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### Semester Two Examination, 2020

### Question/Answer booklet

# MATHEMATICS

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

**SPECIALIST**

**UNITS 1&2**

## Section One:

## Calculator-free

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

In words

Your name

|  |  |
| --- | --- |
| Number of additional answer booklets used (if applicable): |  |

## Time allowed for this section

Reading time before commencing work: five minutes

Working time: 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 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 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 |

|  |  |  |
| --- | --- | --- |
| Markers use only | | |
| Question | Maximum | Mark |
| 1 | 7 |  |
| 2 | 6 |  |
| 3 | 8 |  |
| 4 | 7 |  |
| 5 | 5 |  |
| 6 | 6 |  |
| 7 | 7 |  |
| 8 | 6 |  |
| S1 Total | 52 |  |
| S1 Wt (×0.6731) | 35% |  |
| S2 Wt | 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 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 (7 marks)

Two matrices are and . Determine

(a) . (2 marks)

(b) . (2 marks)

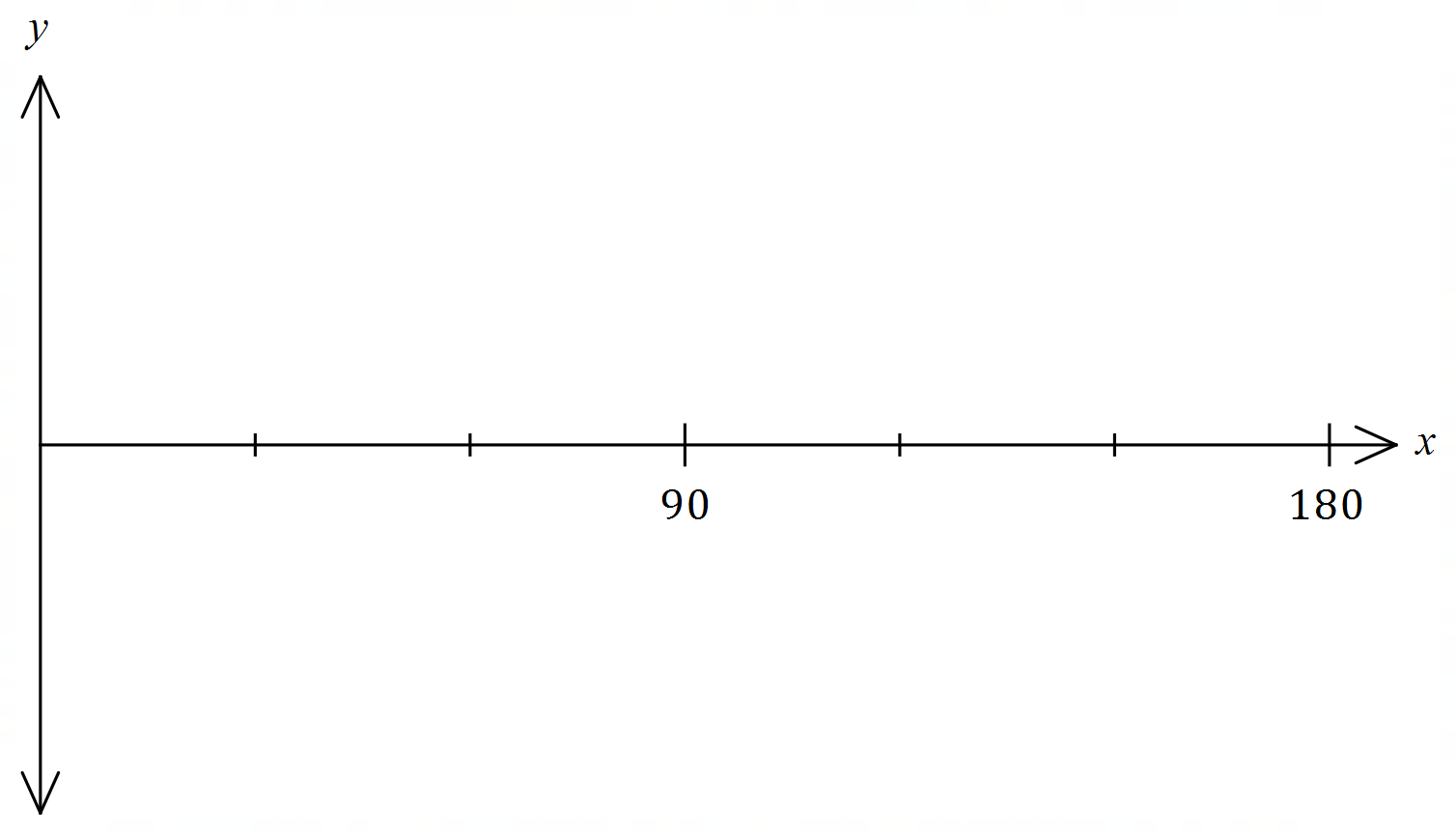
(c) . (3 marks)

Question 2 (6 marks)

(a) State the exact value of . (1 mark)

(b) Given that and , state the exact value of . (2 marks)

(c) Sketch the graph of for on the axes below. (3 marks)



Question 3 (8 marks)

(a) Express in the form where . (2 marks)

(b) Two complex numbers are and . Calculate

(i) . (1 mark)

(ii) . (2 marks)

(iii) . (3 marks)

Question 4 (7 marks)

(a) Use an angle sum identity to prove that . (2 marks)

(b) Hence, or otherwise, prove that . (3 marks)

(c) Solve for . (2 marks)

Question 5 (5 marks)

is a diameter of a circle centre and point lies on the circumference of the circle.  
  
Let and .  
  
Use a vector method to prove that .

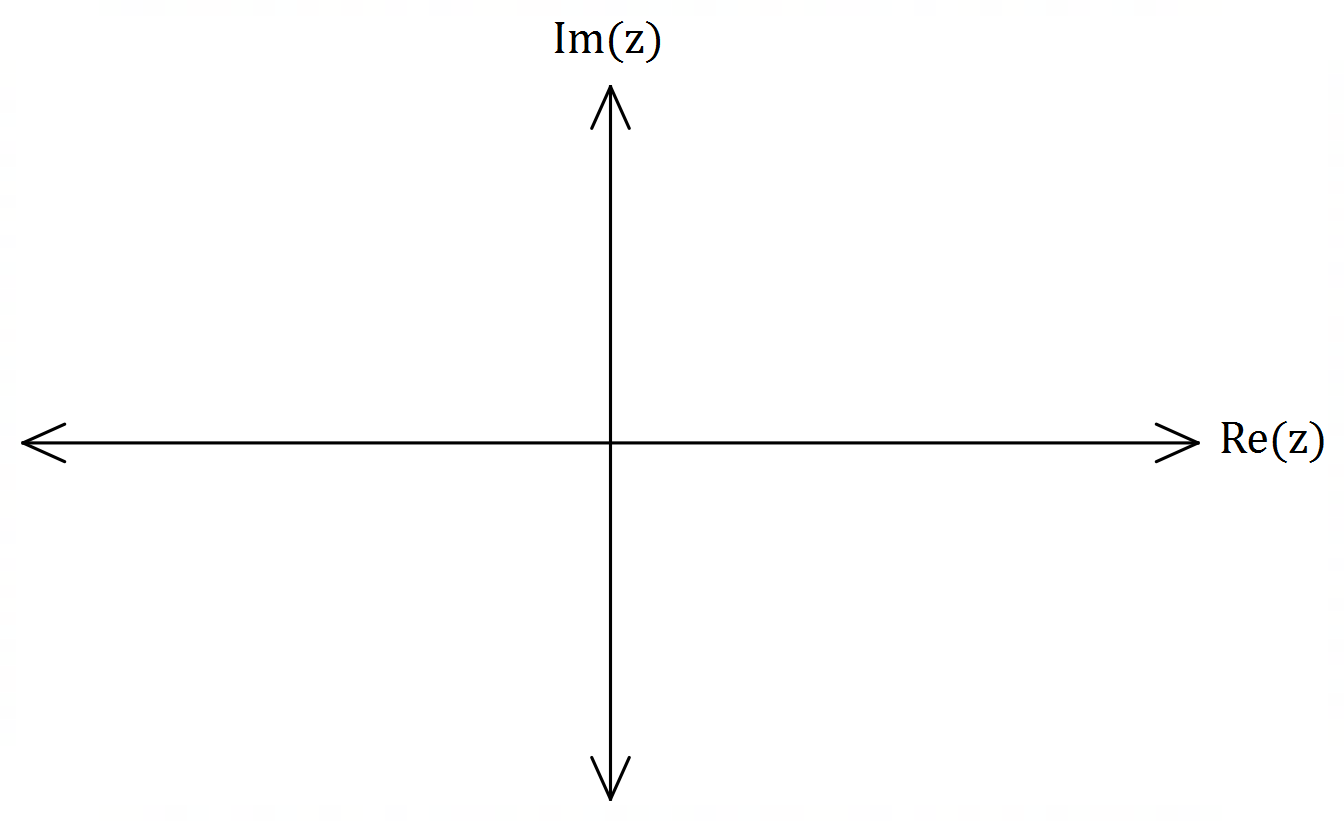
Question 6 (6 marks)

(a) Determine the equation of the real quadratic in the form given that . (2 marks)

(b) Let .

(i) Determine and , the complex roots of . (2 marks)

(ii) Sketch and label , and in the complex plane below. (2 marks)



Question 7 (7 marks)

Use mathematical induction to prove the following proposition for every integer .

Question 8 (6 marks)

(a) Determine the vector projection of on . (2 marks)

(b) The vectors and are perpendicular and the sum of their magnitudes is . Determine the values of the constants and . (4 marks)

Supplementary page

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

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