Marked example 1

Paper 1 style · No calculator

1 6 marks AHL 1.12 ●●○ Typical

The complex number z satisfies $2z + \mathrm{i}z^* = 3 + 4\mathrm{i}$.

(a) Find z, giving your answer in the form $a + b\mathrm{i}$, where $a, b \in \mathbb{R}$. **[4]**

(b) Hence find z^2 in the form $c + d\mathrm{i}$. **[2]**

MARKSCHEME (a)

$z = a + b\mathrm{i}$: $2a + 2b\mathrm{i} + \mathrm{i}(a - b\mathrm{i}) = (2a + b) + (a + 2b)\mathrm{i}$ **M1**

$2a + b = 3$ and $a + 2b = 4$ **M1A1**

$z = \frac{2}{3} + \frac{5}{3}\mathrm{i}$ **A1**

Total 4 marks

Note M1 for equating real and imaginary parts.

MARKSCHEME (b)

$\left(\frac{2}{3} + \frac{5}{3}\mathrm{i}\right)^2 = \frac{4}{9} + \frac{20}{9}\mathrm{i} - \frac{25}{9}$ **(M1)**

$= -\frac{7}{3} + \frac{20}{9}\mathrm{i}$ **A1**

Total 2 marks

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