Mark Scheme 4725
January 2007

1.	(i) $a = -3$ (ii) $2a - 3 = 7$ or $3a - 6 = 9$ $a = 5$	B1 M1 A1	1 2 **3**	State correct value Sensible attempt at multiplication Obtain correct answer
2.	$x^2 - y^2 = 15$ and $xy = 4$ $\pm(4 + i)$	M1 A1 A1 M1 DM1 A1	 6 **6**	Attempt to equate real and imaginary parts of $(x + iy)^2$ and 15 +8i Obtain each result Eliminate to obtain a quadratic in x^2 or y^2 Solve to obtain $x = (\pm)4$, or $y = (\pm)1$ Obtain only correct two answers as complex numbers
3.	$\frac{1}{4}n^2(n+1)^2 - \frac{1}{2}n(n+1)$ $\frac{1}{4}n(n-1)(n+1)(n+2)$	M1 M1 A1 M1 A1 A1	 6 **6**	Expand to obtain $r^3 - r$ Consider difference of two standard results Obtain correct unfactorised answer Attempt to factorise Obtain factor of $\frac{1}{4}n(n+1)$ Obtain correct answer
4.	(i) (ii)	B1 B1 B1 B1 B1 B1	 3 3	Circle Centre (1, -1) Passing through (0, 0) Sketch a concentric circle Inside (i) and touching axes Shade between the circles
5.	(i)	B1	1	Show given answer correctly

	(ii) $-1 \pm i\sqrt{3}$ (iii)	M1 A1 A1 B1 B1 B1	3 3 **7**	Attempt to solve quadratic equation or substitute $x + iy$ and equate real and imaginary parts Obtain answers as complex numbers Obtain correct answers, simplified Correct root on x axis, co-ords. shown Other roots in 2nd and 3rd quadrants Correct lengths and angles or co-ordinates or complex numbers shown
6.	(i) $u_{n+1} - u_n = 2n + 4$ (ii)	B1 M1 A1 B1 M1 M1 A1 A1	3 5 **8**	Correct expression for u_{n+1} Attempt to expand and simplify Obtain given answer correctly State $u_1 = 4$ (or $u_2 = 10$)and is divisible by 2 State induction hypothesis true for u_n Attempt to use result in (ii) Correct conclusion reached for u_{n+1} Clear,explicit statement of induction conclusion
7.	(i) $\alpha + \beta = -5 \quad \alpha\beta = 10$ (ii) $\alpha^2 + \beta^2 = 5$ (iii) $x^2 - \frac{1}{2}x + 1 = 0$	B1 B1 M1 A1 B1 M1 A1 B1ft	2 2 4 **8**	State correct values Use $(\alpha + \beta)^2 - 2\alpha\beta$ Obtain given answer correctly, using value of -5 Product of roots = 1 Attempt to find sum of roots Obtain $\frac{5}{10}$ or equivalent Write down required quadratic equation, or any multiple.

8.	(i)	M1		Factor of $r!$ or $(r + 1)!$ seen
		A1		Factor of $(r + 1)$ found
	$(r + 1)^2 r!$	A1	3	Obtain given answer correctly
	(ii)	M1		Express terms as differences using
		A1		(i)
		M1		At least 1st two and last term correct
	$(n + 2)! - 2!$	A1	4	Show that pairs of terms cancel
	(iii)	B1ft	1	Obtain correct answer in any form
			8	Convincing statement for non-converging, ft their (ii)
9.	(i) $\begin{pmatrix}0\\0\end{pmatrix}$ $\begin{pmatrix}0\\-1\end{pmatrix}$ $\begin{pmatrix}3\\0\end{pmatrix}$ $\begin{pmatrix}3\\-1\end{pmatrix}$	M1		For at least two correct images
		A1	2	For correct diagram, co-ords.clearly written down
	(ii) 90^0 clockwise, centre origin	B1 B1		Or equivalent correct description
	$\begin{pmatrix}0 & 1\\-1 & 0\end{pmatrix}$	B1	3	Correct matrix, not in trig form
	(iii) Stretch parallel to x-axis, s.f. 3	B1 B1		Or equivalent correct description, but must be a stretch for 2nd B1
	$\begin{pmatrix}3 & 0\\0 & 1\end{pmatrix}$	B1 B1	4	Each correct column
			9	

10.	(i)	M1		Show correct expansion process for
		M1		3 x 3
	$\Delta = \det \mathbf{D} = 3a - 6$	A1		Correct evaluation of any 2 x 2 det
		M1		Obtain correct answer
		A1		Show correct process for adjoint
		B1		entries
	$\mathbf{D}^{-1} = \frac{1}{\Delta}\begin{pmatrix} 3 & -2 & 4 \\ -3 & a & -2a \\ -3 & a & a-6 \end{pmatrix}$	A1	7	Obtain at least 4 correct entries in adjoint
	(ii) $\frac{1}{\Delta}\begin{pmatrix} 5 \\ 2a-9 \\ 5a-15 \end{pmatrix}$	M1		Divide by their determinant
		A1A1A1 ft all 3	4	Obtain completely correct answer
			11	
				Attempt product of form $\mathbf{D}^{-1}\mathbf{C}$, or eliminate to get 2 equations and solve
				Obtain correct answers, ft their inverse