Marked example 2

Paper 1 style · No calculator

2 7 marks AHL 1.14 ●●○ Typical

Consider the equation $z^4 = -8 + 8\sqrt{3}\,\mathrm{i}$.

(a) Write $-8 + 8\sqrt{3}\,\mathrm{i}$ in the form $re^{\mathrm{i}\theta}$. **[2]**

(b) Solve the equation, giving your answers in the form $re^{\mathrm{i}\theta}$, where $r > 0$ and $-\pi < \theta \leq \pi$. **[3]**

(c) The roots are the vertices of a quadrilateral in the complex plane. Find its area. **[2]**

MARKSCHEME (a)

$r = \sqrt{64 + 192} = 16$ **A1**

$\theta = \frac{2\pi}{3}$ **A1**

Total 2 marks

MARKSCHEME (b)

$z = 16^{1/4} e^{\mathrm{i}\frac{2\pi/3 + 2k\pi}{4}}$ **(M1)**

$2e^{\mathrm{i}\pi/6},\ 2e^{\mathrm{i}2\pi/3}$ **A1**

$2e^{-\mathrm{i}5\pi/6},\ 2e^{-\mathrm{i}\pi/3}$ **A1**

Total 3 marks

MARKSCHEME (c)

a square with diagonals 4: $\frac{1}{2} \times 4 \times 4$ **(M1)**

$= 8$ **A1**

Total 2 marks

Note Or a square of side $2\sqrt{2}$.

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. © 2026 Hence