Day 31	A Level Maths: A Tier 10-a-day
1 Find the least integer n for which $2^n > 10^9$.	
2 A club has 280 members: 56 Bronze, 120 Silver and 104 Gold. A stratified sample of size 35 is taken. Find the number of members sampled from each group.	
3 Prove that the square of any integer is either a multiple of 4 or one more than a multiple of 4.	
4 X has E(X) = 3 and Var(X) = 3. (a) Find $E(X^2)$. (b) Y = 4X + 7. Find E(Y) and Var(Y). (c) X_1 and X_2 are independent copies of X. Find $Var(X_1 - X_2)$.	
5 A stone is projected vertically upwards from the ground. It passes a ledge 2 s after projection and again 3 s after projection. Find (a) the speed of projection, (b) the height of the ledge, (c) the greatest height. Take g = 9.8.	

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6 Solve $2^{2x} - 232^{x} + 76 = 0$. Give exact roots, or 3 s.f. where the answer is not exact.	
7 A 2 kg particle moves on a smooth horizontal line. At time t s a single force of $(15 - 3t)$ N acts along the line. When $t = 0$ its speed is 1 m s^{-1}. Find (a) its speed when $t = 2$, (b) its greatest speed.	
8 $u_1 = 0$ and $u_{n+1} = \frac{1}{4} u_n + 18$. (a) Find the limit L of the sequence as $n \to \infty$. (b) Find the least n for which $\lvert u_n - L \rvert < 0.1$.	
9 A curve has equation $x^2y - y^3 + x = -25$. Find $\frac{dy}{dx}$ in terms of x and y, and the gradient of the normal at $(-1, 3)$.	
10 Solve $\lvert x^2 - 5x \rvert = 6$.	