Question 1 Find $$\sum_{r=1}^{n}(2r+1)(r^2+3r)$$ in the form $\frac{1}{6}n(n+1)(an^2+bn+c)$. Pass on the value of a to Question 2.	**Question 3** Let $f(x)=x^3+3x^2-bx+4$ where b is the value from Question 2. Use the Newton-Raphson process twice with initial guess $x_0=0$ to obtain an approximate value for one of the roots. Let c be the digit with place value hundredths. Pass this on to Question 4.
Question 5 Prove that 8^n-1 is divisible by d, where d is the value from Question 4. Pass on $e=d^2$ to Question 6.	**Question 7** Let A be a matrix such that its determinant is the value f from Question 6. Given that $A=\begin{pmatrix}2 & 1\\ g & 8\end{pmatrix}$ find g and pass this on to Question 8.
Question 9 Where x and y are from Question 8, find $$\sum_{r=x}^{y}r^2+2^r$$ Let your answer be k and pass this value on to Question 10.	**Question 11** Three vertices of a square are $(0,0)$, $(2,0)$ and $(0,2)$. An enlargement by scale factor l (where l is the value from question 10) is represented by the matrix S and a rotation of $180°$ about $(0,0)$ is represented by the matrix T. Find the absolute value of the y-coordinate of the transformed point when you apply S followed by T to the vertex of the square that is opposite the origin. Pass this on to Question 12.

Question 2	**Question 4**
Using a from Question 1. Let $z = a + 2i$. Calculate $z^2 z^*$. Let b be the real part of $z^2 z^*$ divided by 3. Pass on b to Question 3	A parabola has parametric equations $x = ct^2, y = 2ct$ where c is the value from Question 3. Find the focus, S, and directrix of this parabola. A point P on this parabola has x-coordinate 4. Find the distance $d = PS$ and pass this on to Question 5.
Question 6	**Question 8**
Let e be the number from Question 5. Simplify $$\frac{9 + ei}{4 + 3i}$$ Let f be the square root of the numerator of the imaginary part of your answer. Pass this on to Question 7.	With g being the value obtained from Question 7, solve, using a matrix method, the simultaneous equations $$gx + 2y = 24$$ $$5x + gy = 38$$ Pass your solutions on to Question 9.
Question 10	**Question 12**
Show that $(x - 1)$ is a factor of $x^3 - 5x^2 + 193x - k$. Find the other roots of $x^3 - 5x^2 + 193x - k = 0$. Let l be the real part of the other two roots and pass this on to Question 11.	A rectangular hyperbola has equation $xy = m$ where m is the number from Question 11. Find an equation for the tangent at the point $P\left(mt, \frac{m}{t}\right)$. What is the area of the triangle formed by the x-axis, y-axis and this tangent?