



Course

Specialist

Year 12

Student name: \_\_\_\_\_

Teacher name: \_\_\_\_\_

Task type: Response

Time allowed for this task: 40 mins

Number of questions: 7

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

Marks available: 38 marks

Task weighting: 10%

Formula sheet provided: Yes

Note: All part questions worth more than 2 marks require working to obtain full marks.

Q1 (2, 2 & 3 = 7 marks) (3.1.1 to 3.1.3)

If  $z = 3 - 4i$  &  $w = -1 + 2i$  determine the following.

a)  $w\bar{z}$

b)  $\frac{z}{w}$

c)  $\frac{1}{z} - \frac{1}{w}$

Q2 (3 marks) (3.1.2)

Determine all possible pairs of real numbers  $a$  &  $b$  such that  $\frac{19 - 33i}{a + 2i} = 1 + bi$

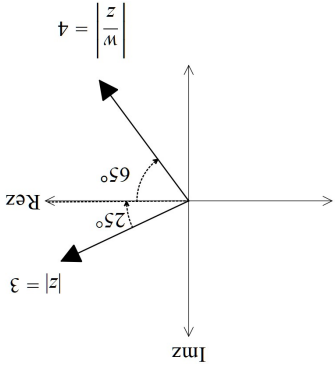
Q3 (2 & 3 = 5 marks) (3.1.13- 3.1.15)  
Consider the function  $f(x) = x^3 - 5x^2 + 9x - 45$ .

a) Determine the remainder of  $f(x)$  when divided by  $x - 5$ .

b) Show that  $x - 3i$  is a factor of  $f(x)$  and hence determine all linear factors.

Q4 (3 marks) (3.1.9)

Determine the complex number  $w$  in the form  $r\text{cis}\theta$  with  $r \geq 0$  &  $-180 < \theta \leq 180$ .



Q5 (2, 2, 3 & 3 = 10 marks) (3.1.10)

Consider the following set of complex numbers  $z$  such that  $|z - 5 - 3i| = 4$ .  
Determine the following.

- Minimum value of  $|z|$ . (exact)
- Maximum value of  $|\bar{z}|$ . (exact)
- Maximum value of  $\text{Arg}(z)$  in radians to two decimal places.
- Maximum value of  $|z + 3|$  (exact)

Q6 (3 & 3 = 6 marks) (3.1.6)

Let  $p, q$  &  $s$  be complex numbers such that

$$|p| = 5 \quad \text{Arg}(p) = \frac{\pi}{6} \quad \bar{q} = 1 - i$$

$$s = \frac{p^5}{(3 + 3i)q}$$

- Determine the exact value of  $\text{Arg}(s)$  in principal form (i.e.  $-\pi < \text{Arg}(s) \leq \pi$ )
- Determine the exact value of  $|s|$

Q7 (4 marks) (3.1.10)

Sketch the locus of complex numbers that satisfy **both** of the following  
 $|z + 2i| = |z - 3| + \sqrt{13}$  **AND**  $|z + 2i| \leq \sqrt{13} + 5$  in the Argand diagram below.

