

Semester One Examination, 2021

Question/Answer booklet

MATHEMATICS
METHODS
UNIT 1

If required by your examination administrator, please place your student identification label in this box

Section Two:
Calculator-assumed

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| WA student number: In figures |  |  |  |  |  |  |  |  |  |  |

 In words

 Your name

|  |  |
| --- | --- |
| Number of additionalanswer booklets used(if applicable): |  |

## Time allowed for this section

Reading time before commencing work: ten minutes

Working time: one hundred minutes

## Materials required/recommended for this section

***To be provided by the supervisor***

This Question/Answer booklet

Formula sheet (retained from Section One)

***To be provided by the candidate***

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener,
correction fluid/tape, eraser, ruler, highlighters

Special items: drawing instruments, templates, notes on two unfolded sheets of A4 paper, and up to three calculators, which can include scientific, graphic and Computer Algebra System (CAS) calculators, are permitted in this ATAR course examination

## 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 unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

## Structure of this paper

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Section | Number ofquestionsavailable | Number ofquestions tobe answered | Workingtime(minutes) | Marksavailable | Percentageofexamination |
| 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.

Section Two: Calculator-assumed 65% (98 Marks)

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

Working time: 100 minutes.

Question 9 (6 marks)

(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 and . (1 mark)

(b) Points and have coordinates and respectively. Determine the equation of the circle that has diameter . (4 marks)

Question 10 (6 marks)

A survey of all houses for sale in a particular suburb showed that had a swimming pool and had a garage. Of those with a garage, had a swimming pool.

Determine the probability that a randomly selected house from those in the survey had

(a) a swimming pool and a garage. (2 marks)

(b) a swimming pool or a garage. (2 marks)

(c) no swimming pool or no garage. (2 marks)

Question 11 (8 marks)

A study of the achievements of students enrolled in a university course yielded the following information:

* of all students did not achieve a distinction
* of those who did not achieve a distinction studied full-time
* of those who studied part-time did not achieve a distinction

(a) Use the above information to complete the following table. (4 marks)

|  |  |  |  |
| --- | --- | --- | --- |
|  | Part-time | Full-time | Totals |
| Distinction |  |  |  |
| No distinction |  |  |  |
| Totals |  |  |  |

(b) Determine the probability that a randomly chosen student from the study

(i) studied part-time and achieved a distinction. (1 mark)

(ii) studied part-time or achieved a distinction. (1 mark)

(c) Explain whether this study provides any evidence that achieving a distinction is independent of study mode. (2 marks)

Question 12 (8 marks)

Let .

(a) Sketch the graph of on the axes below. (4 marks)



(b) Describe the transformation(s) required to obtain the graphs of the following functions from the graph of :

(i) . (2 marks)

(ii) . (2 marks)

Question 13 (8 marks)

(a) Triangle is such that cm, cm and . Determine, with justification, the length of side . (2 marks)

(b) Triangle is such that cm, cm and . Determine all possible areas of this triangle. (6 marks)

Question 14 (9 marks)

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

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

(b) Draw the graph of against on the axes below for the first 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 dB for more than minutes in any hour that it is running. Determine, with justification, whether this machine could be deemed unserviceable. (3 marks)

Question 15 (8 marks)

(a) Let , where and are constants. The graph of has an axis of symmetry with equation and an axis intercept at .

(i) State the value of the constant . (1 mark)

(ii) Determine the value of the constant . (2 marks)

(b) Let . Determine

(i) the coordinates of the turning point of the graph of . (1 mark)

(ii) the domain and range of . (2 marks)

(iii) the coordinates of the turning point of the graph of . (2 marks)

Question 16 (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 |  |  |  |
| Green |  |  |  |

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 least 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 large. (2 marks)

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

(i) both small. (2 marks)

(ii) of different colours. (2 marks)

Question 17 (7 marks)

The equation of a parabola is .

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



All parabolas have a focal point and a directrix. For a parabola with equation , the focal point is at and the equation of the directrix is , where and are constants.

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

Question 18 (8 marks)

The events and are such that and .

Determine in each of the following cases:

(a) and are mutually exclusive. (1 mark)

(b) . (2 marks)

(c) and are independent. (2 marks)

(d) . (3 marks)

Question 19 (8 marks)

A chess club has members, of which are beginners, are intermediate and the rest are advanced. The club has to select a group of 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 beginners. (2 marks)

(c) Determine the probability that the group contains

(i) no advanced members. (2 marks)

(ii) exactly one intermediate member. (2 marks)

Question 20 (7 marks)

The diagram shows sector of a circle
centre of radius cm and .

Circle is inside the sector and just
touches and arc .

(a) Determine the area of sector . (2 marks)

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

(c) Determine the area of the shaded region, inside sector but outside circle .

 (2 marks)

Question 21 (7 marks)

The equation has two solutions, where and and are constants.

The graph of cuts the -axis at , , and at one other point.

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

Supplementary page

Question number: \_\_\_\_\_\_\_\_\_

Supplementary page

Question number: \_\_\_\_\_\_\_\_\_

Supplementary page

Question number: \_\_\_\_\_\_\_\_\_

Supplementary page

Question number: \_\_\_\_\_\_\_\_\_

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