

Trial Examination 2021

VCE Mathematical Methods Units 1&2

Written Examination 1

Question and Answer Booklet

Reading time: 15 minutes

Writing time: 1 hour

Student's Name: _____

Teacher's Name: _____

Structure of booklet

<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
7	7	40

Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners and rulers.

Students are NOT permitted to bring into the examination room: any technology (calculators or software), notes of any kind, blank sheets of paper and/or correction fluid/tape.

Materials supplied

Question and answer booklet of 11 pages

Formula sheet

Working space is provided throughout the booklet.

Instructions

Write your **name** and your **teacher's name** in the space provided above on this page.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

All written responses must be in English.

At the end of the examination

You may keep the formula sheet.

Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.

Instructions

Answer **all** questions in the spaces provided.

In all questions where a numerical answer is required, an exact value must be given, unless otherwise specified.

In questions where more than one mark is available, appropriate working **must** be shown.

Unless otherwise indicated, the diagrams in this booklet are **not** drawn to scale.

Question 1 (4 marks)

A researcher surveyed 50 people to find if they played cards. The results showed the following.

- 8 people who did not play cards were younger than 40.
- 15 people were younger than 40.
- 22 people who played cards were older than 40.

- a. Using these results, complete the Karnaugh map below.

2 marks

	People younger than 40	People older than 40	Total
Yes			
No			
Total			50

- b. Using algebraic techniques, determine if the relationship between age and playing cards is independent.

2 marks

Question 2 (3 marks)

The probability that Sam exercises on a weekday (Monday to Friday) is $\frac{3}{5}$. Given that Sam exercises on a weekday, the probability that he exercises on the weekend (Saturday and Sunday) is $\frac{1}{5}$. Given that Sam does not exercise on a weekday, the probability that he exercises on the weekend is $\frac{3}{10}$.

- a. Draw a tree diagram that expresses the probability of Sam exercising on a certain day. Use W to represent Sam exercising on a weekday and S to represent Sam exercising on a weekend. Include the possible outcomes (sample space) and the probabilities stated above.

2 marks

- b. What is the probability that Sam does **not** exercise in a given week?

1 mark

Question 3 (2 marks)

Given that $\log_3 \left(\frac{x}{3} \right) = \log_3 \left(\frac{1}{9^{-1}} \right)$, express y in terms of x .

Question 5 (7 marks)

Let $f : [-\pi, 2\pi] \rightarrow \mathbb{R}$, where $f(x) = -3 \sin\left(\frac{\pi x}{4}\right) + 1$.

- a.** What is the amplitude of $f(x)$? 1 mark

- b.** What is the period of $f(x)$? 1 mark

- c. i.** Find $f(4)$. 1 mark

- ii.** Find $f\left(\frac{4}{3}\right)$. 2 marks

iii. Find x if $f(x) = -\frac{1}{2}$.

2 marks

Question 6 (11 marks)

Let $g : [-3, 2) \rightarrow \mathbb{R}$, $g(x) = -(x - 1)(x + 2)^2$.

- a.** Find the coordinates of the x -intercept(s). 1 mark

- b.** Find the coordinates of the y -intercept(s). 1 mark

- c.** Find $g'(x)$. 2 marks

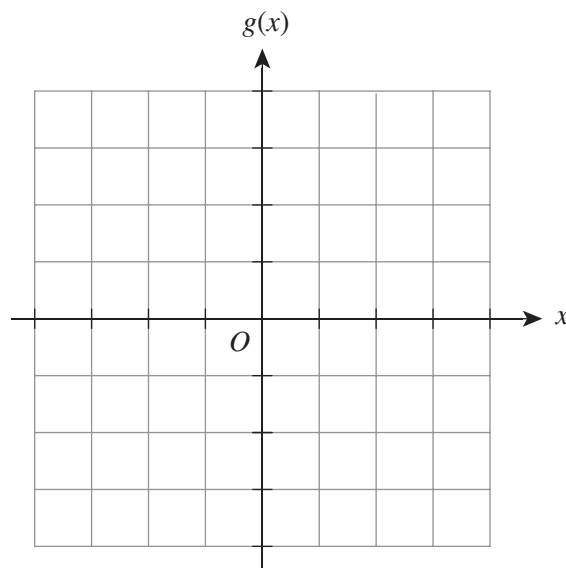
- d.** Find the coordinates of any stationary point(s). 3 marks

- e. State the nature of the stationary point(s) found in **part d.**

1 mark

- f. On the axes below, sketch the graph of $g(x)$. Label all important features.

3 marks



Question 7 (10 marks)

Consider the following functions.

$$f(x) = 2x^4 - 3x^3 + 2x^2 - x + 1$$

$$g(x) = 2x^2 + x - 5$$

- a.** Find $\lim_{x \rightarrow 1} f(x)$. 1 mark

- b.** Find $f'(x)$. 1 mark

- c.** Find $g(3x)$. 1 mark

- d. i.** Find $h(x)$ if $h(x) = f(x) - g(x)$. 1 mark

- ii.** Solve $\int_1^2 h(x) dx$. 3 marks

Trial Examination 2021

VCE Mathematical Methods Units 1&2

Written Examinations 1 and 2

Formula Sheet

Instructions

This formula sheet is provided for your reference.
A question and answer booklet is provided with this formula sheet.

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MATHEMATICAL METHODS FORMULAS**Mensuration**

area of a trapezium	$\frac{1}{2}(a+b)h$	volume of a pyramid	$\frac{1}{3}Ah$
curved surface area of a cylinder	$2\pi rh$	volume of a sphere	$\frac{4}{3}\pi r^3$
volume of a cylinder	$\pi r^2 h$	area of a triangle	$\frac{1}{2}bc \sin(A)$
volume of a cone	$\frac{1}{3}\pi r^2 h$		

Calculus

$\frac{d}{dx}(x^n) = nx^{n-1}$	$\int x^n dx = \frac{1}{n+1}x^{n+1} + c, n \neq -1$
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Probability

$\Pr(A) = 1 - \Pr(A')$	$\Pr(A \cup B) = \Pr(A) + \Pr(B) - \Pr(A \cap B)$
$\Pr(A B) = \frac{\Pr(A \cap B)}{\Pr(B)}$	

END OF FORMULA SHEET