

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 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 (ii)(a) (ii)(b) (iii)	B1 B1 B1B1 B1 ft B1 B1 B1 B1ft B1ft B1ft	2 3 3 3 3 11	State correct answers Circle, centre (3, -3), through O ft for $(\pm 3, \pm 3)$ only Straight line with +ve slope, through (3, -3) or their centre Half line only starting at centre Area above horizontal through a , below (ii) (b) Outside circle
7.	(i) (ii) (iii) $(n+1)^4 - 1 - n(n+1)(2n+1) - 2n(n+1) - n$ $4\sum_{r=1}^n r^3 = n^2(n+1)^2$	M1 A1 M1 A1 B1 B1 M1* *DM1 A1 A1	2 2 6 10	Show that terms cancel in pairs Obtain given answer correctly Attempt to expand and simplify Obtain given answer correctly Correct $\sum r$ stated $\sum 1 = n$ Consider sum of 4 separate terms on RHS Required sum is LHS – 3 terms Correct unsimplified expression Obtain given answer correctly
8.	(i) (ii) $\begin{pmatrix} 1 & 0 \\ 1 & 1 \end{pmatrix}$ (iii) <i>Either</i> $\begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$ Or	B1 B1 B1 B1 B1 B1 M1 A1ft M1 A2ft B1 B1 B1	3 2 6 11	Find coordinates (0, 0) (3, 1) (2, 1) (5, 2) found Accurate diagram sketched Each column correct Correct inverse for their (ii) stated Post multiply C by inverse of (ii) Correct answer found Set up 4 equations for elements from correct matrix multiplication All elements correct, -1 each error 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.	<p>(i) $a \begin{vmatrix} a & 1 \\ 1 & 2 \end{vmatrix} - \begin{vmatrix} 1 & 1 \\ 1 & 2 \end{vmatrix} + \begin{vmatrix} 1 & a \\ 1 & 1 \end{vmatrix}$ $2a^2 - 2a$</p> <p>(ii) $a = 0$ or 1</p> <p>(iii) (a) (b)</p>	<p>M1 A1 A1 M1 A1ft A1ft B1 B1 B1 B1</p>	<p>3 3 4 10</p>	<p>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</p>
10.	<p>i) $u_2 = 7 \quad u_3 = 19$</p> <p>(ii) $u_n = 2(3^{n-1}) + 1$</p> <p>(iii) $u_{n+1} = 3(2(3^{n-1}) + 1) - 2$ $u_{n+1} = 2(3^n) + 1$</p>	<p>M1 A1 A1 M1 A1 B1ft M1 A1 A1 B1</p>	<p>3 2 5 10</p>	<p>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</p>