices, density, pressure) in numerical and algebraic contexts**	Use visual models such as 'four corners' (the box method) to support conversion between units 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**	**Use approximation through rounding to estimate answers and calculate possible resulting errors using inequality notation $a \leq x < b$** **Apply appropriate calculation strategies and degrees of accuracy to increasingly complex problems** **Calculate and solve problems involving numbers in both ordinary and standard form.**	Review fluency with conversion between ordinary and standard form Calculate areas and round to a given number of decimal places and significant figures Model a length 'to the nearest….' and show how knowledge of rounding helps us to decide to go half a unit either side of the given value (up to but not including the uppermost bound) 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

		Apply and interpret limits of accuracy when rounding or truncating {including upper and lower bounds}	Ensure examples/formula that involve division, exploring the 4 possible answers based on the upper and lower bounds
Mon 21-09-2020	**Geometry: Pythagoras**	**Use Pythagoras' Theorem in right-angled triangles to solve problems** **Use trigonometric ratios in right-angled triangles to solve problems**	Revise Pythagoras' Theorem and 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 including 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.** **Calculate arc lengths, angles and areas of sectors of circles**	Revise vocabulary associated with circles and introduce any new words (sector/segment/chord) Explore 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

		Apply and prove the standard circle theorems concerning angles, radii, tangents and chords, and use them to prove related results	• Cyclic quadrilaterals (opposite angels sum to 180^o) • 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**	**Derive and use the standard ruler and compass constructions** • **Perpendicular bisector of a line segment of a given line** • **Constructing a perpendicular bisector at a given point** • **Bisecting a given angle** • **Triangles given three side lengths** **Recognise and use the perpendicular distance from a point to a line as the shortest distance to the line.** **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 Solve a range of abstract and real-life problems that involve geometric constructions. Ensure that conventions for labelling angles, sides, equality and parallel are used consistently and accurately. Use both 180^o and 360^o 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^o

Mon 12-10-2020	**Algebra: Functions and graphs**	**Find contextual approximate solutions to problems from the given graphs of a variety of functions, including piece-wise linear, exponential and reciprocal graphs** **Solve problems involving functions and graphs. Move fluently between different mathematical representations including algebra, graphs and diagrams.** **Model real-life situations by translating them into 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 that illustrate direct and inverse proportion**	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.
Mon 19-10-2020	**Number: Integers, powers and roots**	**Apply appropriate calculation strategies and degrees of accuracy to increasingly complex problems** **Use integer powers and roots to solve problems** **Use fractional and negative powers and roots to solve problems**	Explore the equivalence of roots and fractional powers Explore the relationship between reciprocals and negative powers Ensure $a^0 = 1$ is embedded. Use Gattegno charts to support understanding Use conventional notation for recording powers and roots.

	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**	**Enumerate sets and unions/intersections of sets systematically, using tables, grids and Venn diagrams** **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 probability distributions, with increasing sample size**	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.

		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. Introduce conditional probability and support understanding using tree diagrams to demonstrate how the probabilities change.
Mon 09-11-2020	**Statistics: Averages, charts and calculations**	**Describe, interpret and compare measures of central tendency and spread** **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

Mon 16-11-2020	**Statistics:** **Stem and leaf, frequency tables** **Scatter graphs**	**Construct and interpret tables, charts and diagrams including stem and leaf diagrams and frequency tables** **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 23-11-2020	**Algebra:** **Factorising, expanding and manipulation**	**Substitute numerical values into formulae and expressions, including scientific formulae** **Understand and use the concepts and vocabulary of expressions, equations, inequalities, terms and factors**	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.

		Simplify and manipulate algebraic expression to maintain equivalence by: • **Collecting like terms** • **Multiplying a single term over a bracket** • **Taking out a common factor** • **Expanding two or more binomials** **Rearrange formulae to change the subject** **Model situations or procedures by translating them into algebraic expressions or formulae**	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 Review arithmetic with negative number and apply to algebraic arithmetic Review BIDMAS when substituting into formulae
Mon 30-11-2020	**Transformations**	**Identify properties of, and describe the results of translations, rotations, reflections and enlargements (with integer scale factors) applied to given figures** **Interpret and use fractional and negative scale factors for enlargements** **Describe the changes and invariance achieved by combinations of rotations, reflections and translations** **Describe translations as vectors**	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 07-12-2020	**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 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)**	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
Mon 14-12-2020	**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.
Mon 21-12-2020	**CHRISTMAS**		