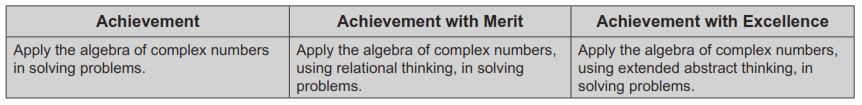
3

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Teacher:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Cambridge High School

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| --- | --- |
|  |  |
| Level 3 Calculus  Practice Assessment 2019  91577 Apply the algebra of complex numbers in solving problems | |

**Credits: Five** 

**You should attempt ALL the questions in this booklet.**

Show ALL working.

If you need more space for any answer, ask the supervisor for extra paper and clearly number the question.

|  |  |
| --- | --- |
| **Overall score** |  |
| **Grade** |  |

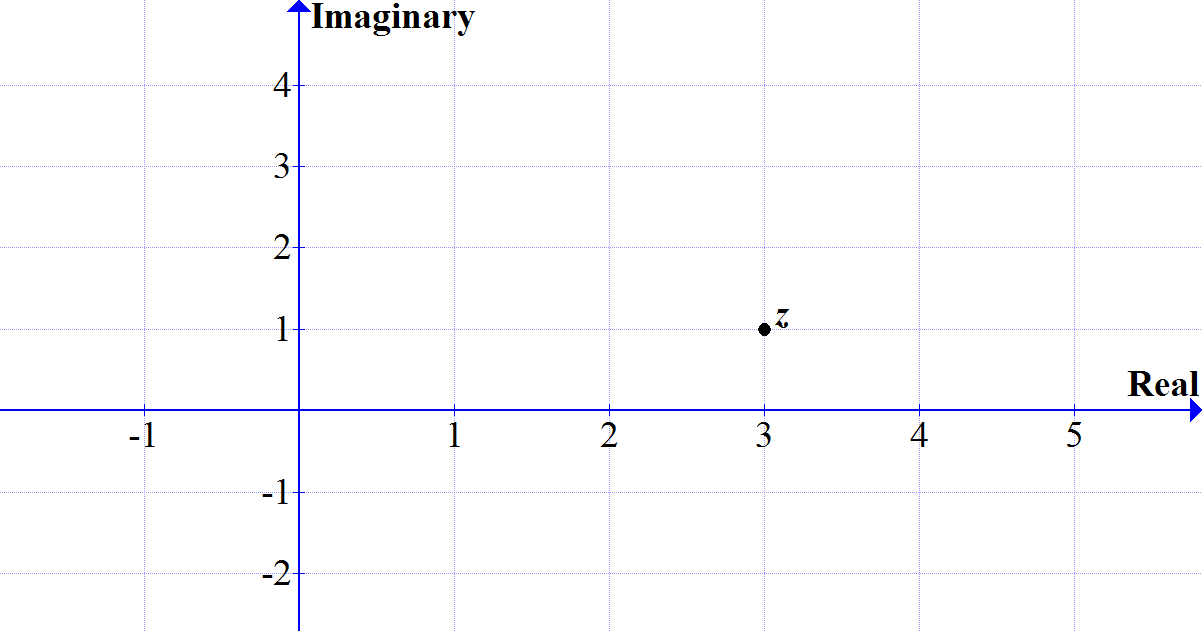
Check that this booklet has questions 1 to 3 in the correct order and that no pages appear to be missing.

**YOU MUST HAND THIS BOOKLET TO THE SUPERVISOR AT THE END OF THE EXAMINATION.**

**QUESTION ONE**

Assessor’s use only

a) The complex number is shown on the Argand diagram below.



(i) Calculate

(ii) If and an angle is formed by joining to the origin ( and then to , find .

b) When the polynomial is divided by , the remainder is 10.

What is the value of *n*?

c) Two of the solutions to the polynomial are 2 and.

Assessor’s use only

Using this information, find the values of *b*, *c* and *d*.

d) If and , find if

.

**QUESTION TWO**

Assessor’s use only

a) Find the exact value of when .

b) Write in its simplest polar form.

c) Given and , write in terms of p and q.

d) Find the range of values of *x* for which , where .

Assessor’s use only

e) Find the Cartesian equation of the of the point representing the complex number , given that .

Show that the locus is a circle, giving its centre and radius.

**QUESTION THREE**

Assessor’s use only

a) Express in quotient plus remainder form.

b) Simplify into the exact value of , where *a* and *b* are rational numbers.

c) Determine the value of *z* in , giving your answer in the form ,

where *a* and *b* are real numbers.

d) Solve

Assessor’s use only

e) Find all the solutions for the equation, where *b* > 0.

**Assessment Schedule – 2019**

**Mathematics and Statistics: Apply the algebra of complex numbers in solving problems (91577)**

Evidence Statement

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ONE | Expected Coverage | Achievement (u) | Merit (r) | Excellence (t) |
|  | | | | |
| (a) i) |  | Correct solution. |  |  |
| (a) ii) |  | Modulus found. | Cosine rule (or similar) used. Ignore if found. |  |
| (b) |  | Correct solution. |  |  |
| (c) | If is a solution then so is  So  becomes  so | A valid method started | Correct values for *b*, *c* and *d* stated. |  |
| (d) | **Check for solution the correct answer is k=2 (must show working)** | Line 1 |  | Justification for answer |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TWO** | Expected Coverage | Achievement (u) | Merit (r) | Excellence (t) |
| (a) | = | Correct answer. |  |  |
| (b) | =  = 16 | Accept correct answer in polar form. |  |  |
| (c) | =  =  = | 1 correct or consistent log rule applied. | stated. |  |
| (d) |  | Expanded and simplified to | Correct solutions. |  |
| (e) | Circle centre = (0, 4)  Radius = 2 | Squares to get to:  . | Rearranges and completes the square either correctly or consistently: | Correct Cartesian equation for circle stated as well as recognition of centre point and radius. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| THREE | Expected Coverage | Achievement (u) | Merit (r) | Excellence (t) |
|  | | | | |
| (a) |  | Correct answer using any appropriate method. |  |  |
| (b) | or equivalent | Correct answer. |  |  |
| (c) | so:  Hence:  which becomes | Simplification to: | Finding: |  |
| (d) | Check solutions  *x* = 2 only valid solution | Squared and simplified to get:  . | Factorised and checked solution to get *x* = 2. |  |
| (e) |  | Line 1 | Any 3 correct solutions | Polar form correct and all 5 solutions stated. |

# Judgement Statement

In the external examinations the grades candidates are awarded fall within the ranges below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Not Achieved | Achievement | Achievement  with Merit | Achievement  with Excellence |
| Score range | 0 – 8 | 9 – 14 | 15 – 20 | 21 – 24 |