» Mathematics Program Summary | **HSC 2-Unit Course**

» TOPIC 1: **RADIAN MEASURE & TRIGONOMETRIC FUNCTIONS**	
Define an angle of one radian	
Convert between degrees & radians	
Evaluate expressions with radians	
Find the length of an arc	
Find the area of a sector	
Find the area of a segment	
Apply formulae to actual problems	
Establish that limit of $(\sin x) \div x = 1$	
Graph trigonometric functions	
Determine period & amplitude	
Determine domain and range	
Graph extended trigonometric graphs, e.g. $y = a\sin(bx + c)$	

» TOPIC 2: **DIFFERENTIATION RULES**	
Expressions with indices	
Expressions requiring simplification	
Expressions containing trigonometric, exponential and logarithmic terms	
Use product and quotient rule	
Use chain rule	
Find equation of tangent or normal	

» TOPIC 3: **PROOFS W/ CO-ORD. GEOM.**	
Find gradient, midpoint and distance	
Write down equation of a line given certain features of the line	
Solve geometric problems	

» TOPIC 4: **CURVE SKETCHING WITH CALCULUS**	
Explain significance of sign of derivative	
Find domain in which a function is increasing or decreasing	
Find stationary points	
Test for local maxima/minima	
Distinguish between local maxima/minima and maxima/minima in a given domain	
Explain geometrical significance of second derivative	
Test for concavity	
Test for points of inflexion and horizontal points of inflexion	
Find equation of inflexional tangent	
Sketch curves with above techniques	
Sketch $y = f(x)$ based on properties of y' & y''	
Sketch y' & y'' based on $y = f(x)$	

» TOPIC 5: **TRIANGLE TRIGONOMETRY**	
Solve problems with right-angled Δ	
State and use Sine Rule	
State and use Cosine Rule	
Solve problems with Δs that have common sides	

» TOPIC 6: **MAX/MIN VALUE PROBLEMS**	
Find stationary values for geometrical and practical situations	
Construct function based on data given in diagram or words	
Recognise both endpoints and stationary points as possible solutions	

» TOPIC 7: **SEQUENCES & SERIES**	
Extend and generalise given number patterns / sequences	
Arithmetic sequences:	
• Define	
• Find general term T_n	
• Find sum of n terms	
• Determine if number belongs to an arithmetic series	

Arithmetic series (continued)	
• Given a general term T_n, prove that it forms an arithmetic series	
• Given S_n, find expression for T_n	
Geometric sequences:	
• Define	
• Find general term T_n	
• Find sum of n terms	
• Find limiting sum	
• Determine if number belongs to an geometric series	
• Given a general term T_n, prove that it forms a geometric series	
• Given S_n, find expression for T_n	
Find sum of a series where number of terms must be recognised	
Find T_n & S_n of composite series	
Practical exercises:	
• Salaries w/ incremental increases	
• Superannuation	
• Time payments	
• General problems of non-commercial nature	
• Recurring decimals	

» TOPIC 8: **PRIMITIVES & INTEGRATION**	
Recognise standard forms	
Integrate expressions with sums & differences	
Integrate functions that require initial algebraic simplification	
Choose appropriate methods for integration	
Use link between differentiation and integration to evaluate an integral	
Find $f(x)$ given $f'(x)$ and a point that is on the curve	

» TOPIC 9: **AREAS UNDER CURVES**	
Perform calculations involving:	
• Areas for curves above x–axis	
• Areas for curves that cut x–axis	
• Areas bounded by 2 curves	
• Areas involving addition and subtraction of integrals	
• Areas involving the y–axis	
• Simpson's Rule	
• Trapezoidal Rule	
Distinguish between integral & area	

» TOPIC 10: **VOLUMES**	
Find the volume of solids rotated around both x–axis and y–axis	
Derive volume of cone & sphere	
Use Simpson's rule to find approximation of volume	
Find volumes involving trig. graphs and ones leading to logarithmic and exponential functions	

» TOPICS 11 & 20: **GEOMETRY PROOFS**	
Year 7-11 knowledge & skills	

» TOPIC 12: **GRAPHS**	
Graph equalities & inequalities with straight lines	
Graph circles	
Recognise and graph semi-circles	
Graph parabolas	
Graph hyperbolas	
Graph regions involving unions and intersections of inequalities	

» TOPIC 13: **GROWTH & DECAY**	
Graph $y = Ae^{kt}$	
Convert verbal information to a differential equation	
Prove by substitution that $y = Ae^{kt}$ is a solution of $dN/dt = kN$	
Solve problems with given features	

» TOPIC 14: **MOTION** (Differentiation)	
Describe motion verbally given displacement as a function of time	
Describe motion verbally given velocity as a function of time	
Describe motion verbally given acceleration as a function of time	

» TOPIC 15: **PROBABILITY**	
Use dot diagrams to represent sample space for 2-stage events	
Distinguish between situations that require addition or product rule	
Use tree diagrams to represent multiple-stage events	
Use probability tree diagrams to represent multiple-stage events with varying chances	
Solve problems with:	
• mutually exclusive events	
• complementary events	

» TOPIC 16: **MOTION** (Integration)	
Understand that two-dimensional graph represents one-dimensional movement and time, **not** two-dimensional motion	
Find expressions for:	
• Displacement, given velocity	
• Velocity, given displacement	
• Displacement & velocity, given acceleration	

» TOPIC 17: **QUADRATICS**	
Solve quadratic equations	
Solve quadratic inequalities	
Write down relation between roots and co-efficients	
Define discriminant	
Use discriminant to identify different types of roots	
Find condition that gives real, unequal / distinct or unreal roots	
Find condition for quadratic to be positive or negative definite	

» TOPIC 18: **LOCUS & PARABOLA**	
Derive equation of parabola given focus and directrix	
Find vertex, focus and directrix given equation of a parabola	
Find points of intersection of parabolas	

» TOPIC 19: **RATES OF CHANGE**	
Apply understanding of integration to physical situations	
Solve problems in which a derivative statement is given	

» TOPIC 20: **ABSOLUTE VALUE**	
Draw absolute value graphs	
Solve:	
Equations involving absolute values	
Inequalities involving absolute values	

For more details, please see the full mathematics program, available for download on the school intranet.