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**MATHEMATICS**

**Specialist Units 3 & 4**

**Test 1 – Complex Numbers**

**Chapters 13, 14 and 15**

**Semester 1 2019**

# 

**Section Two – Calculator Assumed**

Time allowed for this section

Working time for this section: 33 minutes

Marks available: 33 marks

## Material required/recommended for this section

##### To be provided by the supervisor

This Question/Answer booklet

Formula sheet

##### To be provided by the candidate

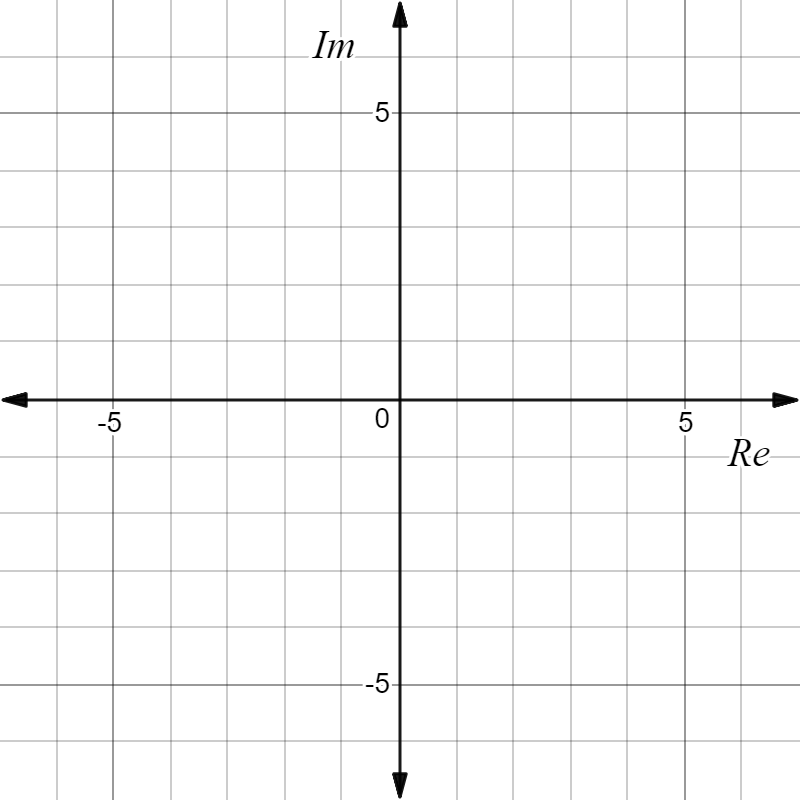
Standard items: pens, pencils, pencil sharpener, eraser, correction fluid, ruler, highlighters

Special items: drawing instruments, templates, notes on one unfolded sheet of A4 paper, and up to three calculators satisfying the conditions set by the Curriculum Council for this course.

## Important note to candidates

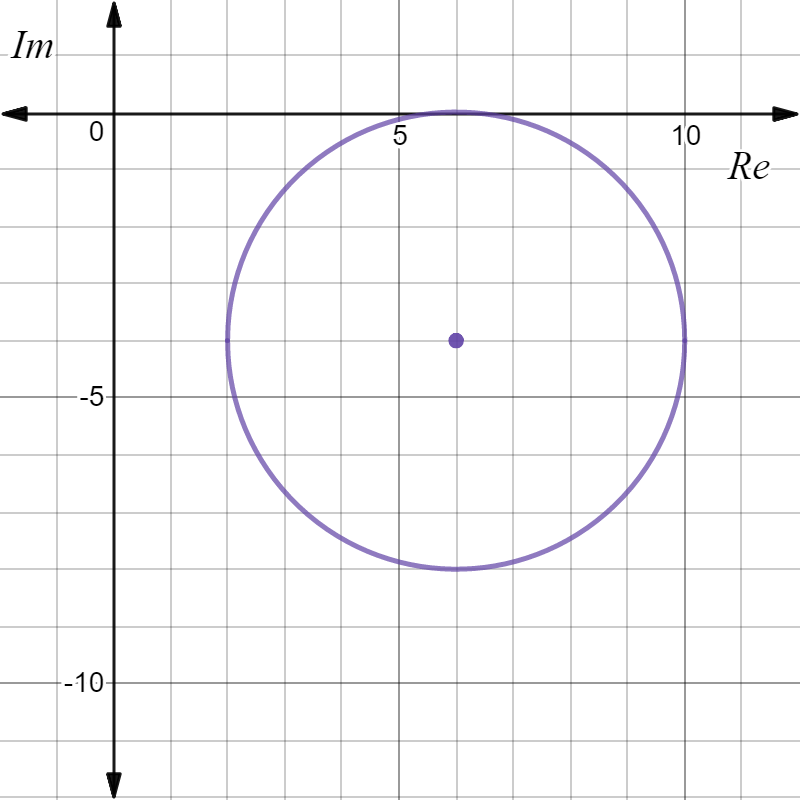
No other items may be used in this section of the examination. It is **your** responsibility to ensure that you do not have any unauthorised notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

1. (6 marks)  
   Consider the complex equations and
2. On the set of axes below sketch the graphs of these complex equations [4]



1. On your diagram shade in the region which satisfies [2]

1. (7 marks)  
   Given
2. Show that [1]
3. Hence find all solutions to the equation expressing your answers in the form where and . [6]
4. (7 marks)  
   A subset of points in the complex plane form a circle with centre C and radius 4 units as shown.



**C**

1. Mark the position on the plane where is a minimum, clearly label this point A and give this minimum value exactly. [2]

1. Mark the position on the plane where is a maximum, clearly label this point B and give this maximum value exactly. [2]

1. Determine, to three decimal places, the minimum value of . [3]

1. (6 marks)  
   If and express each of the following in terms of and .
2. [2]
3. [2]
4. [2]
5. (7 marks)  
   Assume .
6. Use De Moivre’s theorem to prove that [3]
7. Expand and use the outcome in part (a) above to prove that

. [4]

**End of Test**

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You may use this space to extend or re-attempt an answer to a question or questions and should you do so then number the question(s) attempted and cross out any previous unwanted working.