

Time allowed for this section	Pre-reading time before commencing work: ten minutes Working time for this section: one hundred minutes
Materials required/recommended for this section	Materials provided by the supervisor
Formulas Sheet (obtained from Section One)	This Question/Answer Booklet
To be provided by the candidate	Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, ruler, highlighters
Special items:	Drawing instruments, templates, notes on two unfolded sheets of A4 paper, and up to three calculators approved for use in the WACE examinations
Important note to candidates	

Teacher's name

our name

MATHEMATICS METHODS UNITS 1 AND 2

Section Two: Calculations assumed

Question/Answer Booklet

Year 11 Examination, 2015

Rossmyne Senior High School



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Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of exam
Section One: Calculator-free	7	7	50	52	35
Section Two: Calculator-assumed	12	12	100	98	65
Total			150	100	

Additional working space

Question number: _____

Instructions to candidates

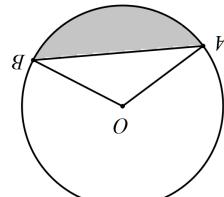
1. The rules for the conduct of examinations are detailed in the school handbook. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer Booklet.
3. You must be careful to confine your response to the specific question asked and to follow any instructions that are specified to a particular question.
4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
 - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
 - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.
5. **Show all your working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.
6. It is recommended that you **do not use pencil**, except in diagrams.
7. The Formula Sheet is **not** to be handed in with your Question/Answer Booklet.

(2 marks)

- (b) Determine the length of the chord AB to 2 decimal places.

(2 marks)

- (a) Determine the exact length of the minor arc AB.



The chord AB subtends an angle of $\frac{5\pi}{3}$ at O, the centre of the circle.
A and B lie on the circumference of a circle of radius 20 cm.

(6 marks)

Question 8

Working time for this section is 100 minutes.

provided.

This section has twelve (12) questions. Answer all questions. Write your answers in the spaces provided.

Section Two: Calculator-assumed
(98 Marks)

Question number: _____

Question 9

(5 marks)

A small body moves in a straight line such that its displacement from the origin after t seconds is given by $x = 16t - 2t^2 + 5$, where x is the displacement in metres and $t \geq 0$.

- (a) At what time does the body pass through the origin?

(1 mark)

- (b) Determine the velocity, v , of the body when $t = 2.5$ seconds.

(2 marks)

- (c) Calculate the displacement of the body at the instant that it is stationary.

(2 marks)

Question 19

(9 marks)

The first three terms of a sequence are, in order, $x - 2$, 3 and $2x - 1$.

- (a) Determine the value of x and the sixth term of the sequence if the sequence is an arithmetic progression. (4 marks)

- (b) Determine the value of x and the sum of the first ten terms of the sequence if the sequence is a geometric progression with a positive common ratio. (5 marks)

METHODS UNITS 1 AND 2	16	CALCULATOR-ASSUMED	8 marks	Question 10	8 marks	(a) An analysis of the 210 students in their final year of school determined that 35 choose to study Physics, 45 choose to study Chemistry and 151 choose neither of these subjects.	(a) Determine the number of students who choose to study both Physics and Chemistry.	(i) Determine the number of different subcommittees that can be selected that contain only senior members.	(iii) Determine the probability that a randomly chosen subcommittee contains at least one junior member.
5		METHODS UNITS 1 AND 2							

(a)	A committee consisting of 10 senior members and 12 junior members has decided to select five of its members to form a subcommittee.	(i) Determine the number of different subcommittees that can be selected that contain only senior members.	(iii) Determine the probability that a randomly chosen subcommittee contains at least one junior member.
(b)	Determine the probability that a randomly selected student chooses to study Chemistry given that they choose to study Physics.	(i) Determine the probability that a randomly selected student chooses to study Chemistry given that they choose to study Physics.	(i) If $P(A) = 0.55$ and $P(B) = 0.3$, determine $P(A \cup B)$ in each of the following cases:
(i)	$P(A \cap B) = 0.25$	(ii) $P(A \cup B) = 0.25$	(ii) $P(A \cap B) = 0.5$
(ii)	Physics but did not choose Chemistry.	Chemistry given that they choose to study Physics.	Is there any indication that choosing to study Chemistry is independent of choosing to study Physics?
(iii)	Physics but did not choose Chemistry.	Chemistry given that they choose to study Physics.	Study Physics? Explain your answer.

(c)	Is there any indication that choosing to study Chemistry is independent of choosing to study Physics?	Study Physics? Explain your answer.	(iii) $P(A B) = 0.5$
(i)	A and B are mutually exclusive.	(ii) $P(A \cup B) = 0.25$	(i) $P(A \cap B) = 0.25$
(ii)	$P(A) = 0.55$ and $P(B) = 0.3$, determine $P(A \cup B)$ in each of the following cases:	(iii) $P(A B) = 0.5$	

(c)	Is there any indication that choosing to study Chemistry is independent of choosing to study Physics?	Study Physics? Explain your answer.	(iii) $P(A B) = 0.5$
(i)	A and B are mutually exclusive.	(ii) $P(A \cup B) = 0.25$	(i) $P(A \cap B) = 0.25$
(ii)	$P(A) = 0.55$ and $P(B) = 0.3$, determine $P(A \cup B)$ in each of the following cases:	(iii) $P(A B) = 0.5$	

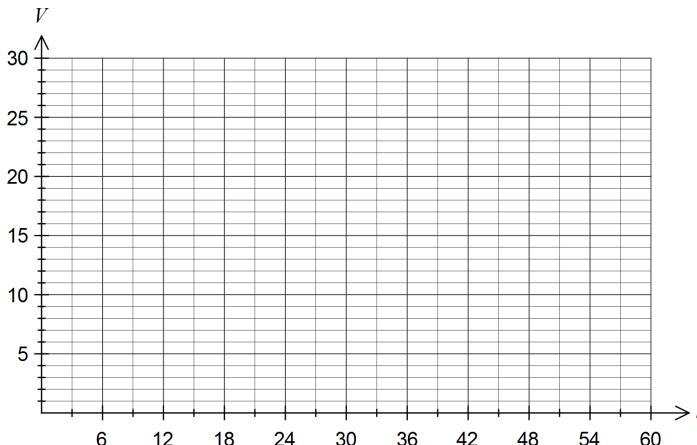
Question 11

(8 marks)

The value V , in thousands of dollars, of an office computer system t months after installation, can be modelled by the equation $V = 28.5(0.97)^t$.

- (a) Calculate the value of the system at the time of installation. (1 mark)

- (b) Draw the graph of the value of the system for $0 \leq t \leq 60$ on the axes below. (3 marks)



- (c) Determine the value of system, to the nearest hundred dollars, after two years. (2 marks)

- (d) Company policy is for the system to be replaced after 5 years or when its value has decreased by 80%, whichever occurs first. When will the system be replaced? (2 marks)

Question 17

(9 marks)

The owners of a market stall know that they can sell 100 greeting cards per day if they charge \$5 per card, giving a daily revenue of \$500. The owners estimate that for every 50 cent increase in price, they will sell five fewer cards per day.

- (a) Complete the table below. (3 marks)

Number of 50 cent increases, x .	Price (\$)	Number of cards sold
0	5.00	100
1	5.50	
2		90
3		
x	$5 + 0.5x$	

- (b) Show that the daily revenue from selling cards, after x 50 cent price increases, is given by $R = 500 + 25x - 2.5x^2$. (1 marks)

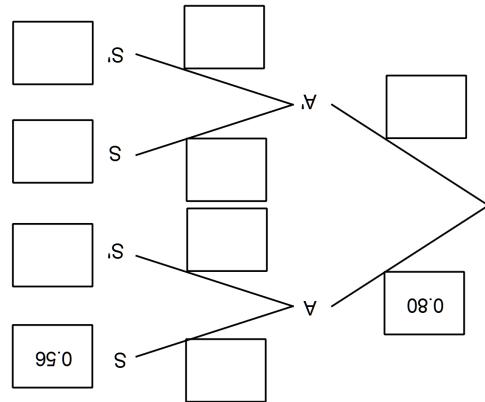
- (c) Using calculus techniques, determine the amount that should be charged per card to maximise daily revenue. State how many cards will be sold at this price and the maximum revenue. (5 marks)

Question 12

(9 marks)

An analysis of new cars sold recently showed that 80% had automatic transmission (event A) and that 68% were classified as having a small sized engine (event S). It was also noted that 56% of cars had both automatic transmission and a small sized engine.

(a) Use the above information to complete the all the probabilities in this tree diagram. (5 marks)



(b) Determine the probability that a randomly selected car will have a small sized engine or have automatic transmission. (1 mark)

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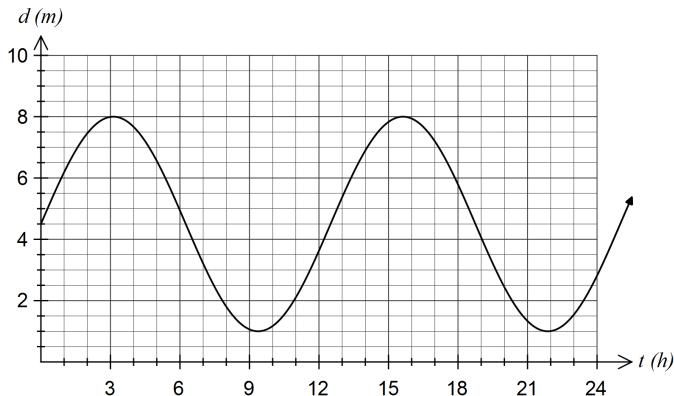
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Question 13

(9 marks)

- (a) The depth of water at a mooring in a tidal inlet during a particular day can be modelled by

$d(t) = 4.5 + 3.5 \sin\left(\frac{4\pi t}{25}\right)$, where d is the depth of water in meters and t is the time in hours after midnight, as shown below.



- (i) Use your calculator to determine the time, to the nearest minute, at which the depth of water is first a minimum. (2 marks)
- (ii) For what percentage of the first 12 hours is the depth less than 2 metres? Give your answer rounded to one decimal place. (3 marks)

See next page

- (c) The function g is given by $g(x) = f(2x)$.

(i) Describe how to transform the graph of $y = f(x)$ to the graph of $y = g(x)$. (1 mark)

(ii) Draw the graph of $y = g(x)$ on the previous axes. (3 marks)

See next page

(a)

- If A and B are acute angles with $\sin A = \frac{3}{5}$ and $\tan B = \frac{12}{5}$ show that $\cos(A+B) = -\frac{16}{65}$.

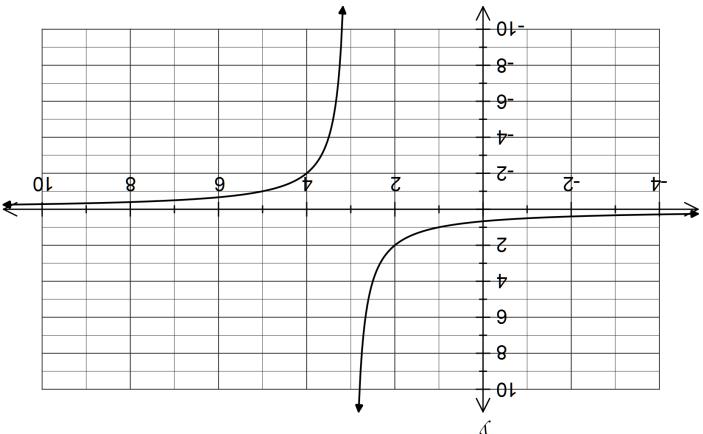
METHODS UNITS 1 AND 2

9

CALCULATOR-ASSUMED

(b)

- The graph of the function $f(x) = \frac{x-a}{x-b}$ is shown below, where a and b are integer constants.



(c)

(8 marks)

(a)

- Determine the values of a and b .

(2 marks)

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

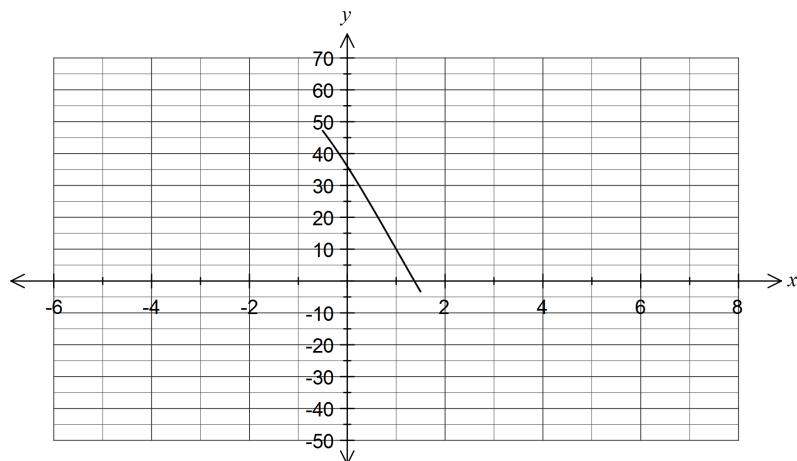
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(10 marks)

Question 14

Part of the graph of $y = x^3 - 3x^2 - 24x + 36$ is shown below.



- (a) Using calculus techniques, determine the coordinates of both stationary points of the graph.
(4 marks)

(b) Neatly complete the graph of $y = x^3 - 3x^2 - 24x + 36$.
(3 marks)

(c) Show that the equation of the tangent to the graph at $x = 3$ is $y = -15x + 9$.
(3 marks)