



Western Australian Certificate of Education
Semester One Examination, 2020

APPLECROSS
SENIOR HIGH SCHOOL

Question/Answer Booklet

**MATHEMATICS
SPECIALIST
UNIT 1&2**

**Section One:
Calculator- free**

	Total	Result	
Section One	52		
Section Two	98		
Total	150		

%

Student's Name: _____
As shown on your exam timetable

Student's Teacher
(Circle your teacher's name.)

Mr Bradbury

Mrs Waddell

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 (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 unauthorized notes or other items of a non-personal nature in the examination room. If you have any unauthorized material with you, hand it to the supervisor **before** reading any further.

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	52	35
Section Two: Calculator-assumed	13	13	100	98	65
Total				150	100

Instructions to candidates

- The rules for the conduct of examinations are detailed in the *School Examination Rules* provided with your exam timetable. Sitting this examination implies that you agree to abide by these rules.
- Write your answers in this Question/Answer booklet preferably using a blue/black pen. Do not use erasable or gel pens.
- 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.
- 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.
- The formula sheet and your notes are **not to be handed** in with your Question/Answer Booklet.

Section One: Calculator-free

35% (52 Marks)

This section has **eight** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 50 minutes.

Question 1

(3 marks)

Two vectors \tilde{a} and \tilde{b} have magnitudes 3 and $\sqrt{3}$ respectively. The angle between the two vectors is measured at 30° . Find the magnitude of the resultant of the two vectors.

DO NOT WRITE IN THIS SECTION AS IT WILL BE CUT OFF.

Question 2

(7 marks)

Two forces are given by $F_1 = -3i + 5j$ N and $F_2 = 2i - j$ N.

(a) Determine

(i) $F_1 - F_2$. (1 mark)

(ii) $5F_1 + 10F_2$. (2 marks)

(iii) $\frac{1}{5}F_1 \vee \frac{1}{10}F_2$. (1 mark)

(b) The resultant of $3F_1$, $6F_2$ and a third force is $5i + 4j$ N. Determine the magnitude of the third force. (3 marks)

DO NOT WRITE IN THIS SECTION AS IT WILL BE CUT OFF.

Question 3

(8 marks)

(a) Consider the statement: $n=2 \Rightarrow n^2=4$.

(i) Write the inverse statement.

(1 mark)

(ii) Write the converse statement.

(1 mark)

(b) State whether each of the following statements are true or false, supporting each answer with an example or counterexample.

(i) \forall positive integer $x, \sqrt{x} \leq x$.

(2 marks)

(ii) $\forall a \in R, \exists b \in R$ such that $ab=24$.

(2 marks)

(c) If a true statement is negated, explain whether the contrapositive of the negated statement will also be true.

(2 marks)

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Question 4

(6 marks)

The position vectors of points A and B are $r_A = \begin{pmatrix} -8 \\ 3 \end{pmatrix}$ and $r_B = \begin{pmatrix} 7 \\ -2 \end{pmatrix}$.

- (a) Determine the position vector of point P that divides AB internally in the ratio $2:3$.

(3 marks)

- (b) A small body leaves A and moves with a constant velocity in a direction parallel to $\begin{pmatrix} 2 \\ 1 \end{pmatrix}$.

Determine, with reasons, whether the body will pass through point C with position vector

$$r_C = \begin{pmatrix} 6 \\ 9 \end{pmatrix}.$$

(3 marks)

DO NOT WRITE IN THIS SECTION AS IT WILL BE CUT OFF.

Question 5

(7 marks)

- (a) 4 different letters are chosen from the 7 in the word PAYMENT and then arranged to form a password. Determine how many different passwords are possible that
- (i) end in T. (1 mark)
- (ii) end in T or start with P. (3 marks)
- (b) Determine the number of two letter permutations that can be made using letters from the word REPAYMENT. (3 marks)

DO NOT WRITE IN THIS SECTION AS IT WILL BE CUT OFF.

Question 6

(7 marks)

Trapezium $OABC$ is such that $\vec{AB} = 3\vec{OC}$.

The midpoints of sides OA, AB, BC and OC are P, Q, R and S .

Let $\vec{OA} = a$ and $\vec{OC} = c$. Use a vector method to prove that $PQRS$ is a parallelogram.

DO NOT WRITE IN THIS SECTION AS IT WILL BE CUT OFF.

Question 7

(7 marks)

Consider the vectors $p = \begin{pmatrix} -7 \\ 8 \end{pmatrix}$, $q = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$ and $r = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$.

(a) Determine the vector projection of r onto q .

(3 marks)

(b) Given that $p = \lambda q + \mu r$, determine the value of λ and the value of μ .

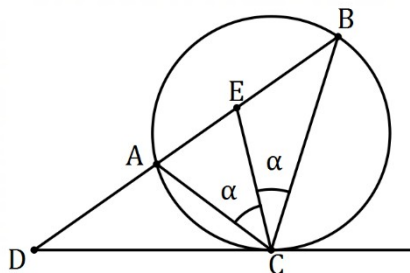
(4 marks)

DO NOT WRITE IN THIS SECTION AS IT WILL BE CUT OFF.

Question 8

(7 marks)

In the diagram shown, A, B and C lie on a circle.
The tangent at C and secant BA intersect at D .
Point E lies on AB so that CE bisects $\angle ACB$.



- (a) Show that $\angle DEC = \angle DCE$.

(3 marks)

- (b) Given that $AE = 4$ cm and $BE = 9$ cm, determine the length of DC .

(4 marks)

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Additional working space.

Question Number: _____

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Additional working space.

Question Number: _____

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