

## LC 2015 (SET B): PAPER 1

### QUESTION 6 (25 MARKS)

#### Question 6 (a)

**COMPLEX NUMBERS**

$$a + bi = c + di$$

Equate the real parts:  $a = c$

Equate the imaginary parts:  $b = d$

$$z_1 = 3 + i = a + bi \Rightarrow a = 3, b = 1$$

$$z_2 = 3 - i = c + di \Rightarrow c = 3, d = -1$$

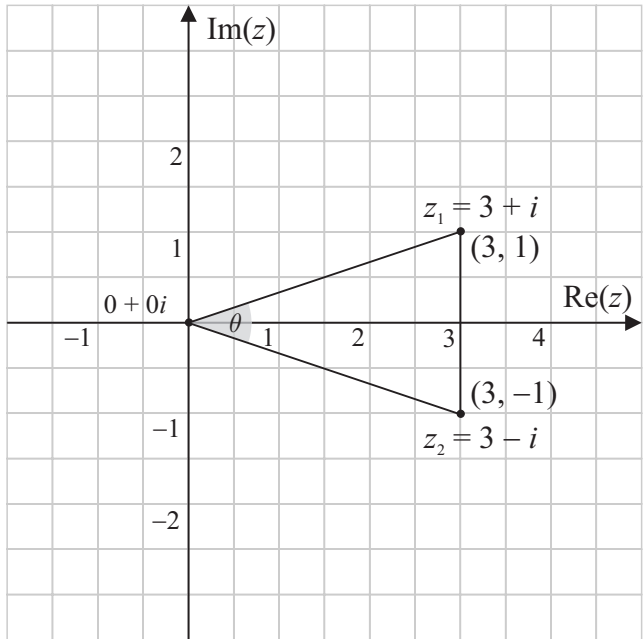
**MARKING SCHEME NOTES**

**Question 6 (a) [Scale 15D (0, 3, 7, 11, 15)]**

- 3:** • One correct value  
• Plots  $z_2$  correctly and stops

- 7:** • Two correct values

- 11:** • Three correct values

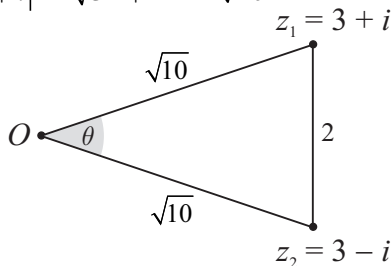


#### Question 6 (b) (i)

Find the modulus of each complex number.  
This is the distance from the origin (0, 0) to each complex number.

$$|z_1| = |3 + i| = \sqrt{3^2 + 1^2} = \sqrt{10}$$

$$|z_2| = |3 - i| = \sqrt{3^2 + 1^2} = \sqrt{10}$$



Apply the Cosine rule as you are given 3 sides in the triangle.

$$2^2 = (\sqrt{10})^2 + (\sqrt{10})^2 - 2(\sqrt{10})(\sqrt{10})\cos\theta$$

$$4 = 10 + 10 - 20\cos\theta$$

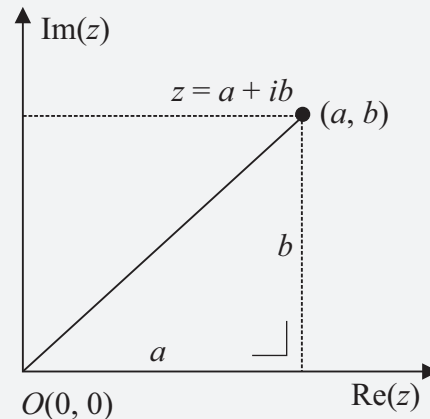
$$4 = 20 - 20\cos\theta$$

$$20\cos\theta = 16$$

$$\therefore \cos\theta = \frac{16}{20} = \frac{4}{5} = 0.8$$

**FORMULA: Complex Numbers**

Modulus  $|z|$

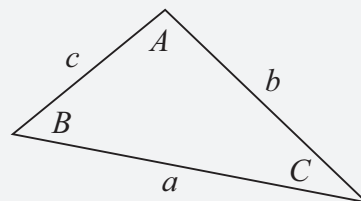


$$|z| = |a + bi| = \sqrt{a^2 + b^2}$$

**FORMULAE AND TABLES BOOK**

**Trigonometry of the triangle:**

**Cosine rule [page 16]**



$$a^2 = b^2 + c^2 - 2bc \cos A$$

**MARKING SCHEME NOTES**

**Question 6 (b) (i) [Scale 5B (0, 3, 5)]**

- 3:**
- Cosine formula written
  - Finds  $|z_1|$
  - Any work of merit
  - Joins  $oz_1$  or  $oz_2$  or  $z_1z_2$

**Question 6 (b) (ii)**

Show the left-hand side (**LHS**) is equal to the right-hand side (**RHS**).

<b>LHS</b>	<b>RHS</b>
$ z_1  \times  z_2  \times \cos \theta$	$ac + bd$
$= \sqrt{10} \sqrt{10} (0 \cdot 8)$	$= (3)(3) + (1)(-1)$
$= 8$	$= 9 - 1$
	$= 8$

$\therefore |z_1| \times |z_2| \times \cos \theta = ac + bd$

**MARKING SCHEME NOTES**

**Question 6 (b) (ii) [Scale 5C (0, 3, 4, 5)]**

- 3:**
- $ac + bd$  correct
  - Any work of merit
  - Finds  $|z_1|$  and/or  $|z_2|$
- 7:**
- one error only in substitution, with conclusion