Exercise 2

Paper 1 style · No calculator

2 7 marks AHL 1.12 ●●● Demanding

Let $w = 7 + 24\text{i}$.

(a) Find the two square roots of w, giving your answers in the form $a + b\text{i}$, where $a, b \in \mathbb{R}$. **[4]**

(b) Hence solve the equation $2z^2 + 6z + 1 - 12\text{i} = 0$. **[3]**

The markscheme is on the next page: try the question first. Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software. Not affiliated with or endorsed by the International Baccalaureate Organization.
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MARKSCHEME (a)

$(a + b\text{i})^2 = 7 + 24\text{i}$: $a^2 - b^2 = 7,\ 2ab = 24$ — **M1A1**

$a^2 - \dfrac{144}{a^2} = 7,\ a^4 - 7a^2 - 144 = 0,\ a^2 = 16$ — **(M1)**

$4 + 3\text{i}$ and $-4 - 3\text{i}$ — **A1**

Total 4 marks

MARKSCHEME (b)

$z = \dfrac{-6 \pm \sqrt{36 - 8(1 - 12\text{i})}}{4} = \dfrac{-6 \pm 2\sqrt{7 + 24\text{i}}}{4}$ — **M1**

$z = \dfrac{-3 \pm (4 + 3\text{i})}{2}$ — **(A1)**

$z = \frac{1}{2} + \frac{3}{2}\text{i}$ or $z = -\frac{7}{2} - \frac{3}{2}\text{i}$ — **A1**

Total 3 marks