ST. MARY MAGDALENE
C OF E SIXTH FORM
PENINSULA CAMPUS
Excellence through innovation, founded in faith since 1840.

FELLOWSHIP • FAITH • FAMILY

Overview:

Subject: Mathematics

Year: 12

Key Content:

Pure content:

1. Complex numbers
2. Argand diagrams
3. Series
4. Roots of polynomials
5. Volumes of revolution
6. Matrices
7. Linear transformations
8. Proof by induction
9. Vectors
10. Complex Numbers (Year 2)
11. Series (Year 2)

Decision Maths content:

1. Algorithms
2. Graphs and Networks
3. Algorithms on graphs
4. Route inspection
5. The travelling salesman problem
6. Linear programming
7. The simplex algorithm
8. Critical path analysis
9. Transportation problems (Year 2)

Assessment Objectives:

OT1.1 Construct and present mathematical arguments through appropriate use of diagrams; sketching graphs; logical deduction; precise statements involving correct use of symbols and connecting language, including: constant, coefficient, expression, equation, function, identity, index, term, variable.
OT1.2 Understand and use mathematical language and syntax as set out in the content.
OT1.3 Understand and use language and symbols associated with set theory, as set out in the content. Apply to solutions of inequalities and probability.
OT1.4 Understand and use the definition of a function; domain and range of functions.
OT1.5 Comprehend and critique mathematical arguments, proofs and justifications of methods and formulae, including those relating to applications of mathematics

OT2.1 Recognise the underlying mathematical structure in a situation and simplify and abstract appropriately to enable problems to be solved.
OT2.2 Construct extended arguments to solve problems presented in an unstructured form, including problems in context.
OT2.3 Interpret and communicate solutions in the context of the original problem.
OT2.4 Understand that many mathematical problems cannot be solved analytically, but numerical methods permit solution to a required level of accuracy.

OT2.5 Evaluate, including by making reasoned estimates, the accuracy or limitations of solutions, including those obtained using numerical methods.
OT2.6 Understand the concept of a mathematical problem-solving cycle, including specifying the problem, collecting information, processing and representing information and interpreting results, which may identify the need to repeat the cycle.
OT2.7 Understand, interpret and extract information from diagrams and construct mathematical diagrams to solve problems, including in mechanics.

OT3.1 Translate a situation in context into a mathematical model, making simplifying assumptions.
OT3.2 Use a mathematical model with suitable inputs to engage with and explore situations (for a given model or a model constructed or selected by the student).
OT3.3 Interpret the outputs of a mathematical model in the context of the original situation (for a given model or a model constructed or selected by the student).
OT3.4 Understand that a mathematical model can be refined by considering its outputs and simplifying assumptions; evaluate whether the model is appropriate.
OT3.5 Understand and use modelling assumptions

Key Assessment Points:

- Baseline Assessment at beginning of year covering prerequisite knowledge
- Assessment at the end of Term 1 covering Pure 1-3, Statistics 1-2, Mechanics 1-2
- Assessment at the end of Term 2 covering Pure 1-7, Statistics 1-5, Mechanics 1-2
- Assessment at the end of Term 3 covering all AS-Level content

Christian Ethos:

A Christian ethos will be promoted in Maths lessons by encouraging a sense of wonder in the natural world and a respect for all of God's creation. Students will treat each other with mutual respect and learn to work together through group and practical activities, and consider Christian views on ethical issues discussed. The incorporation of real-life skills and a large emphasis on problem solving will also encourage a wider scope on the natural world and further develop students' sense of wonder.

British Values:

- **Individual liberty** in the sense of being able to develop and express one's own views, **tolerance** and **mutual respect** for one another's views is taught through the topics in which different views and/or ethics are involved.
- **The rule of law** is addressed in units of work covering statistical applications, through students understanding the need for following classroom rules.
- **Democracy** is taught through student debates when reasoning mathematically and explaining proofs.
- Group activities in Maths require students to engage in **team work** and show **mutual respect** for each other.

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Long Term Plan:

Subject: Mathematics
Year: 1 Pure Decision

Week	Weekly Plan	Key Topics /Learning Intentions and/or Key Questions	
		Teacher 1 (3-hour teacher)	**Teacher 2 (2-hour teacher)**
1	5th Sept	1 – Imaginary and complex numbers (2-5) 2 – Multiplying complex numbers (5-6) 3 – Complex conjugation (6-8)	1 - Roots of quadratic equations (8-10) 2 – Solving cubic and quartic equations (10-14)
2	12th Sept	1 – Argand diagrams (18-19) 2 – Modulus and argument (20-23) 3 – Modulus and argument form (23-24)	1 – Modulus and argument form (25-28) **2 – Complex numbers review (14-16)**
3	19th Sept	1 – Loci in the argand diagram (28-36) 2 – Regions in the argand diagram (36-38) 3 – More on loci and regions (28-38)	1 – Sums of natural numbers (44-47) 2 – Sums of squares and cubes (47-51)
4	26th Sept	1 – Regions (53-55) 2 – Cubic & quartic graphs (60-66) 3 – Reciprocal graphs (66-67)	**1 – Argand diagrams review (39-42)** **2 – Series review (51-53)**
5	3rd Oct	1 – Roots of a quadratic equation (55-57) 2 – Roots of a cubic equation (57-59) 3 – Roots of a quartic equation (59-61)	1 – Expressions from roots of polynomials (62-64) 2 – Linear transformations of roots (65-67)
6	10th Oct	1 – Algorithms and flow charts (2-10) 2 – Bubble sort (10-16) 3 – Quick sort (13-6)	1 – Bin-packing algorithms (16-21) **2 – Roots of polynomials review (68-70)**
7	17th Oct	1 – Order of an algorithm (21-24) 2 – Modelling and graph theory (30-38) 3 – Types of graphs and using matrices (38-43)	1 – The planarity algorithm (43-47) **2 – Algorithms review (25-28)**
HALF TERM			
8	31st Oct	**1 – Pure Chapter 1-4 Assessment** 2 – Kruskal's algorithm (53-57) 3 – Prim's algorithm (57-59)	1 – Prim's algorithm in distance matrices (60-65) 2 – Dijkstra's algorithm for shortest paths (66-73)
9	7th Nov	1 – Floyd's algorithm (73-79) 2 – Eulerian graphs (86-89) 3 – Route inspection algorithm (89-94)	1 – Networks with more than 4 odd nodes (94-98) 2 – More route inspection practice (89-98)
10	14th Nov	1 – Volume of revolution around x-axis (72-75) 2 – Volume of revolution around y-axis (76-78) 2 – Adding and subtracting volumes (78-83)	1 – Modelling with volumes of revolution (83-86) **2 – Graphs and networks review (48-51, 79-84)**
11	21st Nov	1 – Introduction to matrices (95-99) 2 – Multiplying with matrices (99-103) 3 – Determinants (104-108)	1 – More on determinants (104-108) **2 – Route inspection review (98-101)**
12	28th Nov	1 – Inverting 2x2 matrices (108-111) 2 – Inverting 3x3 matrices (112-116) 3 – More on inverting matrices (108-116)	1 – Solving equations using matrices (116-121) **2 – Volume of revolution review (86-88)**
13	5th Dec	1 – Solving equations using matrices (116-121) **2 – Matrices review (121-125)** **3 – Decision Chapter 1-4 Review (128-137)**	**1&2 – Pure Chapter 1-5 Review (89-93)**
14	12th Dec	**ASSESSMENTS**	
CHRISTMAS HOLIDAYS			
15	2nd Jan	1 – Linear transformations in 2D (127-130) 2 – Reflections and rotations (131-136) 3 – Enlargements and stretches (136-140)	1 – Successive transformations (140-144) 2 – Linear transformations in 3D (144-147)
16	9th Jan	1 – Inverse of linear transformations (148-150) 2 – Linear transformations revision (127-150) 3 – Proof by mathematical induction (156-159)	1 – Proving divisibility results (160-162) 2 – Proving statements with matrices (162-164)

17	16th Jan	1 – Classical and practical problems (103-107) 2 – MSP to find upper bounds (107-113) 3 – MSP to find lower bounds (114-118)	1 – Nearest neighbour algorithm (118-122) **2 – Linear transformations review (151-154)**
18	23rd Jan	1 – Linear programming problems (139-145) 2 – Graphical methods (145-148) 3 – Locating the optimal point (149-162)	**1 – Travelling Salesman review (123-127)** **2 – Proof by induction review (165-166)**
19	30th Jan	1 – Locating the optimal point (149-162) 2 – Solutions with integer values (162-166) 3 – **Linear Programming review (167-170)**	**1 – Decision Chapter 1-5 Review (128-137)** **2 – Pure Chapter 6-8 Review (209-214)**
20	7th Feb	**ASSESSMENTS**	
HALF TERM			
21	21st Feb	1 – Equation of a line in 3D (168-175) 2 – Equation of a line in 3D (168-175) 3 – Equation of a plane in 3D (175-178)	1 – Scalar product (178-184) **2 – Linear transformations review (151-154)**
22	28th Feb	1 – Angles between lines and planes (184-189) 2 – Points of intersection (189-192) 3 – Finding perpendiculars (193-201)	1 – Vectors gap-filling lesson (168-201) **2 – Proof by induction review (165-166)**
23	7th Mar	1 – Linear programming problems (172-175) 2 – The simplex method (176-196) 3 – More simplex method (176-196)	1 – Requiring integer solutions (196-198) 2 – Two-stage simplex method (199-204)
24	14th Mar	1 – The big-M method (205-212) 2 – Modelling a project (222-226) 3 – Dummy activities (226-229)	1 – Early and late event times (230-232) **2 – The simplex algorithm review (213-220)**
25	21st Mar	1 – Critical activities (232-235) 2 – Float activities (236-237) 3 – Gantt charts (238-241)	1 – Resource histograms (242-249) 2 – Scheduling diagrams (249-253)
26	28th Mar	**ASSESSMENTS**	
EASTER HOLIDAYS			
27	18th Apr	Float time	Float time
28	25th Apr	Float time	Float time
29	2nd May	Float time	Float time
30	9th May	Float time	Float time
31	16th May	Float time	Float time
32	23rd May	**ASSESSMENTS**	
HALF TERM			
33	6th June	Core Pure 1 Revision	Decision 1 Revision
34	13th June	Core Pure 1 Revision	Decision 1 Revision
35	20th June	**END-OF-YEAR ASSESSMENTS**	
36	27th June	1 – Exponential form of complex numbers (2-5) 2 – Multiplying and dividing (5-8) 3 – De Moivre's theorem (8-11)	1 – Trigonometric identities (11-15) 2 – Sums of series (16-19)
37	4th July	1 – nth roots of complex numbers (20-25) 2 – Solving geometric problems (25-27) 3 – Method of differences (32-37)	1 – Higher derivatives (38-39) 2 – Maclaurin series (40-44)
38	11th July	1 – Expansions of compound functions (44-48) 2 – North-west corner method (2-6) 3 – Unbalanced problems & degenerate solutions (6-11)	1 – Finding an improved solution (11-18) 2 – The stepping-stone method (19-28)
39	18th July	1 – Linear programming (28-31) **2 – Complex numbers review (27-30)** **3 – Series review (48-51)**	**1 – Transportation problems review (32-37)** **2 – End of year**