# Rossmoyne Senior High School

### Year 12 Trial WACE Examination, 2014

### Question/Answer Booklet

**SOLUTIONS**

# MATHEMATICS: SPECIALIST 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 | 7 | 7 | 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**seven (****7)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time for this section is 50 minutes.

Question 1 (4 marks)

One of the solutions to  is .

Determine all other solutions to the equation in Cartesian form and plot all solutions on the Argand diagram below.





Question 2 (8 marks)

(a) If , evaluate . (4 marks)



(b) Use the substitution  to evaluate . (4 marks)



Question 3 (8 marks)

(a) If  determine

(i) . (2 marks)



(ii) . (2 marks)



(b) The matrix , its inverse and a system of equations in  are shown below.



Using these and/or any other matrices, show use of matrix techniques to solve the system of equations. (4 marks)



Question 4 (8 marks)

A small body moves along the -axis so that after  seconds it is  centimetres from the origin. The velocity of the body for  is given by , where  and .

(a) Show that . (3 marks)



(b) Determine the acceleration of the body when  cm. (3 marks)



(c) The body reaches a speed of 25 cm/s after  seconds. Determine the value of .

(2 marks)



Question 5 (5 marks)

The production of a chemical in a laboratory can be modelled by the differential equation , where  kg is the total mass of the chemical produced after  hours.

Given that , determine an exact value for the total mass of substance produced after three hours.



Question 6 (10 marks)

(a) Use Euler's formula  to show that . (3 marks)



(b) Use the definition  to show that .

Do **not** use any identities from the formula sheet. (4 marks)



(c) Show that . (3 marks)



Question 7 (7 marks)

A small rocket is launched from position  on a school oval and moves with a constant velocity of . At the same instant the rocket is launched, a small balloon at position  is being blown horizontally by the wind with constant velocity . All distances are in metres and all velocities are in metres per second.

The rocket misses the balloon, with the distance between them a minimum exactly two seconds after its launch.

(a) Determine the value of the constant . (5 marks)



(b) Determine the minimum distance between the rocket and the balloon. (2 marks)



Additional working space

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

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