Marked example 2

Paper 1 style · No calculator

2 6 marks AHL 2.12 ●●● Demanding

The roots of the equation $x^3 + px^2 + qx - 64 = 0$, where $p, q \in \mathbb{R}$, are α, 2α and 4α.

(a) Find the value of α. **[3]**

(b) Hence find the value of p and the value of q. **[3]**

MARKSCHEME (a)

product of the roots $= \alpha \times 2\alpha \times 4\alpha = 8\alpha^3$ **A1**

$8\alpha^3 = \frac{(-1)^3(-64)}{1} = 64$ **M1**

$\alpha = 2$ **A1**

Total 3 marks

Note The product formula with the correct sign.

MARKSCHEME (b)

sum $2 + 4 + 8 = 14 = -p$: $p = -14$ **A1**

$q = 2 \times 4 + 4 \times 8 + 2 \times 8$ **(M1)**

$q = 56$ **A1**

Total 3 marks

Note The sum of the products in pairs.

Written and verified by a practising IB mathematics teacher, produced with AI assistance; solved twice and recomputed by software.
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