Marked example 2

Paper 1 style · No calculator

2 7 marks AHL 1.13 ●●● Demanding

Let $u = 1 + \mathrm{i}$ and $v = \sqrt{3} + \mathrm{i}$.

(a) Find uv in the form $a + b\mathrm{i}$. **[2]**

(b) Write u and v in the form $re^{\mathrm{i}\theta}$. Hence write uv in the same form. **[3]**

(c) Hence find the exact value of $\cos\dfrac{5\pi}{12}$. **[2]**

MARKSCHEME (a)

$\sqrt{3} + \mathrm{i} + \sqrt{3}\,\mathrm{i} - 1$ **(M1)**

$= (\sqrt{3} - 1) + (\sqrt{3} + 1)\mathrm{i}$ **A1**

Total 2 marks

MARKSCHEME (b)

$u = \sqrt{2}\,\mathrm{e}^{\mathrm{i}\pi/4},\ v = 2\mathrm{e}^{\mathrm{i}\pi/6}$ **A1A1**

$uv = 2\sqrt{2}\,\mathrm{e}^{\mathrm{i}5\pi/12}$ **A1**

Total 3 marks

MARKSCHEME (c)

$2\sqrt{2}\cos\frac{5\pi}{12} = \sqrt{3} - 1$ **M1**

$\cos\frac{5\pi}{12} = \dfrac{\sqrt{3}-1}{2\sqrt{2}} = \dfrac{\sqrt{6}-\sqrt{2}}{4}$ **A1**

Total 2 marks

Note Equating the real parts of the two forms of uv.

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