

AQA Further Pure 1

Complex Numbers

Topic assessment

1. Find the complex roots of the equation $x^2 + 6x + 10 = 0$ [2]

2. Express in the form $a + ib$:

(a) $(2 + i)^2$; [1]

(b) $(5 + 2i)(-3 + 4i)$. [1]

3. Given that $p, q \in \mathbb{R}$ find p and q where:

$$2(p + iq) = q - ip - 2(1 - i) \quad [2]$$

4. (a) Show that $(3 - i)^2 = 8 - 6i$. [1]

(b) The quadratic equation

$$az^2 + bz + 10i = 0$$

where a and b are real, has a root $3 - i$.

(i) Show that $a = 3$ and find the value of b . [6]

(ii) Determine the other root of the quadratic equation, giving your answer in the form $p + iq$. [3]

5. Given that $z = -2 + 2\sqrt{3}i$, show that $z^2 + 4z$ is real. [3]

6. If $z = x + iy$ and $z^* = x - iy$, solve $(z + 5) - 2(z^* - 3) = 1 - 2i$ [3]

7. If the roots of the equation $z^2 - (1 - i)z + 2 - i = 0$ are α and β ,

(a) find and simplify the values of $\alpha + \beta$ and $\alpha\beta$. [2]

(b) Find the equation whose roots are $\alpha + 2\beta$ and $2\alpha + \beta$. [6]

Total 30 marks