

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 the paper.

Important note to candidates

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.

To be provided by the candidate
 Formula Sheet (retained from Section One)
 This Question/Answer Booklet
To be provided by the supervisor
Material required/recommended for this section

Working time for this section: 100 minutes
 Reading time before commencing work: 10 minutes
Time allowed for this section

Goh Robinson Longley Birrell Whyte

Student Name _____

Calculator-assumed

Section Two:

MATHEMATICS 3C/3D

Question/Answer Booklet

Examination, Semester 1 2010

Rossmyne Senior High School

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available
Section One: Calculator-free	9	9	50	40
Section Two: Calculator-assumed	13	13	100	80
				120

Additional working space

Question number(s): _____

Instructions to candidates

1. 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.
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.
3. **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.
4. It is recommended that you **do not use pencil** except in diagrams.

(3 marks)

culture and t is time measured in days. How long will it take the culture to double in size?

A bacterial culture grows according to the rule $\frac{dC}{dt} = 0.03C$, where C is the size of the

(3 marks)

Question 2.

(4 marks)

(b) the values of a and c correct to two decimal places

(1 mark)

$$(a) P(20 < X < 50)$$

Given that $P(X < 20) = 0.35$ and $P(X > 50) = 0.45$, determine:
A random variable is normally distributed with a mean a and a standard deviation c .

(5 marks)

Question 1.

Suggested working time for this section is 100 minutes.

number of the question(s) that you are continuing to answer at the top of the page.
original answer space where the answer is continued, i.e. give the page number. Fill in the
continuing an answer: If you need to use the space to continue an answer, indicate in the
• Planning: If you use the spare pages for planning, clearly at the top of the page.
and/or as additional space if required to continue an answer.
Spare pages are included at the end of this booklet. They can be used for planning your responses

This section has **thirteen (13)** questions. Answer all questions. Write your answers in the space provided.

Section Two: Calculator-assumed (80 Marks)

Additional working space
Question number(s): _____

Question 3.**(5 marks)**

A committee of 6 people is to be chosen to edit the school magazine. 10 girls and 5 boys apply, and the school decides to appoint 4 girls and 2 boys.

- (a) How many different committees can be formed?

(3 marks)

Mathematics

- (b) Two of the girls who applied are the twins Sarah and Samantha. Assuming that all possible committees have the same probability of being formed, what is the probability that both Sarah and Samantha are selected?

(2 marks)

Question 14.

3C Mathematics

Quadrilaterals are to be formed using (as vertices) 2 dots from the top row and 2 dots from the bottom row.



(6 marks)

(a) How many different quadrilaterals can be formed?

(i) do not have B as a vertex nor contain B on the upper side
 (ii) How many of these quadrilaterals:

(2 marks)

(a) $f(x)$ (b) $f^{-1}(x)$

(1 mark)

Question 5.

(2 marks)

(i) do not have B as a vertex
 (ii) do not have B as a vertex

(2 marks)

The cost $\$C$ for the production of x widgets is given by $C = (x+15)^2 + 175$. Using calculus, find the value of x for which the average cost per widget is a minimum and find this minimum cost.

(4 marks)

Question 5.

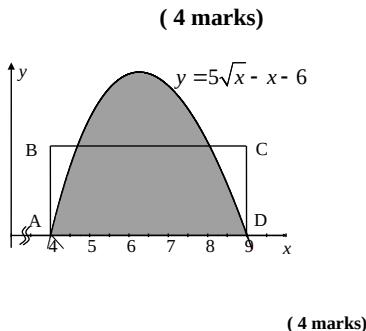
(4 marks)

The cost $\$C$ for the production of x widgets is given by $C = (x+15)^2 + 175$. Using calculus, find the value of x for which the average cost per widget is a minimum and find this minimum cost.

Question 6.

The diagram shows a rectangle ABCD with points A and D having coordinates $(4,0)$ and $(9,0)$ respectively. The shaded region satisfies the inequalities $y \leq 5\sqrt{x} - x - 6$ and $y \geq 0$.

Find the length AB such that the area of rectangle ABCD is equal to the area of the shaded region.

**Question 7.**

(7 marks)

For independent events A and B, $P(B) = \frac{2}{5}$ and $P(A|B) = \frac{1}{3}$, determine :

(a) $P(A \cup B)$

(3 mark)

(b) $P(B \cup \bar{A})$

(2 mark)

(c) $P(\bar{B}|A)$

(2 mark)

Question 13.

(8 marks)

The serving time, seconds, for a customer at an automatic banking machine is a uniformly distributed random variable, with lower and upper limits 50 and 150. The mean serving time is 100 seconds and the standard deviation is 28.9 seconds. The serving times for different customers are independent.

- (a) Sketch the graph of the distribution function for .

(2 mark)



- (b) Evaluate $P(T = 120)$

(1 mark)

- (c) Evaluate

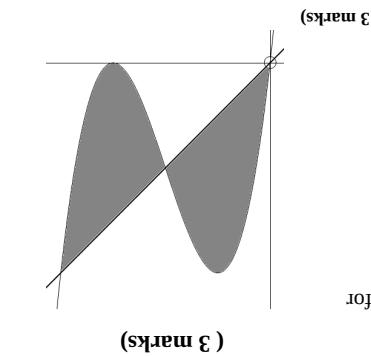
(1 mark)

- (d) What is the probability that exactly 3 of the next 5 customers will require at least 2 minutes to be served?

(2 marks)

- (e) What is the probability that fewer than 3 of the next 5 customers will require at least 2 minutes to be served?

(2 mark)

**Question 9.**

$$y = x(x - 3)^2 \text{ and evaluate it}$$

Determine the area trapped by the functions $y = x$ and $y = x(x - 3)^2$ involving the use of the definite integral for

(3 marks)

(3 marks)

- Suppose that an arbitrary definition of being overweight is "has a weight of more than 100 kg".
 (c) If three Australian males 18 years and over are randomly selected, what is the probability that at least two of them will be considered "overweight"?

(b) Is within 5 kg of the mean weight?

(2 marks)

(5 marks)

If $y = \frac{t^2 + 1}{t^2}$, use differentiation to determine the approximate percentage change in y if the value of t , initially valued at 3, increases by 5%

(5 marks)

Question 8.

(2 marks)

- (a) Has a weight of 90 kg or more?
 selected person in this category:
 Australian males 18 years and over are 82.0 kg and 13.6 kg respectively.
 Assuming that the distribution of weights is normal, what is the probability that a randomly

Question 10.**(6 marks)**

Three balls are to be drawn one at a time and without replacement from a bag containing four red balls and eight white balls.

- (a) Find the probability distribution for the random variable, X , the number of red balls drawn

X					
$P(X = x)$					

(2 mark)

Question 11.**(6 marks)**

In a certain large company 15% of the employees have attended a health and safety training course. Of the employees who have attended the training course, 75% are qualified to perform first aid, whereas of the employees who have not attended the training course only 20% are qualified to perform first aid.

- (a) What percentage of employees in the company are not qualified to perform first aid?

(4 marks)

- .
- (b) What is the expected number of red balls in this scenario?

(2 mark)

- .
- (b) Find the probability that two red balls are selected given that at least one of them was red

(2 mark)

- (b) A randomly chosen employee is found to be qualified to perform first aid. What is the probability that he attended the training course?

(2 marks)