Assessment Schedule – 2006

Calculus: Manipulate real and complex numbers, and solve equations (90638)

Evidence Statement

	Achievement Criteria	Q.	Evidence	Code	Judgement	Sufficiency
Achievement	Manipulate real and complex numbers, and solve equations.	1(a)	$3-\sqrt{7}$	A1	No alternative.	**Achievement:**
		1(b)	$17+28i$	A1	No alternative.	**Four** of Code A
		1(c)	$(6\text{cis}\frac{\pi}{12})^4$ $= 1296\,\text{cis}\,\frac{\pi}{3}$ $= 648 + 648\sqrt{3}\,i$ or $= 648 + 1122.4i$	A1	Or equivalent in rectangular form.	**including** at least **One** of Code A1 **and** **One** of Code A2.
		2(a)	$x = 0.3989$	A2	Or equivalent.	No repeated skills.
		2(b)	$2x-3=7^{4.5}$ $x = 3177.7$	A2	Or equivalent.	

	Achievement Criteria	Q.	Evidence	Code	Judgement	Sufficiency
Achievement with Merit	Solve more complicated equations.	3	$(\sqrt{x+5})^2 = (2x-3)^2$ $4x^2 - 13x + 4 = 0$ $x = 2.91$ or 0.344 Checking gives just $x = 2.91$ as the only solution.	A2 M	Or equivalent.	**Merit:** Achievement **plus** **Two** of Code M **or** **Three** of Code M.
		4	$r^3 \text{cis}\, 3\theta = 64\, \text{cis} \frac{\pi}{2}$	A1	Conversion to polar form.	
			$\sqrt[3]{64 cis \frac{\pi}{2}} = \sqrt[3]{64} cis(\frac{\pi}{6} + \frac{2k\pi}{3})$ 3 solutions are: $4\text{cis}\frac{\pi}{6},\ 4\text{cis}\frac{5\pi}{6},\ 4\text{cis}(-\frac{\pi}{2})$	A2 M	Or equivalent.	
		5	$[z-(3+2i)][z-(3-2i)]$ $= [(z-3)-2i][(z-3)+2i]$ $= (z-3)^2 - 4i^2$ $= z^2 - 6z + 13$ $\frac{z^3 - 10z^2 + 37z + p}{z^2 - 6z + 13}$ $= z - 4$ remainder $p + 52$ Since $p + 52 = 0$, $p = -52$. Other roots: $z = 3 - 2i, 4$.	A2 M	Can assume p correct if 2 other roots given. Or equivalent.	

	Achievement Criteria	No.	Evidence	Code	Judgement	Sufficiency
Achievement with Excellence	Solve problem(s) involving real or complex numbers.	6	Let $z = x + y\text{i}$ $\frac{z+\text{i}}{z-\text{i}}$ $= \frac{x+(y+1)\text{i}}{x+(y-1)\text{i}} \quad x \neq 0, y \neq 1$ $= \frac{x+(y+1)\text{i}}{x+(y-1)\text{i}} . \frac{x-(y-1)\text{i}}{x-(y-1)\text{i}}$ $= \frac{x^2+(y+1)(y-1)+[x(y+1)-x(y-1)]\text{i}}{x^2+(y-1)^2}$ If $\frac{z+\text{i}}{z-\text{i}}$ is purely imaginary, its real part is equal to zero. $x^2 + (y+1)(y-1) = 0$ $x^2 + y^2 = 1, x \neq 0, y \neq 1$ Hence locus is a circle with centre (0, 0) and radius 1, excluding the point (0, 1).	A M E	Or equivalent. Award E to students who do not provide exclusion.	**Excellence:** Merit **plus** code E.

Judgement Statement

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Achievement	Achievement with Merit	Achievement with Excellence
Manipulate real and complex numbers, and solve equations. $4 \times$ A including at least $1 \times$ A1 and $1 \times$ A2 No repeated skills	Solve more complicated equations. Achievement *plus* $2 \times$ M **OR** $3 \times$ M	Solve problem(s) involving real or complex numbers. Merit *plus* $1 \times$ E