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

Overview:

Subject: Mathematics
Year: 13

Key Content:

Pure content:

1. Proof
2. Algebraic and partial fractions
3. Functions and modelling
4. Series and sequences
5. Binomial theorem
6. Trigonometry
7. Parametric equations
8. Differentiation
9. Numerical methods
10. Integration (part one)
11. Vectors (3D)
12. Integration (part two)

Statistics content:

1. Regression and correlation
2. Probability
3. Normal distribution

Mechanics content:

4. Moments
5. Forces at any angle
6. Applications of kinematics
7. Applications of forces
8. Further kinematics

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:

Assessments will also cover topics from Year 1 of study.

- Baseline Assessment at beginning of year covering Year 1 knowledge
- Assessment at the end of Term 1 covering Pure 1-3, Statistics 1-2, Mechanics 4-5
- Assessment at the end of Term 2 covering Pure 1-11, Statistics 1-3, Mechanics 4-6
- Assessment at the end of Term 3 covering all A-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 – Proof by contradiction (2-5) 3 – Simplifying algebraic fractions (5-8)	1 – Partial fractions (9-11) 2 – Repeated factors (12-13)
2	12th Sept	1 – Algebraic division (14-18) 2 – The modulus function (23-27) 3 – Functions and mapping (27-32)	1 – Composite functions (32-35) 2 – Inverse functions (36-39)
3	19th Sept	1 – Algebraic methods review 2 – Modulus transformation (40-44) 3 – Combining transformations (44-48)	1 – Solving modulus problems (48-53) 2 – Functions and graphs review
4	26th Sept	1 – Arithmetic sequences and series (60-66) 2 – Geometric sequences (66-70) 3 – Geometric series (70-73)	1 – Sum to infinity (73-76) 2 – Sigma notation (76-78)
5	3rd Oct	1 – Recurrence relations (79-83) 2 – Modelling with series (83-86) 3 – Exponential models (2-5)	1 – Measuring correlation (5-8) 2 - Hypothesis testing for zero correlation (8-12)
6	10th Oct	1 – Set notation (17-21) 2 – Conditional probability (21-24) 3 – Sequences and series review	1 – Probability in Venn diagrams (24-27) 2 – Regression and correlation review
7	17th Oct	1 – Probability formulae (27-30) 2 – Tree diagrams (31-34) 3 – Conditional probability review	1 – Assessment 2 – Assessment review
		HALF TERM	
8	31st Oct	1 – Expanding (1+x)^n (92-97) 2 – Expanding (a+bx)^n (97-100) 3 – Using partial fractions (101-103)	1 – Binomial expansion review 2 - `Radian measure (114-118)
9	7th Nov	1 – Arc length (118-122) 2 – Areas of sectors and segments (122-128) 3 – Solving trigonometric equations (128-132)	1 – Small angle approximations (132-135) 2 – Radians review
10	14th Nov	1 – Trigonometric functions (143-145) 2 – Graphs of sec, cosec, and cot (145-149) 3 – Using sec, cosec, and cot (149-153)	1 – Trigonometric identities (153-157) 2 – Inverse trigonometric functions (158-161)
11	21st Nov	1 – Addition formulae (167-171) 2 – Using the angle addition formulae (171-173) 3 – Double angle formulae (174-177)	1 – Solving trigonometric equations (177-181) 2 – Simplifying acos(x)±bsin(x) (181-186)
12	28th Nov	1 – Proving trigonometric identities (186-189) 2 – Modelling with trig functions (189-191) 3 – Trigonometry review	1 – Moments and resultant moments (71-76) 2 – Equilibrium (76-80)
13	5th Dec	1 – Centre of mass (80-83) 2 – Tilting (83-85) 3 – Resolving forces (91-96)	1 – Inclined planes (96-99) 2 – Friction (100-104)
14	12th Dec	**MOCK ASSESSMENTS & FEEDBACK**	
		CHRISTMAS HOLIDAYS	
15	3rd Jan	1 – Parametric equations (198-202) 2 – Using trigonometric identities (202-205) 3 – Curve sketching (206-208)	1 – Points of intersection (209-213) 2 – Modelling w/ parametric equations (213-220)
16	9th Jan	1 – Parametric equations review 2 – Pure review 2 3 – Differentiating sin(x) and cos(x) (232-234)	1 – Differentiating exp and logs (235-237) 2 – Chain rule (237-240)
17	16th Jan	1 – Product rule (241-243) 2 – Quotient rule (243-245) 3 – Differentiating trig functions (246-251)	1 – Parametric differentiation (251-254) 2 – Implicit differentiation (254-257)
18	23rd Jan	1 – Using second derivatives (257-261) 2 – Rates of change (261-264) 3 – Differentiation review	1 – Locating roots (274-277) 2 – Iteration (278-282)
19	30th Jan	1 – Newton-Raphson method (282-285) 2 – Applications to modelling (286-289) 3 – Numerical methods review	1 – Horizontal projection (108-111) 2 – Horizontal and vertical components (111-113)
20	6th Feb	1 – Projections at any angle (113-120) 2 – Projectile motion formulae (120-125) 3 – Projectiles review	1 – Assessment 2 – Assessment review
		HALF TERM	
21	20th Feb	1 – Integrating standard functions (294-296) 2 – Integrating f(ax+b) (296-298) 3 – Using trigonometric identities (298-300)	1 – Reverse chain rule (300-303) 2 – Integration by substitution (303-307)
22	27th Feb	1 – Integration by parts (307-310) 2 – Partial fractions (310-313)	1 – Areas under parametric curves (Add Material) 2 – The trapezium rule (317-322)

		3 – Finding areas (313-317)	
23	6th Mar	1 – Solving differential equations (322-326) 2 – Modelling with differential eq'ns (326-329) 3 – Integration review	1 – The normal distribution (38-41) 2 – Finding probabilities for normal dist. (41-44)
24	13th Mar	1 – Inverse normal distribution function (44-47) 2 – Standard normal distribution (47-49) 3 – Finding mu and sigma (49-53)	1 – Approximating a binomial distribution (53-55) 2 – Hyp. testing with the normal dist. (56-60)
25	20th Mar	**MOCK ASSESSMENTS & FEEDBACK**	
26	27th Mar	Pure review lessons	Applied review lessons
EASTER HOLIDAYS			
27	17th Apr	1 – 3D coordinates (337-338) 2 – Vectors in 3D (339-343) 3 – Solving geometric problems (344-347)	1 – Application to mechanics (347-349) 2 – Vectors review
28	24th Apr	1 – Static particles (129-132) 2 – Modelling with statics (133-137) 3 – Friction and static particles (137-142)	1 – Static rigid bodies (142-146) 2 – Dynamics and inclined planes (147-150)
29	1st May	1 – Connected particles (150-154) 2 – Vectors in kinematics (160-164) 3 – Vector methods with projectiles (165-167)	1 – Variable acc. in one direction (167-170) 2 – Differentiating vectors (171-173)
30	8th May	1 – Integrating vectors (173-177) 2 – Applications of forces review 3 – Further kinematics review	1 – Catch-up lesson 2 – Catch-up lesson
31	15th May	Pure year 1 revision	Statistics revision
32	22nd May	Pure year 2 revision	Mechanics revision
HALF TERM			
33	5th June	**EXAMINATIONS**	
34	12th June		
35	19th June		
36	26th June		
37	3rd July		
38	10th July		
39	17th July		