Argand diagrams, modulus and argument

Answers

Further Maths topic practice

This topic online

Q	Answer	Marks
1	**a)** z1 at (4, 3), z2 at (-2, -5), z1 + z2 = 2 - 2i at (2, -2) **b)** $2\sqrt{2}$	4
2	**a)** $\|z\| = 5$, arg z = 2.21 **b)** $\|w\| = \sqrt{5}$, arg w = -2.03	4
3	**a)** $2(\cos \frac{5\pi}{6} + i \sin \frac{5\pi}{6})$ **b)** $2\sqrt{2}(\cos(-\frac{\pi}{4}) + i \sin(-\frac{\pi}{4}))$	4
4	**a)** $-3 + 3\sqrt{3}i$ **b)** $6(\cos(-\frac{2\pi}{3}) + i \sin(-\frac{2\pi}{3}))$ **c)** -6, real because the imaginary parts cancel ($z + z^* = 2 \operatorname{Re} z$)	4
5	**a)** 3 - i **b)** $\|z\| = \sqrt{10}$, arg z = -0.322 **c)** $\|z^2\| = 10$, $\arg(z^2) = -0.644$	6
6	**a)** $8(\cos(-\frac{11\pi}{12}) + i \sin(-\frac{11\pi}{12}))$ **b)** $2(\cos(-\frac{5\pi}{12}) + i \sin(-\frac{5\pi}{12}))$	5
7	**a)** $p = -\frac{2\sqrt{3}}{3}$ **b)** $\|z\| = \frac{4\sqrt{3}}{3}$ **c)** $\|zw\| = \frac{4\sqrt{6}}{3}$, $\arg(zw) = \frac{5\pi}{12}$	6
8	**a)** z at (3, 2), w at (-1, 3), z + w at (2, 5) **b)** parallelogram: the sides from O to w and from z to z + w both represent w, so opposite sides are equal and parallel **c)** $iz = -2 + 3i$; rotation of 90° anticlockwise about the origin	6
9	**a)** 3 + 2i **b)** C: 3 + 6i, D: 4i **c)** 13	6
10	**a)** $4(\cos \frac{\pi}{6} + i \sin \frac{\pi}{6})$ **b)** OB = OA and angle AOB = π/3, so b is a rotated through ±π/3 about O with the same modulus **c)** b = 4i or $b = 2\sqrt{3} - 2i$ **d)** $4\sqrt{3}$	7
11	**a)** $\|z1\| = \sqrt{2}$, $\arg z1 = \frac{\pi}{4}$; $\|z2\| = 2$, $\arg z2 = -\frac{\pi}{6}$ **b)** $\|z1z2\| = 2\sqrt{2}$, $\arg = \frac{\pi}{12}$; $\|z1/z2\| = \frac{\sqrt{2}}{2}$, $\arg = \frac{5\pi}{12}$ **c)** $(\sqrt{3} + 1) + (\sqrt{3} - 1)i$ **d)** shown: $2\sqrt{2} \cos \frac{\pi}{12} = \sqrt{3} + 1$	8
12	**a)** shown **b)** $a = 4 - 2\sqrt{3}$ (shown) **c)** $\|z\| = 2\sqrt{3} - 2$	8

Full worked solutions, written out by hand, are on the solutions sheet for this topic.

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