



WESLEY COLLEGE
GOTHIC

Semester One Examination, 2011
Question/Answer Booklet

**MATHEMATICS
3C/3D**

**Section Two:
Calculator-assumed**

Student Name: _____

Time allowed for this section:

Reading time before commencing work: Ten (10) minutes
Working time for this section: One hundred (100) 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, ruler, highlighters
Special items: drawing instruments, templates, notes on two unfolded sheets of A4 paper, and up to three calculators satisfying the conditions set by the Curriculum Council for this course.

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	8	8	50	40	33 1/3
Section Two: Calculator-assumed	11	11	100	80	66 2/3
			120	100	

Instructions to candidates

- The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2010*. 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 contain an answer.
 - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
 - Containing an answer: If you do not use the space in the question, however, indicate in the original answer where the answer continues, 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.

DO NOT WRITE IN THIS AREA

This section has **eleven (11)** 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.

The working time for this section is 100 minutes.

Question 9

The sector of a circle, as shown, is divided by the line AB (which is a chord of the full circle) into a triangle OAB and a segment (above AB).

For $AB = 18$ and $OA = 15$, calculate:

(a) the altitude of $\triangle QAB$

(a) the sum of ΩAB

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(d) Calculate $\frac{dx}{dt}$ and then, for time t , use this result to express $\frac{du}{dt}$ in terms of d .

(c) Let $AB = h$ and $CY = x$. Show clearly that $m = \frac{h}{x}$

(b) XY is positioned so that the shadow $AB = 1.0\text{ m}$. Determine the lengths CY and BY.

(a) prove that $\Delta PBC \cong \Delta QAC$ by AAS criterion.

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A spotlight, mounted on horizontal ground at point C, is

(b) the general pattern of the number of words learned

With the help of your ClassPad, determine:
 $\lim_{x \rightarrow 0} f(x) = 0.01x - 0.43x^2 + 4$

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Question 10

(9 marks)

A particle has displacement (position) x at time t defined by $x(t) = t^3 - 6t^2 + 9t + 4$

Determine expressions or values that describe:

(a) the rate of change of displacement, at time t (1 mark)

(b) when the particle is stationary (2 marks)

(c) the maximum displacement that occurs between $t = 0$ and $t = 4$ (2 marks)(d) the distance travelled between $t = 0$ and $t = 4$ (1 mark)(e) when, between $t = 0$ and $t = 4$, the particle is travelling fastest (3 marks)

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Additional working space

Question number(s):

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- (d) the age when the battery needs to be replaced because it is lasting less than three hours. (1 mark)

- (e) the battery lifetime expected for a three year old computer. (1 mark)

- (f) the value of $\frac{dy}{dx}$ when the derivative has declined to 7.2 hours. (2 marks)

- This notebook computer had an 8 hour battery life when it was brand new, after 6 months.

- (g) Show, by differentiation that $y = L^{x^2}$ satisfies this condition. Specify any necessary restrictions on the value of k . (3 marks)

- The lifetime (L) hours of a fully charged battery in a notebook computer is defined as a function of the computer's age x years.

- At a rate proportional to the current lifetime, which is defined as a fraction of the computer's age, the lifetime (L) hours of a fully charged battery in a notebook computer is believed to decrease

- at a rate proportional to the current lifetime, which is defined as a fraction of the computer's age, if $L = L_0 e^{-kx}$.

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- (e) The rule XY is moving towards the wall at a rate of 0.1 m/sec . How is the length of the shadow changing when it is 1.8 m long ? (3 marks)

