# Rossmoyne Senior High School

### Year 12 Trial WACE Examination, 2014

### Question/Answer Booklet

**SOLUTIONS**

# MATHEMATICS 3C/3D

## Section One:

## Calculator-free

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Student Number: In figures |  |  |  |  |  |  |  |  |

In words

Your name

## Time allowed for this section

Reading time before commencing work: five minutes

Working time for this section: fifty minutes

## Materials required/recommended for this section

##### *To be provided by the supervisor*

This Question/Answer Booklet

Formula Sheet

##### *To be provided by the candidate*

Standard items: pens, pencils, pencil sharpener, eraser, correction fluid/tape, ruler, highlighters

Special items: nil

## Important note to candidates

No other items may be used in this section of the examination. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

## 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 | 8 | 8 | 50 | 50 | 33⅓ |
| Section Two:  Calculator-assumed | 13 | 13 | 100 | 100 | 66⅔ |
|  | | | **Total** | 150 | 100 |

## Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2013*. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in the spaces provided in this Question/Answer Booklet. 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(s) that you are continuing to answer at the top of the page.

1. **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 an answer to any question, ensure that you cancel the answer you do not wish to have marked.
2. It is recommended that you **do not use pencil**, except in diagrams.

Section One: Calculator-free (50 Marks)

This section has**eight (****8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time for this section is 50 minutes.

Question 1 (3 marks)

If  and , determine .



Question 2 (5 marks)

The function , where ,  and  are constants, passes through the three points (3, 10), (2, -1) and (1, -6).

(a) Explain why ,  and  the satisfy the equation . (1 mark)

When , and by substitution



(b) Write down another two equations satisfied by ,  and . (1 mark)



(c) Solve the above equations to determine the values of ,  and . (3 marks)



Question 3 (8 marks)

(a) If , evaluate . (4 marks)



(b) Determine the area enclosed between the curve  and the line .

(4 marks)



Question 4 (7 marks)

Let  and .

(a) Determine

(i) an expression for . (1 mark)



(ii) the domain of . (2 marks)



(b) Determine

(i) the domain of . (2 marks)



(ii) the range of . (2 marks)



Question 5 (7 marks)

The radius, in centimetres, of a circular ink spot  seconds after it first appears is given by .

(a) Determine

(i) the time taken for the radius to double its initial value. (2 marks)



(ii) the rate at which the radius is increasing when . (3 marks)



(b) Use the formula  to approximate the increase in the radius of the ink spot between  and  seconds. (2 marks)



Question 6 (8 marks)

Let  and, where  is a constant.

(a) Show that . (2 marks)



(b) The tangents to the graphs of  and  are parallel when . Determine the value of . (3 marks)



(c) What are the minimum and maximum values of  over the domain ?

(3 marks)



Question 7 (5 marks)

In a pack of six identical rechargeable batteries, it is known that two are flat and the other four are fully charged.

Four batteries are removed at random from the pack.

(a) Determine the probability that

(i) three of them are fully charged. (2 marks)



(ii) no more than two of them are fully charged. (2 marks)



(b) The first battery removed is flat, the second is fully charged, but the condition of the last two removed is not known. Determine the probability that three out of the four batteries removed are fully charged. (1 mark)



Question 8 (7 marks)

Let , where  and  are both positive integers.

(a) For each conjecture below state whether it is true or false. If a conjecture is true, give an example that shows it is true. If a conjecture is false, give an example that shows it is false. (3 marks)

(i)  is always odd when  is even.



(ii)  is always odd when  is odd.



(iii)  is always even when  is even.



(b) Prove the conjecture from part (a) that is true. (4 marks)

Prove if  is odd, then  is always odd:

Let , where  is any integer, .

Then 

Additional working space

Question number: \_\_\_\_\_\_\_\_\_

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