Mathematics Syllabus

Form 3 Track 3

Contents

Form III – Track 3: Number and Applications (i)						
Formula One Maths C2						
Ch	Mod	**Learning Outcome:**	Pg	Level	SEC	Notes
1	NA1	i. Work out the percentage increase/decrease using a multiplying factor.	2		Core	
	NA1	ii. Carry out reverse percentage calculations.				E.g. to find the cost price given the selling price and the percentage profit.
	NA1	iii. Solve problems involving percentages.				E.g. profit and loss, discount, tax, and percentage error.
1	NA2	i. Use percentages to calculate the simple interest on a sum of money.	8		Core	E.g. for one year without using the formula.
	NA2	ii. Extend the notion of calculating the simple interest for a period longer or shorter than one year.				E.g. using half yearly fractions or multiples thereof E.g. 18 months.
	NA2	iii. Use the formula, or a variation of it, to find the simple interest, the principal sum, the rate, the time or the amount.				E.g. $I = \frac{PTR}{100}$, $A = P + I$.
	NA2	iv. Use a calculator and/or a spreadsheet to investigate the effect of changing the principal, rate or time on simple interest.				
8	NA3	i. Divide quantities in a given ratio.	74		Core	
	NA3	ii. Find missing quantities in a given ratio.				
	NA3	iii. Understand and use the elementary ideas of direct and inverse proportion.				• Include calculating an unknown quantity from quantities that vary in direct or inverse proportion using the unitary method.
	NA3	iv. Use direct and inverse proportion to calculate speed/average speed/ distance/time.				• Refer to Formula One C1, pages 8, 9.
10	NN4	i. Add and subtract fractions/mixed numbers.	94		Core	Students learn:
	NN4	ii. Multiply and divide fractions/mixed numbers.				• the meaning of these terms: common denominator, equivalent, reciprocal, and cancelling.
14	NN5	i. Understand that a negative power will give the reciprocal of the number.	132		Core	
	NN5	ii. Understand and use a^n for multiplication and division where a is a positive number and n is an integer.				• Understand that any number raised to the power of zero equals one.
	NN5	iii. Write ordinary numbers in standard form and vice versa.				• Learn to use the 'EXP' key on the calculator.
16	NN6	i. Round numbers to a given number of significant figures.	146			• Students learn to use the calculator appropriately and efficiently while at the same time employ suitable procedures to check the result displayed on the calculator. • Exclude the notion that a measurement to a given degree of accuracy is in fact a range of values.
	NN6	ii. Choose reasonable approximations.				
	NN6	iii. Carry out rough estimates to check accuracy.				

Form III - Track 3: Number and Applications (ii)						
Formula One Maths C2						
Ch	Mod	**Learning Outcome:**	Pg	Level	SEC	**Notes**
17	NN7	i. Be able to identify planes of symmetry.	156		Coe	• Students are expected to be able to draw the net of solids having one or more planes of symmetry.
20	NN8	i. Use the number line to illustrate simple cases of inequalities.	176		Core	E.g $x \geq 6$, $x < -5$, $-5 < x \leq 1$
25	NA9 NA9	i. Use scales and weights in investigations. ii. Use polygons to create tessellations and polygon rings.	219		Core	

Form III - Track 3: Algebra(i)							
Formula One Maths C2							
Ch	Mod		**Learning Outcome:**	Pg	Level	SEC	Notes
2	AL1	i.	Factorise fully expressions by taking out the highest common factor.	12		Core	
	AL1	ii.	Use and interpret positive integral indices and zero; use the index laws in simple instances.				
	AL1	iii.	Multiply a bracket by a single term.				
	AL1	iv.	Expand two brackets of the form $(x \pm a)(x \pm b)$ and $(x \pm a)^2$.			Ext	
	AL1	v.	Simplify and/or factorise more complicated non-linear expressions.				E.g. $5a^2 + 3a + 2a + 7a^2$ $9ef^6 \times 4e^2f$ $\frac{15x^2y^5}{5xy^3}$
4	AL2	i.	Solve linear equations in one unknown.	34		Core	• Include the use of brackets and simple fractions with numerical denominators.
	AL2	ii.	Solve problems by forming linear equations in one unknown.				
	AL2	iii.	Introduce the use of trial and improvement method to solve equations correct to 1 d.p.			Ext	E.g $x^2 \pm x = c$ $x^3 \pm x = c$
6	AL3	i.	Generate terms of a sequence, given the formula, for the n^{th} term and the value of n.	56		Core	
	AL3	ii.	Use algebraic expressions to describe the n^{th} term of a linear sequence.				• In the form $\pm an \pm b$.
	AL3	iii.	Generate number patterns on a spreadsheet.				• Students are given the opportunity to use a spreadsheet to generate sequences of numbers that they can describe both verbally and algebraically.
	AL3	iv.	Recognise spatial patterns associated with square, rectangular and triangular numbers.				
9	AL4	i.	Solve two simultaneous equations graphically.	82		Core	
	AL4	ii.	Solve two linear equations simultaneously.				
	AL4	iii.	Solve problems leading to the solution of simultaneous linear equations.				
10	AL5	i.	Simplify algebraic fractions by taking out the common factors and cancelling.	92			

Form III – Track 3: Algebra (ii)						
Formula One Maths C2						
Ch	Mod	**Learning Outcome:**	Pg	Level	SEC	Notes
11	AL6	i. Generate and plot coordinate pairs that satisfy a linear rule.	98		Core	• Students are given opportunities to use a spreadsheet and/or a CAS to explore algebraic relationships graphically. For example, by graphically representing the relationship of the form $y = mx + c$, students appreciate that by changing the values of m and/or c, the gradient and/ or y-intercept of the line is changed accordingly.
	AL6	ii. Understand, interpret and calculate the gradient of a line from the coordinates of two points on the line.				• Obtain the equation of a straight-line from a given linear graph.
	AL6	iii. Understand how the gradient and the y-intercept are connected to $y = mx + c$.				• Obtain the gradient and y-intercept of a straight-line from its equation and vice versa.
	AL6	iv. Draw quadratic graphs and identify maxima/minima.				
	AL6	v. Use quadratic graphs to solve equations of the form $f(x) = c$.				
15	AL7	i. Evaluate practical formulae by substituting variables with numbers.	140		Core	• Students are encouraged to interpret the results.
	AL7	ii. Change the subject of the formula involving more than one operation.				• Exclude formulae where the power of the required subject, in the given formula, is not one. E.g. Exclude: Make r the subject of the formula in $v = \pi r^2 h$.
18	AL8	i. Draw and interpret linear and non-linear graphs arising from real-life situations.	162		Core	E.g. distance-time and velocity-time graphs; conversion graphs of height against age. • Exclude the interpretation of the gradient.

Form III - Track 3: Shape, Space and Measurement (i)							
Formula One Maths C2							
Ch	Mod		**Learning Outcome:**	Pg	Level	SEC	Notes
5	GG1	i.	Solve problems involving the angles of triangle and quadrilaterals.	44		Core	
	GG1	ii.	Derive the sum of the exterior/interior angles of a polygon.				• Use a formula such as $[2n - 4]$ right angles or $(n - 2) \times 180°$.
	GG1	iii.	Draw the inscribed regular hexagon in a given circle using ruler and compasses only.				• LOGO provides an ideal environment for students to experience angle as a measure of turn, in both clockwise and anti-clockwise direction. Besides, turtle geometry gives students an opportunity to manipulate angles of different sizes.
	GG1	iv.	Inscribe a regular polygon in a circle with given radius for integral values of $\frac{360°}{n}$.				
	GG1	v.	Solve problems involving angles of polygons.				
	GG1	vi.	Understand the rule of Pythagoras through drawing and measurement.				• Dynamic Geometry Software can help students discover the properties of vertically opposite angles, angles at a point and angles on a straight line.
	GG1	vii.	Use Pythagoras' rule to find the side of a right-angled triangle given the other two sides.				
	GG1	viii.	Understand and use Pythagorean triples and the converse of Pythagoras' rule.				
	GG1	ix.	Use Pythagoras' rule to solve practical problems.				• By drawing simple shapes such as squares, rectangles and triangles using simple LOGO commands such as FD, BK, RT, LT and REPEAT, students are given the opportunity to reflect upon the properties of these shapes.
7	GM2	i.	Understand the notion of π as a ratio of circumference to diameter.	66		Core	
	GM2	ii.	Deduce and use the formulae $C = \pi d$ and $C = 2\pi r$.				
	GM2	iii.	Deduce and use the formula for the area of a circle $A = \pi r^2$ by dividing it into sectors.				• Build a parallelogram and use: Area = base × perpendicular height for the parallelogram thus obtained.
	GM2	iv.	Find the length of arc and area of sector as fractions of a circle.				
	GM2	v.	Find the area of composite shapes by dividing them into simple shapes including circles.				
12	GG3	i.	Use three-figure bearings to describe direction.	110		Core	
	GG3	ii	Use three-figure bearings to describe the position of one point from another.				
	GG3	iii.	Use scale drawings to solve problems involving angles of elevation and depression.				• Restrict to problems in a plane.
		iv.	Use scale drawings to solve problems involving bearings.				• Restrict to problems in a plane.
17	GM4	i.	Use the formula of the volume of a cylinder to find the volume.	158		Core	
	GM4	ii.	Derive and use the formulae of the surface area of a cylinder.				• Curved Surface Area = $2\pi rh$ • Total Surface Area = $2\pi rh + 2\pi r^2$

Form III - Track 3: Shape, Space and Measurement (ii)							
Formula One Maths C2							
Ch	Mod		**Learning Outcome:**	Pg	Level	SEC	Notes
22	GG5	i.	Understand sine, cosine and tangent as the ratio between pairs of sides of a right-angled triangle.	192		Core	
	GG5	ii.	Use trigonometric ratios to find the length of a side given a side and an angle; use trigonometric ratios to find an angle given two sides.				
	GG5	iii.	Use trigonometric ratios to solve practical problems.				• Problems to include isosceles triangles, bearings and angles of elevation/depression.
24	GG6	i.	Learn the meaning of "proof by exhaustion" and "counter example".	206		Core	• Apply mathematical reasoning in simple proofs.
	GG6	ii.	Learn to present an argument logically.				• Use simple cases of a syllogism in the form: if $a = b$ and $b = c$ then $a = c$ or if $a = b$ and $a = c$ then $b = c$.
	GG6	iii.	Prove geometrical results.				• Use simple cases of angles between parallel lines and in a triangle in geometric proofs.
	GG6	iv.	Understand a proof of Pythagoras' Theorem.				
	GG6	v.	Prove the following circle theorems: the angle at the centre is twice the angle at the circumference; angles in the same segment are equal; the angle in a semicircle = 90°.			Ext	• Learn to apply these theorems in simple numerical cases.

Form III - Track 3: Data Handling						
Formula One Maths C2						
Ch	Mod	**Learning Outcome:**	Pg	Level	SEC	Notes
3	DH1	i. Interpret bar charts and pie charts.	22		Core	
	DH1	ii. Draw bar charts with equal intervals from frequency tables.				• Include un/grouped discrete and continuous data. • Examples for class intervals: $10 - 19, 20 - 29,$ $0 \leq t < 5, \ 5 \leq t < 10, \ldots$
13	DH2	i. Understand, compute and interpret the mean, median, mode and range of a set of ungrouped data from a frequency table.	118		Core	• Use the same exercises given for finding the mean to find the median, mode and range from a frequency table.
21	DH3	i. Understand and work out the probability of an event.	184		Core	
	DH3	ii. Understand that the probabilities of all mutually exclusive outcomes add up to 1.				
	DH3	iii. Compile and use a possibility space.				
	DH3	iv. Work out the probability from a frequency table.				