Government of **Western Australia**
Curriculum Council

WACE
Western Australian Certificate of Education

Western Australian Certificate of Education
Examination, 2011

Question/Answer Booklet

MATHEMATICS: SPECIALIST 3C/3D

Section One: Calculator-free

Please place your student identification label in this box

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

In words _____

_____

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.

 Ref: 11-139

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	40	
Section Two: Calculator-assumed	13	13	100	80	
			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. Answer the questions in the spaces provided.

   Section One: Write answers in this Question/Answer Booklet. Answer **all** questions.

   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.

   It is recommended that you **do not use pencil**, except in diagrams.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific 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(s) that you are continuing to answer at the top of the page.

See next page

Section One: Calculator-free **(40 Marks)**

This section has **seven (7)** questions. Answer **all** questions. Write your answers in the spaces provided.

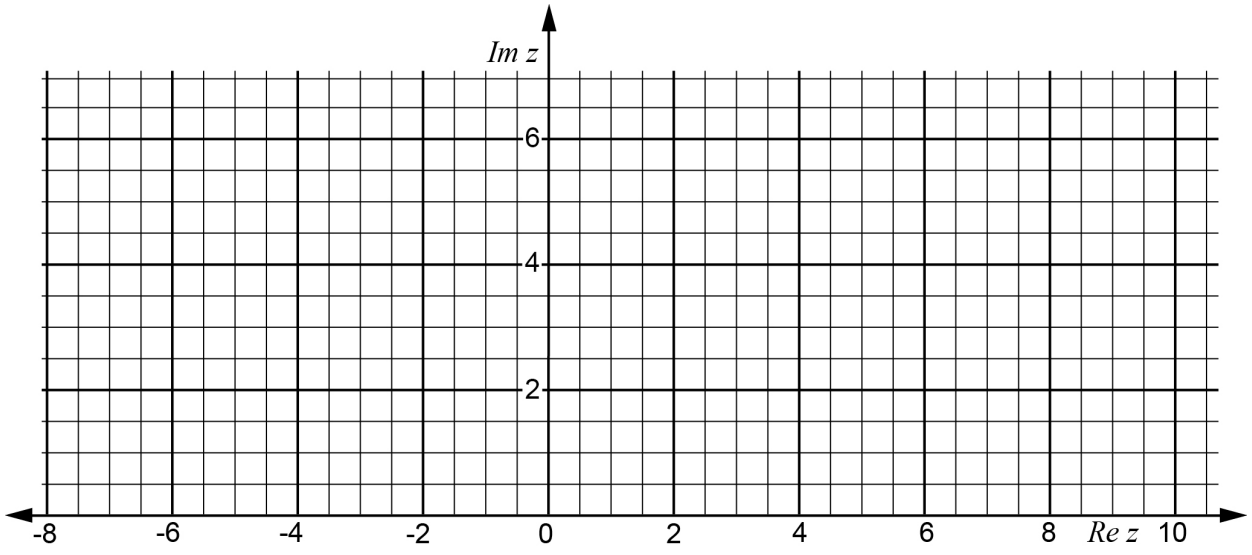
Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- 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.

Working time: 50 minutes.

Question 1 **(5 marks)**

(a) Sketch, on the complex plane below, the region defined by $|z-3-4i| \leq \frac{5}{2}$. (3 marks)



(b) For the region in (a), find the maximum value of $|z|$. (2 marks)

Question 2 **(3 marks)**

Use proof by exhaustion to prove that no square number ends in 8.

See next page

Question 3 **(6 marks)**

Determine the following integrals:

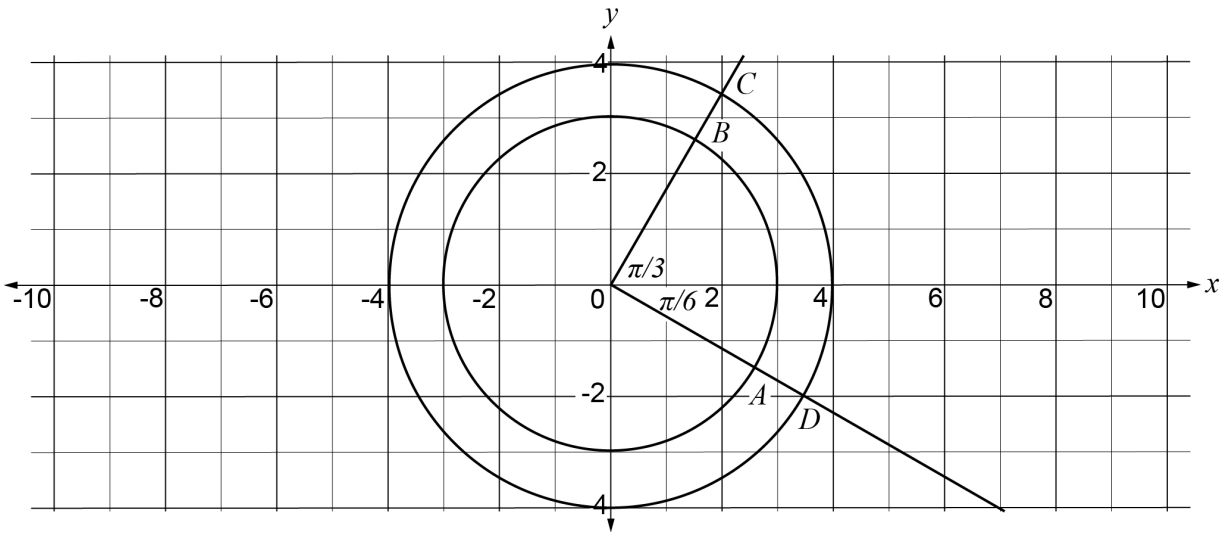
(a) $\int \frac{\sin\frac{\theta}{2}\cos\frac{\theta}{2}}{\cos\theta+1}d\theta$ (3 marks)

(b) $\int \cos^3 x\, dx$ (3 marks)

See next page

Question 4 **(6 marks)**

(a) Use polar inequalities to describe the region bounded by the minor arcs AB and CD and the straight lines BC and AD in the diagram below. (2 marks)



(b) If the graph of $r = k\theta,\ k > 0$, passes through A, find a possible value for k. (2 marks)

Question 4 (continued)

(c) Find the distance between B and D. (2 marks)

Question 5 **(6 marks)**

(a) Solve the equation $X\begin{bmatrix} 2 & -2 \\ -7 & 4 \end{bmatrix} + X = \begin{bmatrix} 1 & 2 \\ -3 & 1 \end{bmatrix}$ for the 2×2 matrix X. (4 marks)

(b) If A is a square matrix satisfying $A^2 - 2A + I = 0$, where I is the 2×2 identity matrix, determine an expression for A^{-1} in terms of A and I. (2 marks)

See next page

Question 6 **(5 marks)**

Evaluate exactly: $\int_0^{10} \frac{6t^2+1}{\sqrt{2t^3+t+1}}\,dt$

See next page

Question 7 **(9 marks)**

Consider the integrals $I = \int_0^a \frac{f(x)}{f(x)+f(a-x)}dx$ and $J = \int_0^a \frac{f(a-x)}{f(x)+f(a-x)}dx$.

(a) Use the substitution $u = a - x$ to show that $I = J$. (3 marks)

(b) By considering $I + J$, or otherwise, evaluate I in terms of a. (2 marks)

Question 7 (continued)

(c) Use the result from (b) to evaluate $\int_0^{\frac{\pi}{2}} \frac{\sin x}{\sin\left(x+\frac{\pi}{4}\right)} dx$. (4 marks)

End of questions

Additional working space

Question number: _____

Additional working space

Question number: _____

Additional working space

Question number: _____

Additional working space

Question number: _____

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