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

Overview:

Subject: Mathematics

Year: 12

Key Content:

Pure content:

1. Algebra and functions
2. Coordinate geometry in the (x, y) plane
3. Further algebra
4. Trigonometry
5. Vectors
6. Differentiation
7. Integration
8. Exponentials and logarithms
9. Proof (A-Level)
10. Algebraic and partial fractions (A-Level)

Statistics content:

1. Statistical sampling
2. Data presentation and interpretation
3. Probability
4. Statistical distributions
5. Statistical hypothesis testing
6. Regression and correlation (A-Level)

Mechanics content:

1. Quantities and units in mechanics
2. Kinematics
3. Forces and Newton's laws
4. Kinematics 2
5. Moments (A-Level)

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 Statistics Mechanics

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 – Baseline Assessment** 2 – Index Laws, Expanding, Factorising (2-9) 3 – Indices & Surds (9-14)	1 – Solving quadratics (19-22) 2 – Completing the square (22-24)
2	12th Sept	1 – Functions (25-27) 2 – Quadratic graphs (27-30) 3 – Discriminant (30-32)	1 – Modelling with quadratics (32-35) 2 – Linear simultaneous equations (39-40)
3	19th Sept	1 – Quadratic simultaneous equations (41-42) 2 – Graphical simultaneous equations (42-45) 3 – Linear inequalities (46-48)	1 – Quadratic inequalities (48-51) 2 – Inequalities on graphs (51-53)
4	26th Sept	1 – Regions (53-55) 2 – Cubic & quartic graphs (60-66) 3 – Reciprocal graphs (66-67)	1 – Points of intersection (68-70) 2 – Translating graphs (71-74)
5	3rd Oct	1 – Stretching graphs (75-78) 2 – Transforming functions (79-81) **3 – Pure Review**	1 – Population and sampling (2-7) 2 – Non-random sampling & types of data (7-10)
6	10th Oct	1 – Measures of central tendency (21-25) 2 – Other measures of location (25-28) 3 – Measures of spread (28-29)	1 – Variance and standard deviation (30-33) 2 – Coding (33-36)
7	17th Oct	1 – Outliers (41-43) 2 – Box Plots (43-45) 3 – Cumulative frequency (46-48)	1 – Histograms (48-52) 2 – Comparing data (53-54)
HALF TERM			
8	31st Oct	1 – y=mx + c (90-93) 2 – Equations of straight lines (93-96) 3 – Parallel and perpendicular lines (97-100)	1 – Length and area with straight lines (100-103) 2 – Pure 1-4 Assessment
9	7th Nov	1 – Assessment Review Lesson 2 – Modelling with straight lines (103-108) 3 – Midpoints and perp. bisectors (114-117)	1 – Equation of a circle (117-120) 2 – Intersections of lines and circles (121-122)
10	14th Nov	1 – Using tangent & chord properties (123-128) 2 – Circles and triangles (128-132) 2 – Lines and Graphs review lesson	1 – Simplifying algebraic fractions (138-139) 2 – Dividing polynomials (139-142)
11	21st Nov	1 – The factor theorem (143-146) 2 – Mathematical proof (146-150) 3 – Methods of proof (150-153)	1 – Pascal's triangle & factorial notation (159-163) 2 – Algebraic Methods review lesson
12	28th Nov	1 – The binomial expansion (163-164) 2 – Solving binomial problems (165-167) 3 – Binomial estimation (167-169)	1 – Models & assumptions (119-122) 2 – Quantities and units (122-124)
13	5th Dec	1 – Working with vectors (125-127) 2 – Displacement-time graphs (131-133) 3 – Velocity-time graphs (133-136)	1&2 – Constant acceleration formulae (137-146)
14	12th Dec	Vertical motion under gravity (146-152)	**ASSESSMENTS**
CHRISTMAS HOLIDAYS			
15	2nd Jan	1 – The cosine rule (174-179) 2 – The sine rule (179-185) 3 – Area of triangles (185-187)	1 – Solving triangle problems (187-191) 2 – Graphs of sine, cosine and tangent (192-194)
16	9th Jan	1 – Transforming trigonometric graphs (194-198) 2 – Angles in all four quadrants (204-208) 3 – Values of trigonometric ratios (208-209)	1 – Trigonometric identities (209-212) 2 – Simple trigonometric equations (213-216)

17	16th Jan	1 – Harder trigonometric equations (217-219) 2 – Equations and identities (219-222) **3 – Pure Review**	1 – Introduction to vectors (231-235) 2 – Representing vectors (235-238)
18	23rd Jan	1 – Magnitude and direction (239-242) 2 – Position vectors (242-244) 3 – Solving geometric problems (244-247)	1&2 – Modelling with vectors (248-251)
19	30th Jan	1 – Correlation (60-62) 2 – Linear regression (63-67) 3 – Calculating probabilities (70-72)	1 – Venn diagrams (72-75) 2 – Mutually exclusivity & independence (75-78)
20	7th Feb	1 – Tree diagrams (78-80) 2 – Probability distributions (84-88) 3 – The binomial distribution (88-91)	1&2 - Cumulative probabilities (91-94)
HALF TERM			
21	21st Feb	1 – Gradients of curves (256-259) 2 – Finding the derivative (259-262) 3 – Differentiating x^n (262-264)	1 – Differentiating two or more terms (264-268) 2 – Gradients, tangents, and normal (268-270)
22	28th Feb	1 – Increasing & decreasing functions (270-271) 2 – Second order derivatives (271-272) 3 – Stationary points (273-276)	1 – Sketching gradient functions (277-278) 2 – Modelling with differentiation (279-281)
23	7th Mar	1 – Integrating x^n (288-290) 2 – Indefinite integrals (290-293) 3 – Finding functions (293-295)	1 – Definite integrals (295-297) 2 – Area under curves (297-300)
24	14th Mar	1 – Area under the x-axis (300-302) 2&3y – Area between curves and lines (302-306)	1 – Hypothesis testing (99-101) 2 – Finding critical values (101-105)
25	21st Mar	1 – One-tailed tests (105-107) 2 – Two-tailed tests (107-109)	1&2 – Large Data Set
26	28th Mar	**ASSESSMENTS**	
EASTER HOLIDAYS			
27	18th Apr	1 – Exponential functions (312-314) 2 – y=e^x (314-317) 3 – Exponential modelling (317-319)	1 – Logarithms (319-321) 2 – Laws of logarithms (321-324)
28	25th Apr	1 – Solving using logarithms (324-325) 2 – Working with natural logarithms (326-328) 3 – Logarithms and non-linear data I (328-333)	1 - Logarithms and non-linear data II (328-333) **2 – Pure Review**
29	2nd May	1 – Force diagrams (157-159) 2 – Forces as vectors (160-162) 3 – Forces and acceleration (162-166)	1&2 – Motion in 2 dimensions (166-169)
30	9th May	1 – Connected particles (169-172) 2 – Pulleys (173-177) 3 – Connected particles & pulleys	1 – Functions of time (182-184) 2 – Using differentiation (185-186)
31	16th May	1 – Maxima and minima problems (186-188) 2 – Using integration (188-191) 3 – Constant acceleration formulae (191-195)	**Statistics Review**
32	23rd May	**Pure Review**	**Mechanics Review**
HALF TERM			
33	6th June	Pure Year 1 Revision	Statistics Year 1 Revision
34	13th June	Pure Year 1 Revision	Mechanics Year 1 Revision
35	20th June	**END-OF-YEAR ASSESSMENTS**	
36	27th June	1 – Proof by contradiction (2-5) 2&3 – Algebraic fractions (5-8)	1&2 – Partial fractions (9-11)
37	4th July	1 – Repeated factors (12-13) 2&3 – Algebraic division (14-18)	1&2 - Algebraic Methods review (19-21)
38	11th July	Pure Assessment Review	Statistics Assessment Review
39	18th July	Mechanics Assessment Review	Pure Assessment Review