

Rossmoyne Senior High School

Question/Answer Booklet

Semester One Examination, 2016

UNIT 1
METHODS
MATHEMATICS
Section Two:
Calculator-assumed

Place your student identification label in this box
Required by your examination administrator, please

our name

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Student Number: In figures

Time allowed for this section
Reading time before commencing work
Working time for section:

Materials required/recommended for this section

ANSWER

Section One)

to be provided by the candidate

tape, eraser, ruler, highlighters

Special items: drawing instruments, emplates, notes on two unruled sheets of A4 paper, and up to three calculators approved for use in the WACE examinations

Important note to candidates Do other items may be taken into the examination room. It is Your responsibility to ensure that

before reading any further.

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and how it can improve the school.

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	50	35
Section Two: Calculator-assumed	13	13	100	99	65
Total			149	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)
answer.

1 mark)

1 mark)

(1 mark)

[1 mark]

The results from a clinical study on the effect of sleep on reaction times for a group of 210 male police cadets is shown in the table below. The participants were given either 4, 6 or 8 hours sleep, broken and immediately asked to perform a series of tasks involving reacting to various stimuli, from which the total reaction time was calculated.

Question 8

Working time for this section is 100 minutes.

provided.

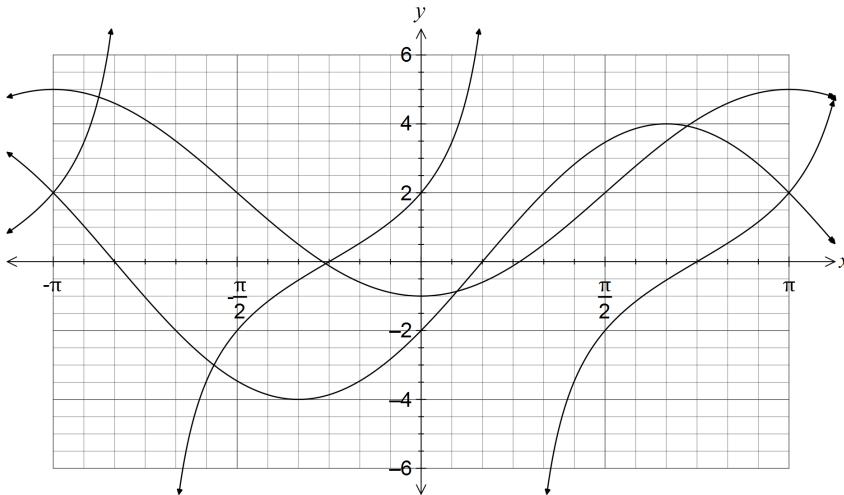
This section has **thirteen (13)** questions. Answer all questions. Write your answers in the spaces provided.

Question number: _____

(7 marks)

Question 9

The graphs of the functions $f(x) = a - b \cos(x)$, $g(x) = c \sin(x - d)$ and $h(x) = m \tan(x + n)$ are shown below, where a, b, c, d, m and n are positive constants.



- (a) Clearly label each of the functions f , g and h on the graph. (1 mark)
- (b) Determine the values of the positive constants a , b , c , d , m and n . (6 marks)

Additional working space

Question number: _____

whether there is any evidence that the improvements were successful. (2 marks)

boxes were examined, of which just 11 contained all broken glasses. Briefly discuss

After improvements were made to the packaging used, a random sample of 350 posted

(b) During one week, a large number of boxes were sent, resulting in 280 customers receiving a box with one broken glass. Estimate how many boxes were sent during the week. (2 marks)

(iii) exactly three glasses break.

(ii) fewer than two glasses break.

(i) at least one glass breaks.

(a) Determine the probability that

glasses break is $\frac{1}{7}$, that one breaks is $\frac{20}{20}$ and that two break is $\frac{3}{25}$.

When a box of three fragile glasses is sent through the post, the probability that none of the

glasses break is $\frac{1}{7} \times \frac{1}{7} \times \frac{1}{7} = \frac{1}{343}$. (7 marks)

Additional working space

Question number: _____

METHODS UNIT 1

CALCULATOR-ASSUMED

Question 10

5

METHODS UNIT 1

CALCULATOR-ASSUMED

Question

(7 marks)

Question 11

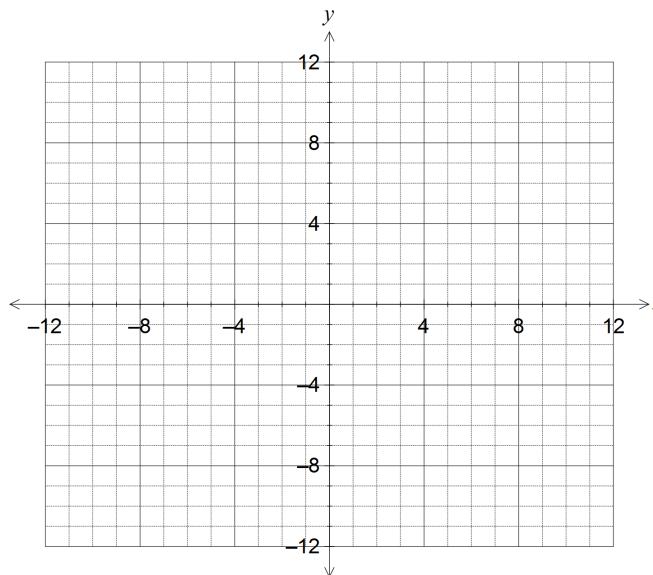
$$f(x) = \frac{6}{x-3}$$

A function is defined by

- (a) State the domain of this function.

(1 mark)

- (b) Draw the graph of
- $y = f(x)$
- on the axes below, clearly showing the coordinates of all axis-intercepts and equations of any asymptotes. (4 marks)



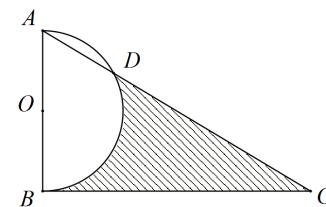
- (c) The graph of
- $y = f(x)$
- is dilated vertically by a scale factor of 4 followed by a translation of three units to the right. Determine the coordinates of the y-intercept of the transformed graph. (2 marks)

(7 marks)

Question 20

- (a) Determine the exact area of a sector enclosed by an arc of length 42 cm in a circle of radius 12 cm. (2 marks)

- (b) In the diagram below,
- BC
- is a tangent to the circle with diameter
- AB
- and centre
- O
- . Given that
- $AB = 20$
- cm and
- $BC = 30$
- cm, determine the shaded area. (5 marks)



(2 marks)

A thin metal plate in the shape of an equilateral triangle has an area of 330 cm². Determine the side length of the triangle.

(b)

$$6 \sin \left(\frac{x}{5} - 50^\circ \right) = 3 \quad \text{for } x \geq 0^\circ \quad (2 \text{ marks})$$

(b)

Determine the two smallest solutions to the equation

(2 marks)

(iii) the distance DC.

(2 marks)

(ii) the distance AB.

(2 marks)

(iii) $\sin 2\theta$.

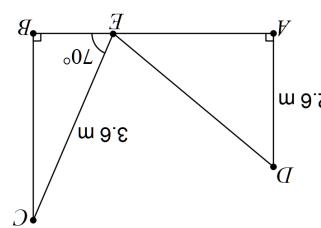
(2 marks)

(i) the angle through which the ladder was rotated.

(2 marks)

(ii) $\cos \theta$.

Showing use of trigonometry, determine



(8 marks)

(a) A 3.6 m long ladder first rests against a vertical wall BC, making an angle of 70° with the horizontal ground. The ladder is rotated in a vertical plane about E to rest against wall AD, reaching a point 2.6 m above the ground.

(2 marks)

(i) $\sin \theta$.

(a) Given that $\tan \theta = \frac{1}{3}$, where $\frac{\pi}{2} < \theta < \pi$, show how to determine the exact value of

(b) Question 12

CALCULATOR-ASSUMED

METHODS UNIT 1

7

CALCULATOR-ASSUMED

14

METHODS UNIT 19

METHODS UNIT 1

- (a) In a group of 47 people, 6 had surnames beginning with A, 5 had first names beginning with A and 38 had neither name beginning with A. Determine the probability that a randomly chosen person from the group

(i) has both names beginning with A.

(2 marks)

(ii) only has a first name beginning with A.

(1 mark)

(iii) only has a surname beginning with A, given that either their first name or surname begins with A.

(2 marks)

- (b) In the population as a whole, it was thought that 3% had surnames beginning with A, 4% had first names beginning with A and 0.15% had both names beginning with A. Estimate how many people in a group of 2000 will have neither name beginning with A.

(3 marks)

The events A and B are such that $P(A) = 0.3$ and $P(B) = 0.6$.

- (a) Determine $P(A \cup B)$ in each of the following cases.

(i) A and B are mutually exclusive.

(1 mark)

(ii) $P(A \cap B) = 0.18$.

(2 marks)

(iii) $P(A|B) = 0.2$.

(2 marks)

- (b) Are A and B independent in any of the above three cases? Justify each decision.

(3 marks)

Question 17 (7 marks)

A function and a relation have been graphed on the axes below.

(a) The diagram below shows the five graphs $y = f(x)$, where a , b , c and d are constants.

(i) Determine $f(4)$. (1 mark)

(ii) Determine the values of the constants a , b , c and d . (4 marks)

(b) State the domain and range of the function. (2 marks)

(c) The relation can be expressed in the form $y^2 = ax + by - 2$. Determine the values of the constants a and b . (2 marks)

(d) Describe two transformations that will transform the graph of $y = g(x)$ to: (3 marks)

(i) $y = g(x - 1) - 2$

(ii) $y = -\frac{1}{2}g(x)$.

Question 14 (9 marks)

CALCULATOR-ASSUMED

CALCULATOR-ASSUMED

METHODS UNIT 1

12

9

METHODS UNIT 1

See next page

Question 15

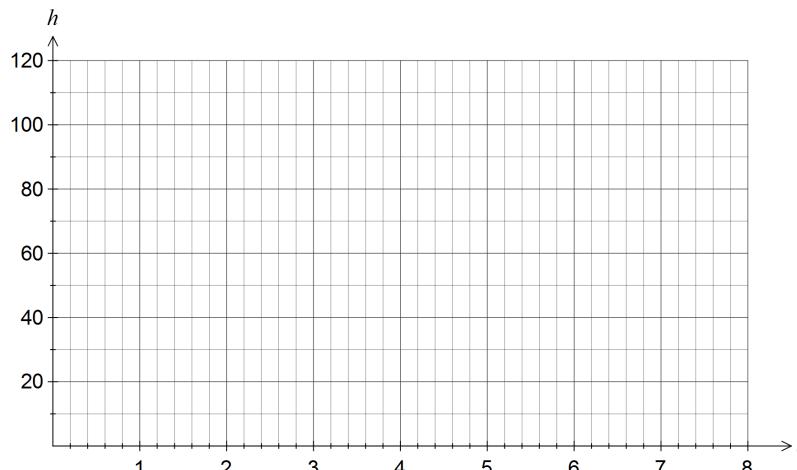
(9 marks)

A sensor was fitted to the tip of a blade on a wind turbine to measure the height, h metres, of the blade above the ground. The height was observed to vary according to the function

$$h(t) = 72 - 38 \sin\left(\frac{\pi t}{2}\right), \text{ where } t \text{ is the time in seconds since measurements began.}$$

- (a) Determine the height of the blade tip above the ground when $t = 3$. (1 mark)

- (b) Sketch the graph of $h(t)$ on the axes below for $0 \leq t \leq 8$. (4 marks)



- (c) How long does the blade take to rotate once? (1 mark)

- (d) Assuming the blade continues to rotate in this manner, determine the percentage of time during which the blade tip is at least 90 m above the ground. (3 marks)

Question 16

(8 marks)

A selection of four representatives is to be made from eleven students, comprising six girls and five boys. Determine

- (a) the number of ways in which this can be done. (2 marks)

- (b) the number of selections that contain the same number of girls and boys. (2 marks)

- (c) the probability that three of the representatives chosen are girls. (2 marks)

- (d) the probability that more boys than girls are chosen. (2 marks)