# 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**

| Number of questions | Number of questions to be answered | Number of marks |
|---|---|---|
| 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.**

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**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.

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**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

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**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

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**Question 3** (2 marks)

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

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**Question 4** (3 marks)

**a.** Show that $\dfrac{x^{\frac{1}{2}} - y^{\frac{1}{2}}}{x^{-\frac{1}{2}} - y^{-\frac{1}{2}}} = -x^{\frac{1}{2}} y^{\frac{1}{2}}$. 2 marks

**b.** Solve $\dfrac{x^{\frac{1}{2}} - y^{\frac{1}{2}}}{x^{-\frac{1}{2}} - y^{-\frac{1}{2}}} > 2$ for $x$ when $y = 1$. 1 mark

**Question 5** (7 marks)

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

**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 $f\left(\dfrac{4}{3}\right)$. 2 marks

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

2 marks

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**Question 6** (11 marks)

Let $g:[-3,2) \to R$, $g(x) = -(x-1)(x+2)^2$.

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

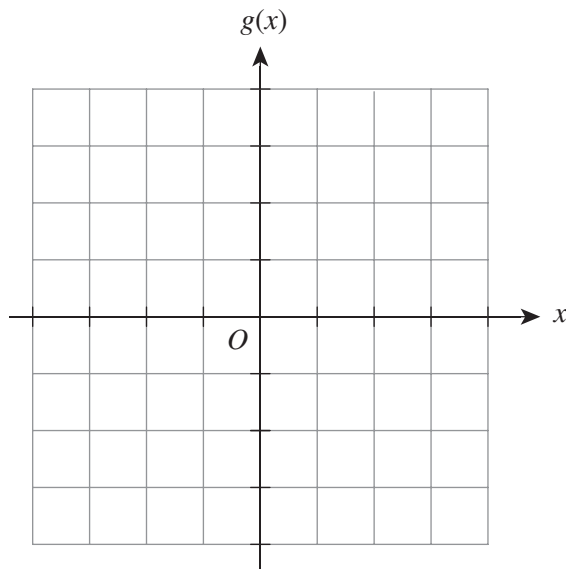**b.** Find the coordinates of the $y$-intercept(s).                                    1 mark

**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

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**f.** On the axes below, sketch the graph of $g(x)$. Label all important features. 3 marks

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**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 $\lim_{x \to 1} f(x)$. 1 mark

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

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

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

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

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**e.** Find $\dfrac{f(x)}{x-2}$.

3 marks

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**END OF QUESTION AND ANSWER BOOKLET**

# Neap

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.

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

# MATHEMATICAL METHODS FORMULAS

## Mensuration

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

## Calculus

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

## Probability

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

## END OF FORMULA SHEET