THE RIVERS SECONDARY COLLEGE
The heart of secondary education for Lismore

Assessment Task Notification

RICHMOND RIVER HIGH CAMPUS

Task Number	3	**Task Name**	Investigation Style Task
Course	Mathematics Advanced	**Faculty**	Mathematics
Teacher	Mr Prince	**Head Teacher**	Mrs Humphrys
Issue date	12.06.2025	**Due date**	Fri 4th July 2025 3.15pm
Focus	**Create** your own exam from past HSC papers, **Solve** all questions with full working and annotation, **Evaluate** a peer's paper with constructive feedback.	**Task Weighting**	20%

Understanding, Fluency and Communication

MA12-1	A student uses detailed algebraic and graphical techniques to critically construct, model and evaluate arguments in a range of familiar and unfamiliar contexts
MA12-9	A student chooses and uses appropriate technology effectively in a range of contexts, models and applies critical thinking to recognise appropriate times for such use
MA12-10	A student constructs arguments to prove and justify results and provides reasoning to support conclusions which are appropriate to the context

Problem Solving, Reasoning and Justification

MA12-2	Models and solves problems and makes informed decisions about financial situations using mathematical reasoning and techniques.
MA12-3	A student applies calculus techniques to model and solve problems
MA12-4	Applies the concepts and techniques of arithmetic and geometric sequences and series in the solution of problems.
MA 12-5	Applies the concepts and techniques of periodic functions in the solution of problems involving trigonometric graphs.
MA12-6	A student applies appropriate differentiation methods to solve problems
MA12-7	applies the concepts and techniques of indefinite and definite integrals in the solution of problems

Task description

In this task, you will deepen your understanding of the HSC Mathematics Advanced course by creating and critically evaluating an examination based on past HSC papers.

Component 1: Create an Exam (20 marks)

- Use questions from the 2022–2024 HSC Mathematics Advanced papers as a starting point.
- Assemble a 100-mark paper with a 3-hour time limit.
- Ensure each subtopic from the Year 12 syllabus (p.21) is close to proportionally represented.
- Include a cover page listing subtopics and corresponding question numbers(see example).

Component 2: Fully Worked Solutions (30 marks)

- Submit handwritten solutions to your exam.
- Include all working out and reasoning.
- Annotate each question with:
    - The subtopic code (e.g., MA-C2)
    - Mark allocation per step.

Component 3: Peer Review (50 marks)

- Exchange exams with a classmate.
- Mark their paper using your own solution set and the HSC marking style.
- Provide written feedback on clarity, accuracy, reasoning, and areas to improve.

Marking Rubric

Criteria	Excellent (A)	Sound (B-C)	Developing (D-E)
Component 1: Exam Creation (20%)	Paper shows excellent balance of subtopics, clearly formatted, all questions linked to sub topics 100 marks, and time-appropriate.	Most subtopics covered, minor formatting or balance issues.	Missing key topics or lacks clarity/structure.
Component 2: Solutions (30%)	Solutions are complete, accurate, clearly annotated with links to sub topics codes and marks. Strong mathematical reasoning. Marking criteria clear.	Most working shown, generally accurate, annotations mostly present.	Working unclear or incomplete. Lacks consistent annotation or justification.
Component 3: Peer Marking & Feedback (50%)	Thoughtful, constructive feedback with appropriate marks. Excellent understanding of marking criteria.	Feedback given, mostly fair marks, shows general understanding of criteria.	Minimal feedback or unfair marks. Shows limited understanding of marking process.
Understanding, Fluency & Communication	Concepts and processes communicated clearly, concisely, and with logical structure.	Mostly clear communication, with minor gaps or errors.	Difficult to follow or lacks clarity in reasoning or layout.
Problem Solving, Reasoning & Justification	Sophisticated use of techniques, clear justifications, evidence of independent thinking.	Logical problem-solving with mostly clear justifications.	Limited justification or procedural working without understanding.

Submission Checklist ✅

☐ My exam contains a full 100 marks and reflects all subtopics.

☐ My solutions are handwritten and annotated with marks, marking criteria and Sub Topic codes.

☐ I have marked a peer's exam and provided written feedback.

☐ I have stapled or bound all three components together.

RRHC Mathematics Investigation Style Task

2025 HIGHER SCHOOL CERTIFICATE EXAMINATION

Mathematics Advanced

General Instructions

- Reading time – 10 minutes
- Working time – 3 hours
- Write using black pen
- Approved calculators may be used
- A reference sheet is provided at the back of this paper
- For questions in Section II, show relevant mathematical reasoning and/or calculations

Total marks : 100

Section I – 14 marks (pages 3 – 6)

- Attempt Questions 1 – 7
- Allow about 30 minutes for this section

Section II – 86 marks (pages 9 – 30)

- Attempt Questions 1 – 10
- Allow about 150 minutes for this section

This paper is constructed from past HSC Mathematics Advanced questions drawn from the 2022, 2023, and 2024 exams. Each Year 12 subtopic from the Stage 6 Syllabus is proportionately represented as follows:

Subtopic	Code	Question(s)	Marks
Graphing Techniques	MA-F2	Q1a, Q4	12
Trigonometric Functions and Graphs	MA-T3	Q3, Q10	11
Differential Calculus	MA-C2	MC 3,5,7 ,Q2a, Q6a	10
Applications of Differentiation	MA-C3	Q2b,c Q6b	11
Integral Calculus	MA-C4	MC 2,4, Q7	12
Modelling Financial Situations	MA-M1	MC 1, Q5	12
Descriptive Statistics & Bivariate Data	MA-S2	MC 5 Q9	12
Random Variables	MA-S3	Q8	13

Section I
14 marks
Attempt Questions 1–7
Allow about 35 minutes for this section

1. Pia's marks in Year 10 assessments are shown. The scores for each subject were normally distributed.

	Pia's mark	*Year 10 mean*	*Year 10 standard deviation*
English	78	66	6
Mathematics	80	71	10
Science	77	70	15
History	85	72	9

In which subject did Pia perform best in comparison with the rest of Year 10?
A. English
B. Mathematics
C. Science
D. History
(2024 Q3 MA-M1)

2. What is $\int (6x + 1)^3 dx$?

A. $\frac{1}{24}(6x+1)^4 + C$

B. $\frac{1}{4}(6x+1)^4 + C$

C. $\frac{2}{3}(6x+1)^4 + C$

D. $\frac{3}{2}(6x+1)^4 + C$

(2024 Q5 MA-C4)

3.

Let $h(x) = \dfrac{f(x)}{g(x)}$, where

$$f(1) = 2 \qquad f'(1) = 4$$
$$g(1) = 8 \qquad g'(1) = 12.$$

What is the gradient of the tangent to the graph of $y = h(x)$ at $x = 1$?

A. -8

B. 8

C. $-\dfrac{1}{8}$

D. $\dfrac{1}{8}$

(2022 Q5 MA-C2)

4.

What is $\displaystyle\int \frac{1}{(2x+1)^2}\,dx$?

A. $\dfrac{-2}{2x+1} + C$

B. $\dfrac{-1}{2(2x+1)} + C$

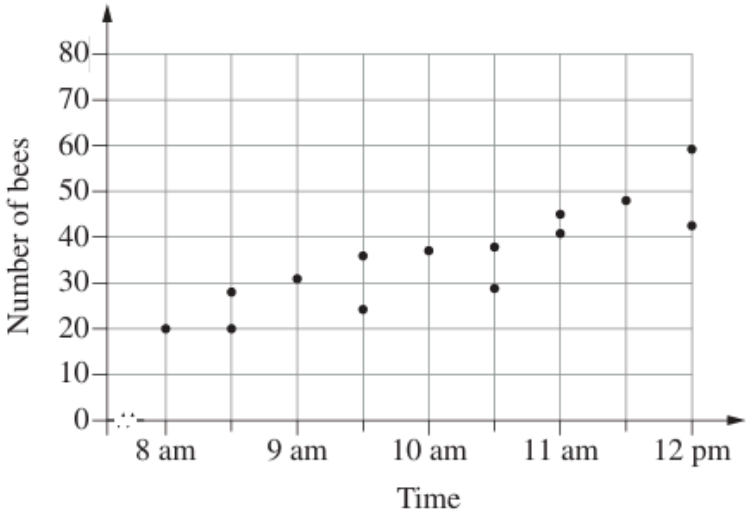
C. $2\ln(2x+1) + C$

D. $\dfrac{1}{2}\ln(2x+1) + C$

(2022 Q6 MA-C4)

5.

The number of bees leaving a hive was observed and recorded over 14 days at different times of the day.



Which Pearson's correlation coefficient best describes the observations?

A. −0.8

B. −0.2

C. 0.2

D. 0.8

(2023 Q1 MA-S2)

6.

It is given that $y = f(g(x))$, where $f(1) = 3$, $f'(1) = -4$, $g(5) = 1$ and $g'(5) = 2$.

What is the value of y' at $x = 5$?

A. −8

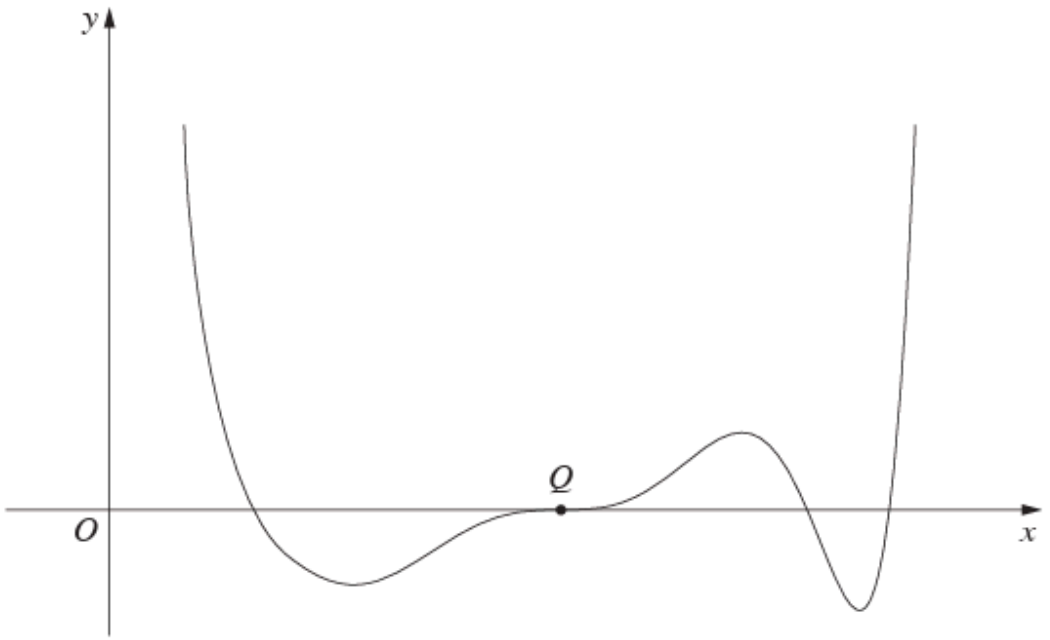
B. −4

C. 3

D. 6

(2023 Q7 MA-C2)

7.



The point Q is a horizontal point of inflection.

Let $A(x) = \int_0^x f(t)\,dt$.

How many points of inflection does the graph $y = A(x)$ have?

A. 2

B. 3

C. 4

D. 5

(2024 Q10 MA-C2)

Section II
86 marks
Attempt Questions 1–10
Allow about 150 minutes for this section

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1. **(7 marks)**

The function $f(x) = x^2 + 3x - 4$ is defined on the domain $-4 \leq x \leq 2$

a) Sketch the graph of $f(x)$, showing the intercepts and turning point. (4 marks) (MA-F2)

b) Find the exact coordinates where $f(x) = 0$. (3 marks) (MA-F1 year 11 content)

(2023 Q2 Adapted)

2. **(10 marks)**

Let $f(x) = 3x^2 - 5x$

a) Find $f'(x)$. (3 marks)(MA-C2)

b) Find the stationary points and determine their nature. (3 marks)(MA-C3)

c) Determine the intervals on which the function is increasing. (4 marks)(MA-C3)

(2024 Q6 Adapted)

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3. **(4 marks)**

Solve: $2cos(2x)\sqrt{3}$ for $0 \leq x \leq \pi$. Give exact solutions. (2022 Q5 Adapted, MA-T3)

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4. **(8 marks)**

The function $g(x) = \frac{2}{x-1}$.

a) State the domain and range. (4 marks)

b) Sketch the graph, showing intercepts and asymptotes. (4 marks)

(2023 Q4 Adapted MA-F2)

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5. **(10 marks)**

A loan of $10,000 is repaid over 4 years with monthly repayments at 6% p.a. compounding monthly.

a) Write an expression for the monthly repayment. (5 marks)

b) Calculate the total amount repaid. (5 marks)

((2022 Q10 Adapted, MA-M1)

6. **(10 marks)**

Let $f(x) = x^3 - 3x^2 + 2$.

a) Find $f'(x)$. (3 marks)(MA-C2)

b) Find and classify turning points. (4 marks)(MA-C3)

c) Sketch the graph with key features. (3 marks)(MA-F1 year 11 content)

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7. **(8 marks)**

Evaluate $\int_{1}^{4}(3x - 2)dx$. Interpret your answer geometrically.(2023 Q6 Adapted, MA-C4)

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Question 8 (13 marks)

A discrete random variable X has distribution:

x	1	2	3	4
$P(X = x)$	0.2	0.3	0.3	0.2

a) Calculate $E(X)$. (4 marks)

b) Calculate $Var(X)$. (5 marks)

c) Interpret the meaning of $E(X)$. (4 marks)

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(2023 Q9 Adapted, MA-S3)

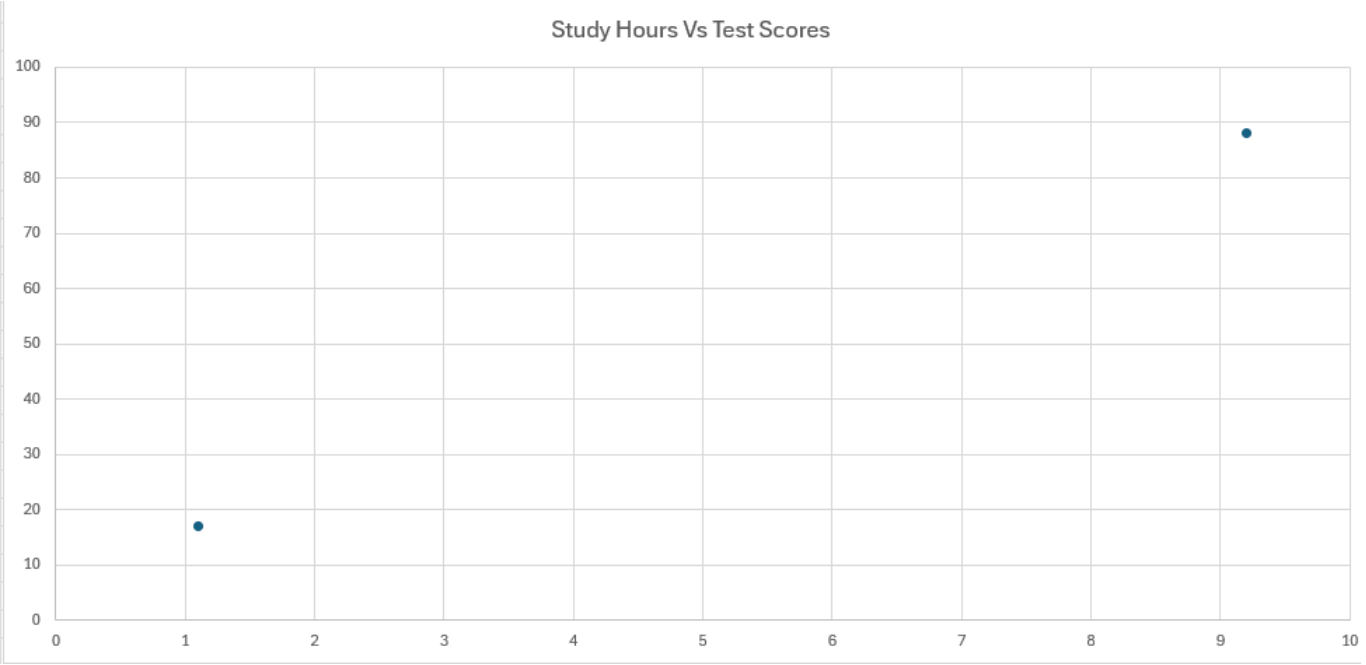
Question 9 (10 marks)

A data set compares study **H**ours and test **S**cores.

H	2.5	5.1	3.2	8.5	3.5	1.5	9.2	5.5	8.3	2.7	7.7	5.9	4.5	3.3	1.1	8.9	2.5	1.9	6.1	7.4	2.7	4.8	3.8	6.9	7.8
S	21	47	27	75	30	20	88	60	81	25	85	62	41	42	17	95	30	24	67	69	30	54	35	76	86

(a) Two scores have been added for you.

Complete the scatter plot and comment on the correlation. (3 marks)



(b) Determine the equation of the least squares regression line. (4 marks)

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(c) Use your equation to predict the test score of a student who studies for 6 hours. (3 marks)

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(2024 Q11 Adapted, MA-S2)

Question 10 (5 marks)

The graph of $f(x) = sin(x) + 1$ is defined on $0 \leq x \leq 2\pi$.

(a) Sketch the graph. (2 marks)

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(b) Solve $sin(x) + 1 = 1.5$ on this domain. (3 marks)

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(2022 Q8 Adapted, MA-T3)

2025 RRHC Mathematics Investigation Style Task

Name _____ Teacher Prince

Section I – Multiple Choice Answer Sheet

Allow about 15 minutes for this section.

Select the alternative A, B, C or D that best answers the question. Fill in the response oval completely.

Sample: 2 + 4 = (A) 2 (B) 6 (C) 8 (D) 9

A ○ B ● C ○ D ○

If you think you have made a mistake, put a cross through the incorrect answer and fill in the new answer.

A ● B ⊗ C ○ D ○

If you change your mind and have crossed out what you consider to be the correct answer, then indicate the correct answer by writing the word **correct** and drawing an arrow as follows.

A ⊗ B ⊗ (correct) C ○ D ○

1. A ○ B ○ C ○ D ○
2. A ○ B ○ C ○ D ○
3. A ○ B ○ C ○ D ○
4. A ○ B ○ C ○ D ○
5. A ○ B ○ C ○ D ○
6. A ○ B ○ C ○ D ○
7. A ○ B ○ C ○ D ○

You are an expert facilitator of Mathematics Advanced in New South Wales using the DET Mathematics Advanced Stage 6 Syllabus 2017. you are designing an HSC "Examination" that complies with NESA guidelines in the following link: https://educationstandards.nsw.edu.au/wps/portal/nesa/mini-footer/privacy/!ut/p/z1/zVNNc5swEP0tOfioSuJDwBG7HX-0Dk5s14YLI2BxlDGCGNlk_OsjSA7tjD-nl-qg0Wre27f7tMIRXuNI8oPYcCVKybc6DiMWW-MRISYxfgXu7DvxJ_2nZf_pmf6YU7zqAIZPGR1Z9OeQupT45vSRBWRAiWXg6C5-MGz5i4AyY-IYwdK-jU_OLJ_cxr8AiC6n_40jHFWpyHBoAyGOk-XI84iHLNN1EAfmIYfbicETy6UpbdGpVJV6wWHVxGkpFUjVI9WufIVUoQaSHpFQ8x7hSblXbdDUOthu0eepzHORCq7DUokUTtygDBQX246KuMzQvsq4ggzVim8AMVRw9QJ6E2mN4J0XQnbP3d7DTiequ540NoNabGRX6eexR2aLro4vDTy55q8eIPH69hb5uu-22XeF1_9x43-U2xqAvhxYn3dg1Zp15Qv8DTgx49emLNRT6py12TDw6iCgwUtZ7gr9a-d3DuXoqoL9jwqX04_JqfSyji9y4tVgGs92cBDlvp7p15qLI3wzPZJz00gQcykgizgWSpidIOp4zOVWTnKT6aJbgY4_xiG9XU2r3KhgWndaVBVLvQrXLOKpshP2PDr2H9FwkLjNApIjhP7DwwcqS5Ei/ . Create an examination made using past hsc examinations from 2022, 2023 and 2024 using the same format, marks total, and time restriction including 10 multiple choice questions in section I and Long response questions with 90 mark value in section II, Additionally, create a fully worked set of solutions for the examination indicating the allocation of marks and sub topic code for each question and each stage of working in the fully worked solution. The Examination should be based on past papers found using the following link: https://educationstandards.nsw.edu.au/wps/portal/nesa/resource-finder/hsc-exam-papers/2024/mathematics-advanced-2024-hsc-exam-pack the examination must give proportionate representation to each Sub Topic identified on page 21 of the Mathematics Advanced syllabus found using the following link: https://educationstandards.nsw.edu.au/wps/portal/nesa/11-12/stage-6-learning-areas/stage-6-mathematics/mathematics-advanced-2017
Include a coverpage that outlines all sub topics, question references and mark allocations for each sub topic.