

**ST STEPHENS SCHOOL**

### Trial WACE Examination, 2011

### Question/Answer Booklet

If required by your examination administrator, please place your student identification label in this box

# 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 | 6 | 6 | 50 | 40 | 33 |
| Section Two:  Calculator-assumed | 13 | 13 | 100 | 80 | 67 |
|  | | | **Total** | 120 | 100 |

## Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2011*. 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 (40 Marks)

This section has**six (****6)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time for this section is 50 minutes.

Question 1 (5 marks)

Find the area trapped between , the -axis, the -axis and the line x = 3.

Question 2 (6 marks)

(a) Find the equation of the tangent to the curve  at the point (1, -2).

(3 marks)

(b) Evaluate  using the substitution . (3 marks)

Question 3 (6 marks)

The transformation matrix .

 represents a shear of factor  parallel to the -axis followed by a rotation of 90° clockwise.

(a) Use properties of the two transformations to explain why  (1 mark)

(b) Determine the values of ,  and . (3 marks)

(c) The point  is transformed by  to the point (8, 3). Determine the coordinates of .

(2 marks)

Question 4 (7 marks)

The Argand diagram below shows the complex number .



(a) On the same diagram plot and label the complex numbers given by (3 marks)



(b) On the same diagram sketch the region given by . (2 marks)

(c) The locus of the complex number  satisfies the equation .

Find the equation of the locus in the form . (2 marks)

Question 5 (8 marks)

(a) Use the identity  to prove that . (5 marks)

(b) Evaluate . (3 marks)

Question 6 (8 marks)

A minor sector of angle  is removed from a circular piece of paper of radius . The two straight edges of the remaining major sector are pulled together to form a right circular cone, with a slant height of .



1. If the base radius of the cone is r, and the height is h, show that r = (1 mark)
2. Show that the volume of the cone is given by . (2 marks)

(b) Find the value of  which maximises the volume of cone. (5 marks)

Additional working space

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

Additional working space

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

Additional working space

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

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