Exercise 3

Paper 2 style · Graphic display calculator

3 7 marks AHL 1.12 ●○○ Routine

Let $z_1 = 2 + 5\text{i}$ and $z_2 = 3 - \text{i}$.

(a) Find $\dfrac{z_1}{z_2}$, giving your answer in the form $a + b\text{i}$. **[2]**

(b) Find $|z_1 z_2|$ and $\arg(z_1 z_2)$. **[3]**

(c) Find the real number k such that $z_1 + kz_2$ is purely imaginary. **[2]**

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)

$\frac{(2+5\text{i})(3+\text{i})}{10}$ **(M1)**

$= 0.1 + 1.7\text{i}$ **A1**

Total 2 marks

MARKSCHEME (b)

$z_1 z_2 = 11 + 13\text{i}$ **(A1)**

$|z_1 z_2| = \sqrt{290} = 17.0$ **A1**

$\arg(z_1 z_2) = 0.869$ **A1**

Total 3 marks

MARKSCHEME (c)

$\text{Re} = 2 + 3k = 0$ **(M1)**

$k = -\frac{2}{3}$ **A1**

Total 2 marks