Neap

Trial Examination 2020

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*
11	11	40

Students are to write in blue or black pen.

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 13 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 (3 marks)

Let $P(x) = 3x^3 - 2x^2 + 4x - 5$ and $Q(x) = -4x^2 - 3$.

a. What is the degree of the polynomial $P(x)$? 1 mark

_____

_____

b. Find $P(x) - Q(x)$. 1 mark

_____

_____

_____

c. Find $P(-2)$. 1 mark

_____

_____

_____

Question 2 (3 marks)

The polynomial $R(x) = x^3 - 7x^2 + 7x + 15$ can be written in the form $(x - 3)(x^2 + bx + c) + r$, where b, c and r are real numbers.

Find the values of b, c and r.

Question 3 (1 mark)

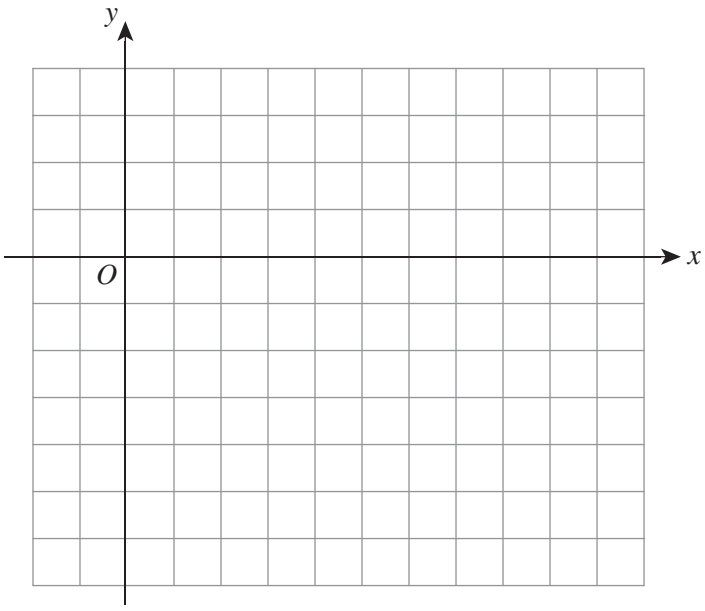
Is the set of ordered pairs $(-3, 5), (-3, 10), (1, 5), (3, -10), (5, -5)$ a function? Provide an explanation to support your answer.

Question 4 (7 marks)

Let $f: R \to R,\ f(x) = -2(x-5)^2 + 18$.

a. **i.** Find the x- and y-intercepts of $f(x)$. 2 marks

ii. Thus, sketch the graph of $f(x)$ on the axes below. Label the turning point and all points of intersection with their coordinates. 2 marks



b. State the domain and range of $f(x)$. 2 marks

_____

_____

c. Restrict the domain of $f(x)$ so that it is a one-to-one function with the greatest possible domain. 1 mark

_____

Question 5 (4 marks)

A transformation is defined by the matrix

$$\begin{bmatrix} -2 & 0 \\ 0 & -3 \end{bmatrix}$$

Find the equation of the image of $f(x) = -2x^2 + 3x + 5$ under this transformation.

Question 6 (3 marks)

Given that $f(x) = 3x^2 - 4x + 5$, find $f'(x)$ using first principles.

Question 7 (8 marks)

Let $f(x) = -2x^3 - 5x^2 + x - \log_{10}100$.

a. Find $f'(x)$. 1 mark

b. **i.** Find the equation of the tangent line $f(x)$ at the point $(-2, -8)$. 2 marks

ii. Find the equation of the line perpendicular to $f(x)$ at the point $(-2, -8)$. 2 marks

c. Evaluate $\int_{-1}^{1} f(x)dx$. 3 marks

Question 8 (2 marks)

Solve $\frac{81^{2x} \times 9^{x+3}}{3^{-2x} \times 3^{0}} = 3\log_5 125$ for x.

Question 9 (2 marks)

Simplify $3^{\log_3(9)} - \log_2\sqrt{32}$.

Question 10 (4 marks)

A bag of lollies contains 5 red, 3 blue and 2 green lollies. Two lollies are drawn at random without replacement.

a. Draw a tree diagram showing all possible outcomes and their probabilities. 3 marks

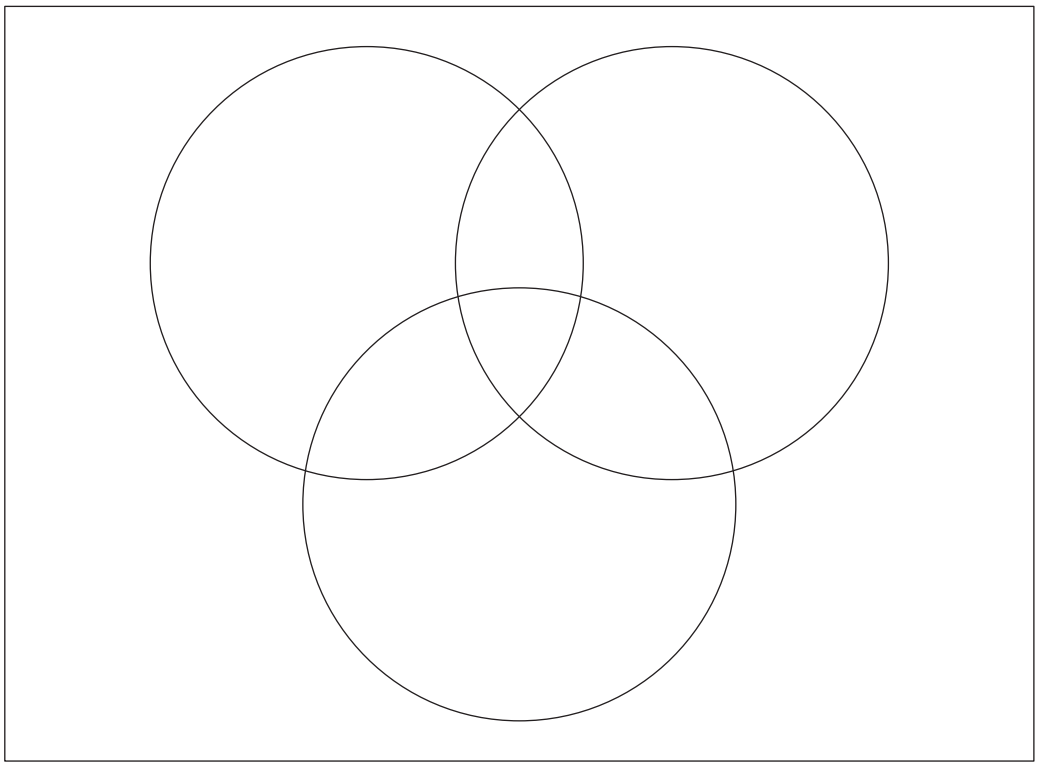
b. What is the probability that a green lolly is drawn second if a red lolly is drawn first? 1 mark

Question 11 (3 marks)

A teacher surveyed the sports preferences of 100 students at their school. The results were as follows:

- 10 students said that they like football, soccer and cricket.
- 15 students said that they like football and cricket only.
- 65 students said that they like football.
- 25 students said that they like football and soccer only.
- 5 students said that they like soccer and cricket only.
- 30 students said that they like cricket.
- 50 students said that they like soccer.

Summarise this information in the Venn diagram below.



END OF QUESTION AND ANSWER BOOKLET

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Trial Examination 2020

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

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

Probability

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

END OF FORMULA SHEET