**

**Mathematics Specialist Unit 2 - 2021**

# Test 6

**Complex Numbers and Matrices**

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| **Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Total Marks:\_\_\_\_\_\_\_\_\_\_** |
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|  |

**Task type: Response**

**Time allowed for this task:** 60 minutes, in-class, under test conditions

Section One: Calculator-free 28 minutes ( 26 marks)

(2 Minutes Reading – 26 Minutes Working)

Section Two: Calculator-assumed 32 minutes ( 29 marks)

(3 minutes Reading - 29 minutes working)

**Materials required:** Calculator with CAS capability (to be provided by the student)

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

**Special items:**  Drawing instruments, templates, notes on one unfolded sheet of   
A4 paper, and up to three calculators approved for use in the WACE examinations

Formula sheet

**Marks available: 55 marks**

**Task weighting: 7%**

**Section One : Calculator Free 26 Marks**

**Time Allowed 30 minutes**

Question 1 (8 marks)

Let and . Find

**Question 2**

**[4 marks]**

If . Find and .

**Question 3**

**[3 marks]**

Determine all complex solutions to the equation .

Question 4

[3 marks]

Determine the equation of the real quadratic in the form given that .

**Question 5**

**[3 marks]**

Express the real quadratic polynomial as a product of its linear factors.

**Question 6**

**[3 marks]**

If and , where real Prove that.

**Question 7**

**[2 marks]**

A triangle on the Cartesian plane is transformed by the matrix  and then by the matrix .

Find the single matrix that will transform the triangle to the final image.

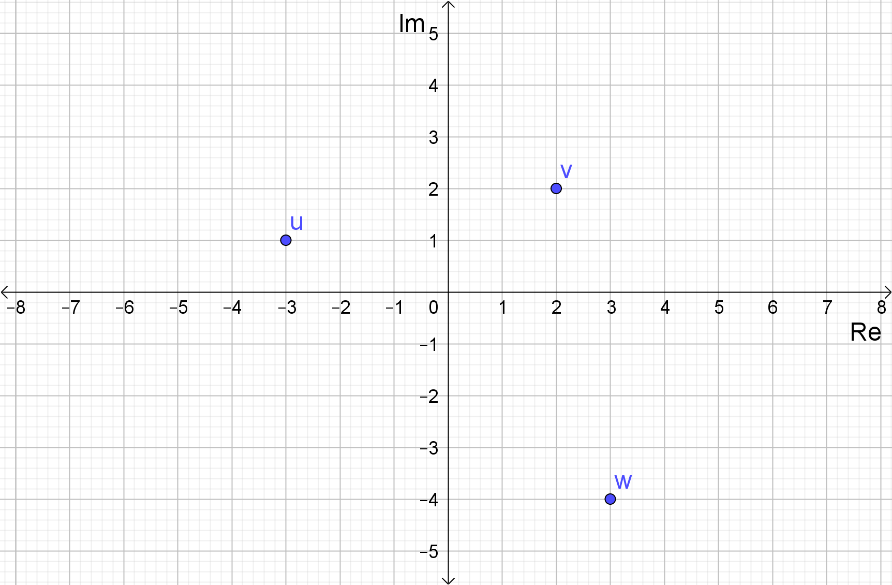
**Section Two : Calculator Assumed 22 Marks**

**Time Allowed 30 minutes Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Question 8

[6 marks]

The location of and in the complex plane are shown below. Plot and label the following



**Question 9**

**[4 marks]**

1. What is the matrix for the transformation T: (x, y)  (2x – 3y, 5x + y)?
2. Find the image of the triangle A(3, –2) B(5, 3) C(1, 6) under the transformation T.

**Question 10**

**[7 marks]**

The vertices of a rectangle are , , and

Transformation is a translation by vector .

1. State the coordinates of the image of after the rectangle is transformed by .

(1 mark)

The transformation matrix Q is .

1. State the coordinates of the image of after the rectangle is transformed by then .

(2 marks)

1. Find the area of the rectangle after it has been transformed by then .

(4 marks)

**Question 11**

**[3 marks]**

Use matrices to find the image of the line after it is reflected in the line.

**Question 12**

**[5 marks]**

The triangle with vertices and is mapped to the triangle by the transformation represented by the matrix . The area of triangle is 36 cm2 and has coordinates Find the value of and .

**Question 13**

**[4 marks]**

A point A is transformed by matrix M to A’ and then by matrix N to A’’, where M is the transformation that rotates 30 anti-clockwise about the origin and N is the transformation that dilates by a scale factor of 4 in the y direction.

Find the single matrix that will transform A’’ back to A.