

	Time allowed for this section	Reading time before commencing work: ten minutes	Working time: one hundred minutes
	Number of additional books used	(if applicable):	

Materials required/recommended for this section

To be provided by the supervisor

Formula sheet (retained from Section One)

This Question Answer booklet

To be provided by the supervisor

Correction fluid/ape, eraser, ruler, highlighters

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,

Special items: drawing instruments, templates, notes on two unruled sheets of A4 paper,

Computer Algebra System (CAS) calculators, are permitted in this ATAR

No other items may be taken into the examination room. It is your responsibility to ensure that you do not have any unauthorised material if you have any unauthorised material with you, hand it to the supervisor before reading any further.

Important note to candidates

course examination

and up to three calculators, which can include scientific, graphic and

graphing calculators.

you do not have any unauthorised material if you have any unauthorised material with you, hand it to the supervisor before reading any further.

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Semester One Examination, 2021

Question/Answer booklet

If required by your student identification label in this box
place your student identification label in this box

METHODS UNIT 1

SECTION TWO:

CALCULATOR-ASSUMED

In words

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WA student number: In figures

Time allowed for this section

Reading time before commencing work: ten minutes

Working time: one hundred minutes

(if applicable):

Materials required/recommended for this section

To be provided by the supervisor

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CHRISTIAN COLLEGE
SOUTHERN RIVER, WESTERN AUSTRALIA



Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of examination
Section One: Calculator-free	8	8	50	52	35
Section Two: Calculator-assumed	13	13	100	98	65
Total					100

Instructions to candidates

1. The rules for the conduct of examinations are detailed in the school handbook. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer booklet preferably using a blue/black pen.
Do not use erasable or gel pens.
3. You must be careful to confine your answers to the specific question asked and to follow any instructions that are specific to a particular question.
4. 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.
5. It is recommended that you do not use pencil, except in diagrams.
6. Supplementary pages for planning/continuing your answers to questions are provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer where the answer is continued, i.e. give the page number.
7. The Formula sheet is not to be handed in with your Question/Answer booklet.

Markers use only		
Question	Maximum	Mark
9	6	
10	6	
11	8	
12	8	
13	8	
14	8	
15	9	
16	8	
17	8	
18	8	
19	7	
20	7	
21	7	
S2 Total	98	
S2 Wt (×0.6633)	65%	

(7 marks)

The equation $f(x) = k$ has two solutions, where $f(x) = ax^3 + bx^2 - 12x + 8$ and a, b and k are constants.

The graph of $y = f(x)$ cuts the x -axis at $x = 2$, $x = -2$, and at one other point.

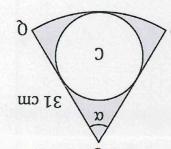
Determine the value(s) of the constant k , rounded to 2 decimal places. Explain your reasoning.

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65% (98 Marks)
 Working time: 100 minutes.

- Question 9**
- A survey of all apartments for sale in a particular suburb showed that 65% had a lift and 78% had a swimming pool. Of those with a lift, 80% had a swimming pool.
- Determine the probability that a randomly selected apartment from those in the survey had a lift and a swimming pool.
- (a) a lift and a swimming pool.
 (b) a lift or a swimming pool.
 (c) no lift or no swimming pool.
- (2 marks)

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- (a) Determine the area of sector OPQ .
 Circle C is inside the sector and just touches OQ , OQ and arc PQ .

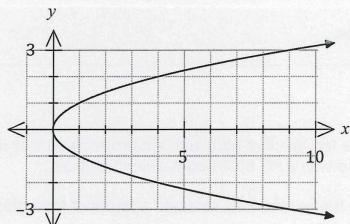
The diagram shows sector OPQ of a circle with centre O of radius 31 cm and $\angle a = 40^\circ$.
 Circle C is inside the sector and just touches OQ and arc PQ .

- (b) Show that the radius of circle C is 7.9 cm, correct to one decimal place.
 (3 marks)

- (c) Determine the area of the shaded region, inside sector OPQ but outside circle C .
 (2 marks)

Question 10

- (a) The parabolic graph of a relation is shown below.



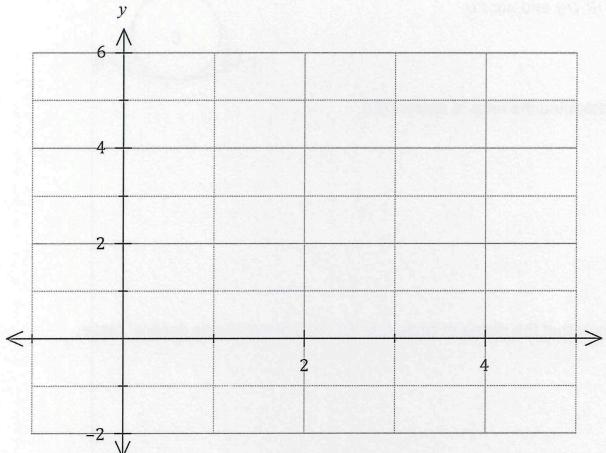
- (i) State the equation of its axis of symmetry. (1 mark)
- (ii) State the equation of the relationship between x and y . (1 mark)
- (b) Points A and B have coordinates $(7, 8)$ and $(-3, 2)$ respectively. Determine the equation of the circle that has diameter AB . (4 marks)

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Question 19

The equation of a parabola is $y = \frac{1}{2}(x^2 - 4x + 6)$.

- (a) Sketch the parabola on the axes below. (3 marks)



All parabolas have a focal point and a directrix. For a parabola with equation $y = a(x - p)^2 + q$, the focal point is at $(p, q + \frac{1}{4a})$ and the equation of the directrix is $y = q - \frac{1}{4a}$, where a, p and q are constants.

- (b) Determine the focal point and directrix for this parabola and add them, with labels, to your sketch above. (4 marks)

(8 marks)

(a)

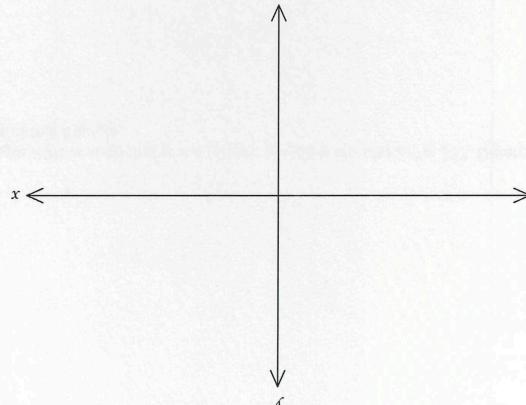
A chess club has 13 members, of which 6 are beginners, 4 are intermediate and the rest are advanced. The club has to select a group of 3 members at random to assist with a regional tournament.

- (a) Determine the number of different groups that can be selected. (2 marks)

- (b) Determine the number of different groups that can be selected which contain at least 2 intermediate members. (2 marks)

- (c) Determine the probability that the group contains no intermediate members. (2 marks)

- (iii) exactly one advanced member. (2 marks)



(4 marks)

(a) Sketch the graph of $y = f(x)$ on the axes below.

$$\text{Let } f(x) = 2\sqrt{4-x} - 2.$$

(b) Describe the transformation(s) required to obtain the graphs of the following functions from the graph of $y = f(x)$:

$$(i) \quad y = 2\sqrt{1-x} - 2.$$

(ii) $y = \sqrt{4-x} - 1.$ (2 marks)

(iii) $y = \sqrt{4-x} - 1.$ (2 marks)

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Question 12

(8 marks)

- (a) Triangle ABC is such that $b = 25$ cm, $c = 33$ cm and $\angle A = 142^\circ$. Determine, with justification, the length of side a . (2 marks)

- (b) Triangle PQR is such that $p = 41.2$ cm, $q = 55.3$ cm and $\angle P = 33^\circ$. Determine all possible areas of this triangle. (6 marks)

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(8 marks)

Question 17

The events S and T are such that $P(S) = 0.4$ and $P(T) = 0.3$.

Determine $P(S \cup T)$ in each of the following cases:

- (a) S and T are mutually exclusive. (1 mark)

- (b) $P(\bar{S} \cup T) = 0.85$. (2 marks)

- (c) S and T are independent. (2 marks)

- (d) $P(T|\bar{S}) = 0.25$. (3 marks)

Question 14

(8 marks)

A souvenir shop sells T-shirts in two colours and three sizes. Sales records for the past year are shown below.

	Small	Medium	Large
White	280	370	200
Black	250	310	190

Assume that the shop holds a large stock and that sales continue in similar proportions. Where relevant, round your answers in this question to three decimal places.

- (a) A customer randomly selects a T-shirt for purchase. Determine

- (i) the most likely size and colour of this T-shirt and the probability that this T-shirt is selected. (2 marks)

- (ii) the probability that the T-shirt selected is not a medium. (2 marks)

- (b) A customer randomly selects two T-shirts for purchase. Determine the probability that the T-shirts are

- (i) both large. (2 marks)

- (ii) of different colours. (2 marks)

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Question 15

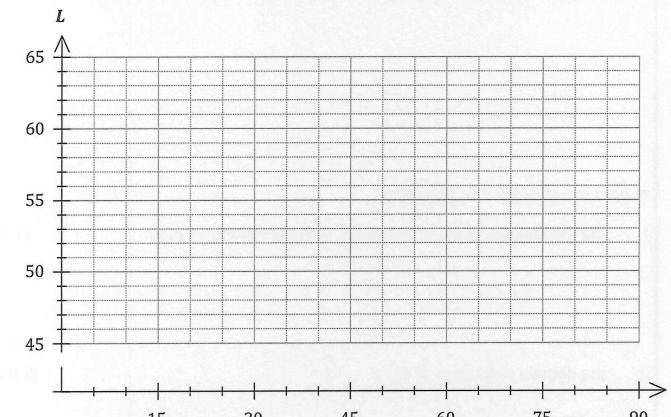
(9 marks)

The loudness L of sound, in decibels, emitted by a machine t minutes after it is switched on can be modelled by

$$L = 55 - 8 \cos\left(\frac{\pi t}{15}\right)$$

- (a) Determine the initial loudness emitted by the machine. (1 mark)

- (b) Draw the graph of L against t on the axes below for the first 90 minutes. (3 marks)



- (c) State the maximum loudness emitted by the machine and the time this maximum was first reached. (2 marks)

- (d) A health and safety inspector can deem a machine unserviceable if the loudness it emits exceeds 60 dB for more than 15 minutes in any hour that it is running. Determine, with justification, whether this machine could be deemed unserviceable. (3 marks)