**Western Australian Certificate of Education
Examination, 2013**

Question/Answer Booklet

MATHEMATICS: SPECIALIST 3A/3B

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

Number of additional answer booklets used (if applicable):	

To be provided by the candidate
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: nil

Important note to candidates
No other items may be taken into the examination room. 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	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 this Question/Answer Booklet.

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 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** handed in with your Question/Answer Booklet.

Section One: Calculator-free **(50 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 that you are continuing to answer at the top of the page.

Working time: 50 minutes.

Question 1 **(4 marks)**

(a)   Convert the polar coordinates $\left[\sqrt{2}, \ \dfrac{3\pi}{4}\right]$ into Cartesian coordinates. (2 marks)

(b)   Convert the Cartesian coordinates $\left(\sqrt{3}, -1\right)$ into polar coordinates $[r,\ \theta]$ where $-\pi < \theta \le \pi$. (2 marks)

Question 2   **(6 marks)**

(a)   Given that $\dfrac{a^2 \times \sqrt[3]{b}}{\sqrt{a} \times b} = a^x b^y$, determine the values of the constants x and y.   (3 marks)

(b)   Solve for x: $(2^x + 4)(2^x - 3) = 0$.   (3 marks)

See next page

Question 3 **(9 marks)**

Evaluate the following derivatives:

(a) $g'(0)$ where $g(x) = \ln{(2x + 1)}$. (3 marks)

(b) $h'(1)$ where $h(x) = 4x\, e^{2x}$. (3 marks)

(c) $q'(e)$ where $q(x) = \dfrac{x}{\ln x}$. (3 marks)

See next page

Question 4   **(4 marks)**

Express the following trigonometric expressions in their simplest form.

(a) $\cos 3x \cos 2x + \sin 3x \sin 2x$ (2 marks)

(b) $\dfrac{4 \tan\left(\dfrac{\pi}{12}\right)}{1 - \tan^2\left(\dfrac{\pi}{12}\right)}$ (2 marks)

See next page

Question 5 **(6 marks)**

The graph of $f(x) = \log_2(x-1)$ is shown below.
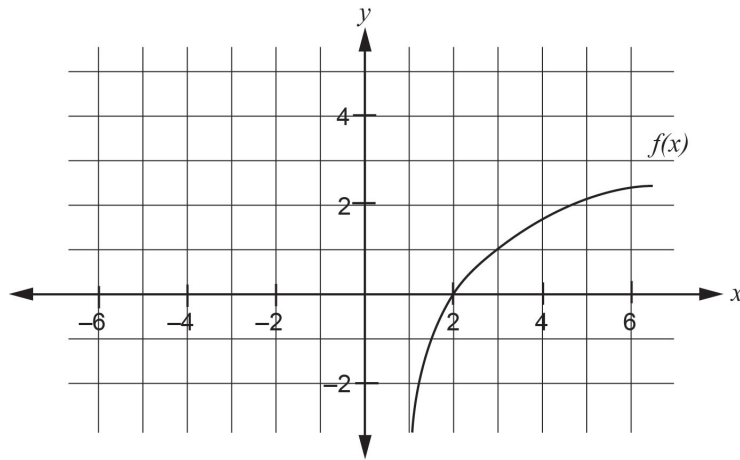
(a) Sketch the graph of $y = f^{-1}(x)$ on the axes above. (3 marks)

(b) Determine the defining rule for $y = f^{-1}(x)$. (3 marks)

See next page

Question 6   **(13 marks)**

$OACB$ is a parallelogram shown below with vectors $\overrightarrow{OA} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$, $\overrightarrow{OC} = \begin{pmatrix} 5 \\ 3 \end{pmatrix}$.
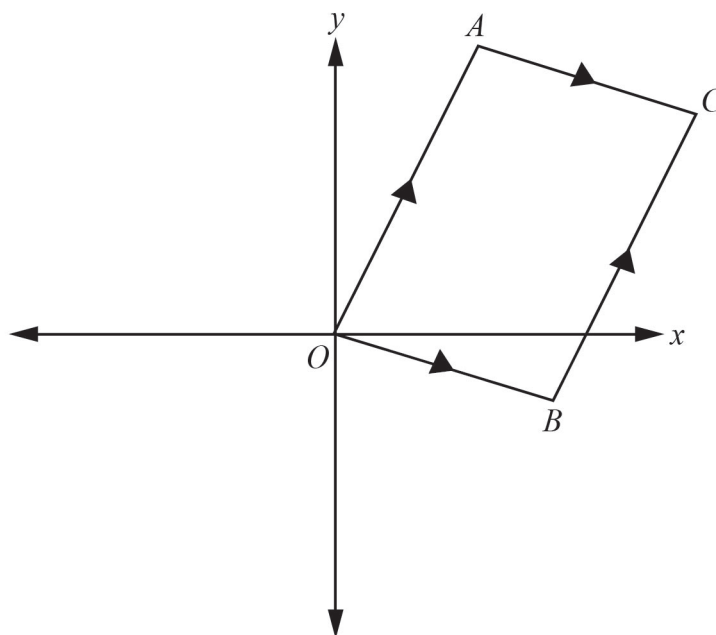
(a)   Determine the distance OA exactly.   (2 marks)

(b)   Determine $\overrightarrow{AC}$.   (1 mark)

(c)   Given that $s\angle AOB = \theta$, show that $\cos\theta = \dfrac{1}{5\sqrt{2}}$.   (3 marks)

See next page

(d)   Give the vector equation for the line containing points A and C.   (3 marks)

(e)   Determine the exact area of parallelogram $OACB$.   (4 marks)

See next page

Question 7   **(8 marks)**

(a)   Prove the identity $\cos\left(\dfrac{3\pi}{2} - x\right) = -\sin x$.   (3 marks)

(b)   Using the result from part (a), solve the equation $\cos\left(\dfrac{3\pi}{2} - x\right) = \sin 2x$ over the

      domain $0 < x < 2\pi$.   (5 marks)

End of questions

Additional working space

Question number: _____

Additional working space

Question number: _____

Additional working space

Question number: _____

Additional working space

Question number: _____

Additional working space

Question number: _____