COMPLEX NUMBERS (Q 4, PAPER 1)

LESSON NO. 5: MODULUS

2006

4 (a) Let $u = 3 - 6i$ where $i^2 = -1$.
Calculate $|u + 2i|$.

2005

4 (b) Let $w = 1 + 3i$.

(i) Express $\frac{2}{w}$ in the form $x + yi$, where $x, y \in \mathbf{R}$.

(ii) Investigate whether $|iw + w| = |iw| + |w|$.

2003

4 (b) Let $z_1 = 2 + 3i$ and $z_2 = 5 - i$.

(i) Plot z_1 and z_2 and $z_1 + z_2$ on an Argand diagram.

(ii) Investigate whether $|z_1 + z_2| > |z_1 - z_2|$.

2001

4 (c) Let $z_1 = 3 + 4i$ and $z_2 = 12 - 5i$.

$\overline{z}_1$ and $\overline{z}_2$ are the complex conjugates of z_1 and z_2, respectively.

(i) Show that $z_1\overline{z}_2 + \overline{z}_1 z_2$ is a real number.

(ii) Investigate if $|z_1| + |z_2| = |z_1 + z_2|$.

2000

4 (b) Let $w = 3 - i$.

(i) Plot w and $w + 6i$ on an Argand diagram.

(ii) Calculate $|w + 6i|$.

(iii) Express $\dfrac{1}{w + 6i}$ in the form $u + vi$ where $u, v \in \mathbf{R}$.

1999

4 (b) Let $u = 3 - 6i$.

(i) Calculate $|u|$.

(ii) Show that $iu + \dfrac{u}{i} = 0$.

(iii) Express $\dfrac{u}{u+3i}$ in the form $p + qi, \quad p, q \in \mathbf{R}$.

1998

4 (b) (ii) Investigate if

$$|2 + 14i| = |10(1 - i)|.$$

1997

4 (b) (i) For what values of a is

$|a + 8i| = 10$ where $a \in \mathbf{R}$?

ANSWERS

2006 4 (a) 5

2005 4 (b) (i) $\frac{1}{5} - \frac{3}{5}i$ (ii) False

2003 4 (b) (i) $z_1 + z_2 = 7 + 2i$ (ii) $\sqrt{53} > \sqrt{25}$ (True)

2001 4 (c) (i) 32 (ii) No

2000 4 (b) (i) (ii) $\sqrt{34}$ (iii) $\frac{3}{34} - \frac{5}{34}i$

1999 4 (b) (i) $|u| = \sqrt{45} = 3\sqrt{5}$ (iii) $\frac{3}{2} - \frac{1}{2}i$

1998 4 (b) (ii) Yes

1997 4 (b) (i) $a = \pm 6$