Mathematics Department: Yearly Overview Plan 2019-2020

Year 9- Students will be expected to master the objectives highlighted in yellow. This ranges from grade 2-4.

Unit	Learning Outcomes *Students will…*			Real World Application	Assessment Methods
H1. Decimals	H1.3A	Round to significant figures or decimal places	2	We use estimation to make sure we have enough money when we go shopping. For example 10.35AED, 17. 60AED so I am going to need 30AED at the shop.	In mathematics, students' ability will be assessed as a whole against the IGCSE 9-1 framework, rather than assessed in each individual unit. Students will be continually assessed against the IGCSE 9-1 framework throughout the year, through both **formative** and **summative** assessment: **Formative assessment** **Ongoing** Classwork Homework Use of fpsmaths.com **Summative assessment** **Term 1/2/3** Year 9 Topic assessments after each unit (Number, Algebra, Geometry and Statistics) *IGCSE Assessment 1* Foundation/higher tier graded assessment paper **Week commencing 24th November 2019** *IGCSE Assessment 2* Foundation/higher tier graded assessment paper
	F1.8B	Estimation	3		
	F1.8D	Use a scientific calculator	3		
	F1.11A	Convert recurring decimals into fractions	6		
H2. Special numbers and powers	F1.4D	Product of prime factors	4	Prime numbers are used in one of the most common encryption schemes, the RSA algorithm. Which is used to protect hackers from getting your bank details.	
	F1.4E	Find the HCF and LCM	4		
	H1.4A	Understand the meaning of surds	6		
	H1.4C	Index laws for integers (negative/fractional)	6		
	H1.4B	Manipulate surds & rationalise a denominator	7		
H3. Fractions	F1.2E	Express a number as a fraction of another number	2	If you have a mixing bowl that has the capacity to hold two cups, and you need to blend 2/3 cup of honey, 1/4 cup of milk, and 1/2 cup of water, so will it fit in the bowl?	
	F1.2G	Convert a fraction to a decimal or percentage	2		
	F1.2D	Order fractions and fraction of an amount	3		
	F1.2F	Add and subtract fractions	4		
	F1.2I/F1.2H	Multiply and divide fractions	4		
H4. Percentages	F1.6B	Express a number as a percentage of another number	2	Investigating percentage profit and loss, when buying houses, renovating them and selling them on	
	F1.6C	Express a percentage as a fraction/decimal	2		
	F1.6D	Use multipliers	3		
	F1.6E	Percentage of an amount, increase and decrease	4		
	F1.6F	Reverse percentages	5		

	F1.6G/H1.6B	Compound interest and depreciation	5		**Week commencing 23rd February 2020** *Year 9 PTM* Computer based assessment in mathematics **May 2020** *IGCSE Assessment 3* Foundation/Higher tier graded assessment paper **Week commencing 23rd May 2020**
	H1.6A	Use repeated percentage change	6		
H5. Ratio and proportion	F1.7A	Simplifying ratio	3	Cooking- using a recipe and scaling the quantities for the right amount of people who you are cooking for. Exchanging currency- deciding whether it is better to buy an iPhone in one country or another.	
	F1.7B	Divide a quantity in a given ratio	3		
	F1.7D/F1.7C	Direct proportion with unknown quantities (recipes etc)	3		
	F1.7E/F1.10A	Worded problems for ratio/proportion	4		
	F1.10B	Mass, length, area, volume and capacity	4		
	F1.10C	Calculations including time, money and converting currencies	5		
H6. Indices and standard form	F1.4C	Index laws for integers	4	We use standard form to show very large numbers and very small numbers when we are measuring things. For example, measuring the diameter of the Sun, measuring the length of a microorganism	
	F1.9A	Standard form basics	5		
	H1.9A	Solve problems involving standard form	6		
H7. Degree of accuracy	F1.8C	Identify upper and lower bounds	3	How can I compete in a 100m race and get a time of 15.2 and next time I beat my time but still get 15.2?	
	H1.8A	Solve problems using upper and lower bounds	7		

H8. Set language, notation and Venn diagrams	F1.5A	understand the definition of a set	3	When we use eBay or any other shopping search engines, set theory is involved. If systems like eBay stored all of their items in one giant database set, then it would take much longer than a couple of seconds to get a response to our search query. What these computer systems do is split up their data into several separate sets, such as all of the Products for Australia, all the cars for Australia, all of the Toyota Cars for Australia, and so on. When we do the search query shown above, the eBay computer searches its database and finds the intersection or "join" of two sets:	
	F1.5B	use set notation for elements	3		
	F1.5C	understand universal sets & empty sets	4		
	F1.5D	understand and use the complement of a set	4		
	F1.5E	use Venn diagrams to represent sets	4		
	F6.3D	find probabilities from a Venn diagram	5		
	H1.5A	understand sets in algebraic terms, and use subsets	6		
	H1.5B	use Venn diagrams to represent sets & the number of elements	6		
	H1.5C	use the notation n(A) for the number of elements in the set A	6		
	H1.5D	use sets in practical situations	6		
H9. Algebraic manipulation	F2.1D	use index laws with algebraic terms (x and ÷)	3	Powers of 2 are used in binary code	
	F2.2B	collect like terms- adding and subtracting	3		
	F2.2C	Expanding a single bracket	3		
	F2.2D	factorise with a single bracket	3		
	H2.1A	use index laws for fractional, negative and zero powers	5		
	H2.2A	Expand double and triple brackets	5		
	H2.2B	Factorise quadratic expressions	6		

	H2.2C	add, subtract, multiply or divide algebraic fractions				7	
	H2.2D	complete the square for a quadratic expression				7	
	H2.2E	use algebra to support and construct proofs				7	
H10. Expressions, formulae and rearranging formulae	F2.3C	Substitution				3	Rearranging scientific formulas
	F2.3D/ F2.3E	Write formulae & expressions from real-life contexts				4	
	H2.3A	Rearranging the subject of the formula				7	
	H2.5A	Direct and inverse proportion				7	
H11. Linear equations and inequalities	F2.4B	set up linear equations from given data				4	Inequalities - constraints in a business. E.G I Can make up to 500 footballs but I have to make at least 200. Linear programming to find the optimal solution given lots of inequalities, optimal solutions are given when you find the region that satisfies all inequalities on a graph
	F2.8C	solve linear inequalities with one variable				4	
	F2.4A	solve linear equations				5	
H12. Sequences	H3.1A	Understand what d & a is in an arithmetic sequence				4	Simple interest is an example of an arithmetic sequence
	H3.1B	Know and use nth term = a + (n – 1)d				5	
	H3.1C	Find the sum of arithmetic series (Sn)				6	

H13. Real life graphs	F3.3A	Interpret linear and non-linear graphs	5	Linear relationships can be modelled on a graph, for example profit and sales.	
H14. Linear graphs	F3.3E	Find the coordinates of the midpoint of line	4	Inequalities- constraints in a business. E.G I Can make up to 500 footballs but I have to make at least 200. When there are several constraints you have to draw them onto a graph to see what the feasible solutions	
	F3.3G	find the gradient of a straight line	4		
	F3.3I	Plot linear graphs	4		
	F2.8D	Represent linear inequalities on a graph	4		
	H3.3F	calculate the gradient of a line given two points	5		
	F3.3H	Find the equation of a straight line in the form y=mx+c	5		
	F2.8E/ H2.8B	Identify a region on a graph defined by linear inequalities	5		
	H3.3G	find the equation of parallel or perpendicular lines to a given line	6		
H15. Quadratic Equations and Graphs	F2.2E	Expand double brackets	4	A ball is thrown straight up, from 3 m above the ground, with a velocity of 14 m/s. When does it hit the ground?	
	F2.2F	Factorise quadratic expressions	5		
	F2.7A	Solve quadratic equations by factorization	5		
	F3.3J	Draw quadratic functions	5		
H16. Harder Graphs &Transformations of Graphs	H3.3A	Draw graphs of polynomial & trigonometric functions	8	Examining the construction of suspension bridges. Students will explore multiple representations of quadratic functions. To change the height of the towers and the height of the	
	H3.3B	Perform graph transformations	8		
	H3.3C	Analyse transformations of functions & write the functions	8		
	H3.3D	find the gradients of non-linear graphs	8		
	H3.3E	Find points of intesection for linear & non linear graphs	8		

<table>
<tr><td></td><td></td><td>cable above the bridge surface to form a vertical

translation. Changing the distance between the towers or just the height of the towers would result in a stretch or compression.</td><td></td></tr>
<tr><td>H17. Simultaneous Equations</td><td><table>
<tr><td>H2.6A</td><td>Solve linear simultaneous equations</td><td>6</td></tr>
<tr><td>H2.6B</td><td>Solve simultaneous equations graphically</td><td>6</td></tr>
<tr><td>H2.7D</td><td>solve linear and quadratic simultaneous equations</td><td>8</td></tr>
</table></td><td>You want to find out the better deal when renting a car. One company charges $30 per day and 40 cents per mile. Another company charges $45 per day and 30 cents a mile. If you can determine when the costs are the same, you can then know which would be the better deal. So you set m = total miles to be driven and c = total cost for each company. Then c = 30 + 0.40 m and c = 45 + 0.30 m. It follows that 30 + 0.40 m = 45 + 0.30m and m = 150. The cost of each company would be the same at 150 miles. Under 150 miles, the first company is cheaper. Above 150 miles, the second company is cheaper.</td><td></td></tr>
<tr><td>H18. Function Notation</td><td><table>
<tr><td>H3.2A</td><td>understand the concept of a function</td><td>7</td></tr>
<tr><td>H3.2B</td><td>use function notations of the form f(x) = … and f : x a …</td><td>7</td></tr>
</table></td><td>A local youth group is planning a trip to a local amusement park. They are taking their school bus which holds 32 people. It</td><td></td></tr>
</table>

H3.2C	Find values to be excluded from a domain	7	
H3.2D	Find the composite function fg & the inverse function f -1	8	

will cost $25 for parking and tickets to enter the park are $22.50 per person. The equation that models this situation is: c(n) = 22.5n + 25, where c represents the cost for
the group to go the park and n represents the number of people who go on this excursion. In this problem, for the domain, the problem says that the bus can only hold 32 people,
so I know that my domain has to be less than or equal to 32. However, since negative
numbers are also less than 32 and I can't have negative people (my independent variable), I have to have a lower limit on my domain of 0.
To find the range values, I simply use the limits I set on the domain and substitute those
values into my equation to find my limits on the range.

H3.4A	understand the concept of a variable rate of change	7	
H3.4B	differentiate integer powers of x	7	

A car goes around a turn of radius 30 meters at a constant speed of 50 km/h. What is the acceleration of

H19. Calculus	H3.4C	Determine gradients, rates of change, stationary points, turning points	8	the car? (Answer: 6.43 m/s^2)	
	H3.4D	distinguish between maxima and minima by using the graph	8		
	H3.4E	apply calculus to linear kinematics and to other problems	8		
H20. Compound measures	F4.9A/F4.10A	Metric conversion (length/area/volume)	3	One well-known application of density is determining whether or not an object will float on water. If the object's density is less than the density of water, it will float; if its density is less than that of water, it will sink. Ships can float because they have ballast tanks that hold air; these tanks provide large volumes of little mass, thus decreasing the density of the ship. Together with the buoyant force that the water exerts on the ship, this reduced density enables the ship to float. In fact, submarines dive below the surface of the water by emptying their ballast tanks.	
	F4.4F	Speed, distance and time	4		
	F4.4G	Speed, density and pressure	4		
H21. Geometry of shapes	F4.1D	Types of triangles and their properties	2	Any form of tiling involves polygons. The tiles need to tessellate to cover an area without leaving any gaps. This is directly connected to the angle properties of polygons.	
	F4.1B	Intersecting, parallel lines and angles on a straight line	3		
	F4.1C	Angles in a triangle	3		
	F4.2B/ F4.2C	Quadrilateral facts and properties	3		
	F4.7A	Problem solving with shapes with informal reasons	3		
	F4.2D	Interior and exterior angles of regular polygons	4		
	F4.2E	Angle sum of polygons	4		

H22. Constructions and bearings	F4.11B/F4.5C	Use maps and scale drawings to solve problems	2	Bisecting angles and other geometrical constructs are used by architects when they are drafting the designs of buildings.	
	F4.4D/F4.4E	Measure an angle including 3 figure bearings	2		
	F4.9A/F4.10A	Convert measurements within the metric system	3		
	F4.5B	Construct 2D shapes using a mathematical equipment	3		
	F4.5D	Perpendicular bisector of a line and bisect an angle	4		
H23. Perimeter, area and volume	F4.9C	Area of triangles and rectangles	2	Calculating the surface area of three boxes which have the same volume, which one should you use for packaging?	
	F4.9B	Perimeter of shapes	3		
	F4.9D	Area of parallelograms and trapezia	4		
	F4.10C	Surface area of triangles/rectangles	5		
	F4.10D	Surface area of a cylinder	5		
	F4.10E	Volume of prisms	5		
	H4.9A/F4.9E	Area and circumference of circles/semicircles/sectors	5		
	H4.10A	Surface area & volume of a sphere and cone	6		
H24. Pythagoras' theorem and trigonometry	F4.8A	Pythagoras' theorem in two dimensions	4	When builders are building extensions they measure the walls and the diagonal to ensure that the set out is at a right angle.	
	F4.8B/F4.8C	Trigonometry in two dimensions	5		
	H4.8B	Angles of elevation and depression	6		
	H4.8A	Trigonometry with obtuse angles	7		

H25. Transformations	F5.2G/F5.2F	Translate a shape using left/right	2	Real life examples of enlargements/reductions are: architectural perspective, scaled house plans and machinery parts' design, enlarging and reducing images on a computer
	F5.2B/F5.2A/F5.2C	Rotate a shape about a point through a given angle	3	
	F5.2E/F5.2D	Use a mirror line to reflect and construct	3	
	F5.2H	Translate a shape using column vectors	3	
	F5.2L/F5.2J/F5.2K	Enlarge a shape given the scale factor given a centre	4	
	F5.2M	Identify and give complete descriptions of transformations	4	
H26. Circle theorems	H4.6B	Understand the term 'cyclic quadrilateral'	6	When designing the wheels of a car. The designer has to make sure that everything is in proportion and works with unity.
	H4.6A	Intersecting chord properties	7	
	H4.6C	Angle properties of the circle	7	
H27. Advanced trigonometry	H4.8D	Pythagoras' theorem in three dimensions	6	When designing the roof of a building you need to measure the lengths of the sides and angles. The smaller the angle the less material you need which has financial implications. But the steeper the slope the better the building copes with rain/ snow etc
	H4.8E	Area of a triangle using 1/2absinc	7	
	H4.8F	Trigonometry in three dimensions	8	
	H4.8C	Sine and cosine rule	8	
H28. Similar shapes	F4.2F/4.2G	Congruent shapes	3	Similar shapes are used when creating scale models and actual buildings, in the design process. UAE real life- the UAE flag has to have the right proportion of red, green and black which is really important for flag
	F4.11A	Similar shapes using lengths	4	
	H4.11A	Similar shapes using area	6	
	H4.11B/H4.11C	Similar shapes using volume	6	

			day when we see lots of different sized flags
H29. Vectors	H5.1A/H5.1B	Understand and use vector notation	7
	H5.1C	Multiply vectors by scalar quantities	7
	H5.1D	Add and subtract vectors	7
	H5.1E	Modulus (magnitude) of a vector	8
	H5.1F	Resultant of two or more vectors	8
	H5.1G	Simple geometrical proofs	8
			Airplane pilots receive instructions to land at airports. During a visual approach, the Air Traffic Control instructs pilots to fly a particular heading(direction) for a certain distance(magnitude). This is exactly what a vector quantity is- something that has a magnitude and direction. This is why the Air Traffic Controllers might sometimes use the phrase " expect vectors for the visual approach..." when the plane nears the airport. https://www.youtube.com/watch?v=eGSt0tf0YHk
H30. Graphical representation of data	H6.1B	construct cumulative frequency diagrams from a table	6
	H6.1A	construct and interpret histograms	7
			In football when you look at the cumulative goals scored in a season
H31. Statistical measures	F6.2A / F6.2B	calculate the mean, median, mode & range for discrete data	2
	F6.2D	identify the modal class for grouped data	3
	F6.2C	calculate an estimate for the mean for grouped data	4
	H6.1C / H6.2A / H6.2D	estimate the median & interquartile range from a cumulative frequency diagram	6
			We use these measures when setting classes, we want to make the range of results as small as possible so that the teacher can plan the most appropriate lessons as possible. The mean/ median/ mode can

	H6.2B /H6.2C	find the interquartile range from a discrete data set	6	be used to compare how each class is performing	
H32. Probability	F6.3C	Use estimates of probability from theoretical models	3	In this case, event A is the event you have this disease, and event B is the event that you test positive. Thus P(B. not A) is the probability of a "false positive": that you test positive even though you don't have the disease.	
	F6.3G	Estimate probabilities from previously collected data	3		
	F6.3H	calculate the probability of an event not happening	3		
	F6.3J	understand and use the term 'expected frequency'	3		
	F6.3I	use the addition rule of probability	4		
	F6.3E	Find the probability of an event from a sample space	4		
	H6.3A	draw and use tree diagrams	7		
	H6.3B	find the probability that multiple independent events occur	7		
	H6.3C	use simple conditional probability when combining events	7		
	H6.3D	apply probability to problems	7		