

## LC 2014 (SET C): PAPER 1

### QUESTION 2 (25 MARKS)

#### Question 2 (a) (i)

$$z_1 = 5 - i$$

$$z_2 = 4 + 3i$$

$$z_1 - z_2 = 5 - i - 4 - 3i = 1 - 4i$$

#### Question 2 (a) (ii)

$$|z_1 - z_2| = \sqrt{1^2 + (-4)^2} = \sqrt{1+16} = \sqrt{17}$$

$$z_2 - z_1 = 4 + 3i - 5 + i = -1 + 4i$$

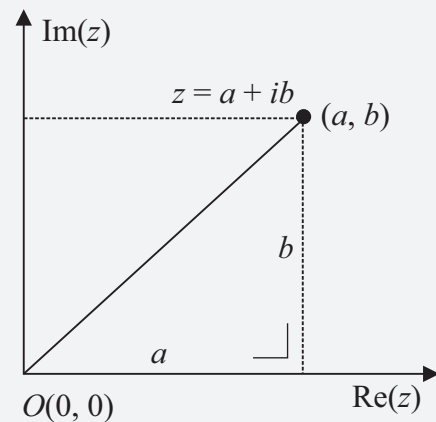
$$|z_2 - z_1| = \sqrt{(-1)^2 + 4^2} = \sqrt{1+16} = \sqrt{17}$$

#### Question 2 (a) (iii)

$|z - w|$  and  $|w - z|$  represents the distance between  $z$  and  $w$  which is a certain value regardless of the order in which you carry out the operation.

#### FORMULA: Complex Numbers

Modulus  $|z|$



$$|z| = |a + bi| = \sqrt{a^2 + b^2}$$

#### MARKING SCHEME NOTES

##### Question 2 (a) (i) [Scale 10C (0, 3, 7, 10)]

3: • Correct substitution for  $z_1$  or  $z_2$  in expression

7: • Correct substitution for  $z_1$  and  $z_2$  in expression but error in finishing

##### Question 2 (a) (ii) [Scale 5C (0, 2, 3, 5)]

2: • Use of candidate's answer from (i)

• Correct modulus formula written

•  $z_2 - z_1$  substituted

3: • One modulus correctly calculated

##### Question 2 (a) (iii) [Scale 5B (0, 2, 5)]

2: • Incomplete explanation but mentions distance or length or squaring

•  $z - w = -(w - z)$  in words or similar

#### Question 2 (b)

$$z_1 = \frac{z_2}{z_3} \Rightarrow z_3 = \frac{z_2}{z_1}$$

$$z_3 = \frac{4 + 3i}{5 - i}$$

$$= \frac{4 + 3i}{5 - i} \times \frac{5 + i}{5 + i} \quad \text{[Multiply above and below by the conjugate of the denominator.]}$$

$$= \frac{20 + 4i + 15i + 3i^2}{25 + 5i - 5i - i^2}$$

$$= \frac{20 + 19i - 3}{25 + 1} = \frac{17 + 19i}{26}$$

$$= \frac{17}{26} + \frac{19}{26}i$$

#### FORMULA: Complex Numbers

Conjugates  $\bar{z}$

$$z = a + bi \Rightarrow \bar{z} = a - bi$$

Multiplying a complex number by its conjugate:

$$z\bar{z} = (a + bi)(a - bi) = a^2 + b^2$$

**MARKING SCHEME NOTES**

**Question 2 (b) [Scale 5C (0, 2, 3, 5)]**

- 2:**
- Terms rearranged
  - Correct substitution
  - $z_3 = z_1 z_2$  and continues
- 3:**
- Multiplication above and below by correct conjugate and some subsequent work
  - Correct application of Real = Real, Im = Im
  - $z_3 = \frac{z_1}{z_2}$  and continues
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