

**MATHEMATICS**

**3C/3D (Year 12)**

**Section One:**

**Calculator-free**

Your name: \_\_\_\_\_

Please circle your teacher's name:    S Ebert    T Hosking    S Rowden

**Time allowed for this section**

Reading time before commencing work: five minutes

Working time for paper: fifty minutes

**Material 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
Section One: Calculator-free	8	8	50	50
Section Two: Calculator-assumed	13	13	100	100
				150

## Instructions to candidates

- The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2012*. Sitting this examination implies that you agree to abide by these rules.
- 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.
- 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.

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Section One: Calculator-free

(50 Marks)

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the space 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 for this section is 50 minutes.

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Question 1

(4 marks)

Given A and B are events with  $P(A) = 0.3$  and  $P(B) = 0.5$

- (a) State the values of  $m$  and  $n$  for  $m \leq P(A \cup B) \leq n$ .

[1]

- (b) If  $P(A \cup B') = 0.7$  determine  $P(B/A')$ .

[3]

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Question 2

(7 marks)

Find the derivative of each of the following: [DO NOT SIMPLIFY YOUR ANSWER]

(a)  $7x^3 - \frac{3}{x} + 4\pi$  [1]

(b)  $(\sqrt{2x})(1+x)^2$  [2]

(c)  $\frac{x}{\sqrt{2x-3}}$  [2]

(d)  $\int_1^{2x} (t^3 + t^2) dt$  [2]

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Question 3

(5 marks)

Make use of the chain rule (with Leibniz notation), to determine:

$$\frac{dz}{dy}, \text{ if } z = \frac{1}{3x} \text{ and } y = \frac{4}{x-3}$$

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Question 4

(7 marks)

Given  $f(x) = x + 3$  and  $g(x) = \frac{2}{x-3} + x$  :

(a) show that  $g \circ f(x) = \frac{x^2 + 3x + 2}{x}$

[3]

(b) determine when  $g \circ f(x) \geq 0$

[4]

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Question 5

(5 marks)

Find the maximum and minimum values of the function  $f(x) = 104 + 8x + \frac{288}{x}$ , over the interval  $1 \leq x \leq 7$ .

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Question 6

(8 marks)

(a) Integrate each of the following with respect to  $x$ . DO NOT SIMPLIFY

(i)  $3 - 2x$

[1]

(ii)  $\frac{6x - 4}{\sqrt{x}}$

[2]

(iii)  $-3(5 - x)^{\frac{3}{4}} + \frac{1}{2x^2}$

[3]

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Question 6 continued

(b)  $\int \frac{2ax + b}{(ax^2 + bx + c)^2} dx$

where  $a$  and  $b$  are constants. Simplify the answer.

[2]

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**Question 7**

**(7 marks)**

(a) Solve  $\frac{x}{3x+9} - \frac{6}{x^2-9} = 0$

[4]

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Question 7 continued

(b) Simplify  $\frac{x-2}{x+3} - \frac{4}{5x^2+14x-3} + 1$

[3]

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Question 8

(7 marks)

Lumen ( $lm$ ) is the unit of total light output from a light source. Three stage lights, Aa, Bb and Cc, of different light outputs are positioned above the stage in the Rixon Theatre. If all of the three stage lights are put on at 50% capacity a total output of 1200  $lm$  lights up the stage. If Aa is turned on 50% and Bb is turned on 100% capacity then 1000  $lm$  lights the stage and if 50% of Bb and 100% of Cc are turned on, 1300  $lm$  lights the stage.

- (a) Write three equations to represent this information.

[2]

- (b) Solve the system of equations

$$\begin{aligned}x + y + z &= 24 \\x + 2y &= 20 \\y + 2z &= 26\end{aligned}$$

[3]

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Question 8 continued

- (c) Hence determine the Lumen capacity of each of the stage lights Aa, Bb and Cc.

[2]

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**Additional working space**

Question number(s): \_\_\_\_\_

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Additional working space

Question number(s): \_\_\_\_\_

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