4725 Further Pure Mathematics 1

1.	$984390625 - 25502500 = 958888125$	B1 M1 A1	 3 **3**	State correct value of S_{250} or S_{100} Subtract $S_{250} - S_{100}$ (or S_{101} or S_{99}) Obtain correct exact answer
2.	$3a + 5b = 1,\ a + 2b = 1$ $a = -3,\ b = 2$	M1 M1 A1 A1	 4 **4**	Obtain a pair of simultaneous equations Attempt to solve Obtain correct answers.
3.	(i) $11 - 29i$ (ii) $1 + 41i$	B1 B1 B1 B1	2 2 **4**	Correct real and imaginary parts Correct real and imaginary parts
4.	Either $p + q = -1, pq = -8$ $\frac{p+q}{pq}$ $-\frac{7}{8}$ Or $\frac{1}{p} + \frac{1}{q} = 8$ $p + q = 1$ $-\frac{7}{8}$ Or $\frac{-1 \pm \sqrt{33}}{2}$ $-\frac{7}{8}$	B1 B1 M1 A1 B1 B1 M1 A1 M1 A1 M1 A1	 4 **4** 	Both values stated or used Correct expression seen Use their values in their expression Obtain correct answer Substitute $x = \frac{1}{u}$ and use new quadratic Correct value stated Use their values in given expression Obtain correct answer Find roots of given quadratic equation Correct values seen Use their values in given expression Obtain correct answer
5.	(i) $u^3 = \{(-)(5u + 7)\}^2$ $u^3 - 25u^2 - 70u - 49 = 0$ (ii) -70	M1 A1 A1 M1 A1 ft	 3 2 **5**	Use given substitution and rearrange Obtain correct expression, or equivalent Obtain correct final answer Use coefficient of u of their cubic or identity connecting the symmetric functions and substitute values from given equation Obtain correct answer

6.	(i) $3\sqrt{2}, -\frac{\pi}{4}$ or $-45°$ AEF	B1 B1	2	State correct answers
	(ii)(a)	B1B1 B1 ft	3	Circle, centre (3, -3), through O ft for $(\pm 3, \pm 3)$ only
	(ii)(b)	B1 B1 B1	3	Straight line with +ve slope, through (3, -3) or their centre Half line only starting at centre
	(iii)	B1ft B1ft B1ft	3 **11**	Area above horizontal through a, below (ii) (b) Outside circle
7.	(i)	M1 A1	2	Show that terms cancel in pairs Obtain given answer correctly
	(ii)	M1 A1	2	Attempt to expand and simplify Obtain given answer correctly
	(iii)	B1 B1		Correct $\sum r$ stated $\sum 1 = n$
		M1*		Consider sum of 4 separate terms on RHS
		*DM1		Required sum is LHS – 3 terms
	$(n+1)^4 - 1 - n(n+1)(2n+1) - 2n(n+1) - n$	A1		Correct unsimplified expression
	$4\sum_{r=1}^{n} r^3 = n^2(n+1)^2$	A1	6 **10**	Obtain given answer correctly
8.	(i)	B1 B1 B1	3	Find coordinates (0, 0) (3, 1) (2, 1) (5, 2) found Accurate diagram sketched
	(ii) $\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$	B1 B1	2	Each column correct
	(iii) *Either*	B1		Correct inverse for their (ii) stated
	$\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$	M1		Post multiply **C** by inverse of (ii)
		A1ft		Correct answer found
	Or	M1		Set up 4 equations for elements from correct matrix multiplication
		A2ft		All elements correct, -1 each error
		B1 B1 B1	6 **11**	Shear, x axis invariant or parallel to x-axis eg image of (1, 1) is (3, 1) **SR** allow s.f. 2 or shearing angle of correct angle to appropriate axis

9.	(i) $a\begin{vmatrix} a & 1 \\ 1 & 2 \end{vmatrix} - \begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix} + \begin{vmatrix} 1 & a \\ 1 & 1 \end{vmatrix}$ $2a^2 - 2a$ (ii) $a = 0$ or 1 (iii) (a) (b)	M1 A1 A1 M1 A1ft A1ft B1 B1 B1 B1	3 3 4 **10**	Correct expansion process shown Obtain correct unsimplified expression Obtain correct answer Equate their det to 0 Obtain correct answers, ft solving a quadratic Equations consistent, but non unique solutions Correct equations seen & inconsistent, no solutions
10.	i) $u_2 = 7$ $u_3 = 19$ (ii) $u_n = 2(3^{n-1}) + 1$ (iii) $u_{n+1} = 3(2(3^{n-1})+1) - 2$ $u_{n+1} = 2(3^n) + 1$	M1 A1 A1 M1 A1 B1ft M1 A1 A1 B1	3 2 5 **10**	Attempt to find next 2 terms Obtain correct answers Show given result correctly Expression involving a power of 3 Obtain correct answer Verify result true when $n = 1$ or $n = 2$ Expression for u_{n+1} using recurrence relation Correct unsimplified answer Correct answer in correct form Statement of induction conclusion