Day 129	A Level Maths: S Tier 10-a-day
1 Particles of mass 7 kg and 3 kg hang on a light string over a smooth fixed pulley. The 7 kg particle is 2.75 m above the ground; the 3 kg one is on the ground. Released from rest, find (a) the tension, (b) the greatest height reached by the 3 kg particle. Take $g = 9.8$ m s^{-2}.	
2 A box holds 8 components, each faulty with probability 0.15, independently. A box is rejected if it has at least 3 faulty components. (a) Find the probability that a box is rejected. (b) 10 boxes are inspected. Find the probability that at least 2 are rejected.	
3 $u_{n+1} = u_n + n + 3$, $u_1 = 2$. (a) Show that $u_n = an^2 + bn + c$ and find a, b, c. (b) Find the least n for which $u_n > 1499$.	
4 A binomial random variable X has mean 9 and variance 3.6. (a) Find n and p. (b) Find P(X = 9), correct to 3 significant figures.	
5 A particle P moves on a straight line. At time t seconds, where $t \geq 0$, its velocity is v m s^{-1}, where $v = 40\sqrt{t} - 8t$. Find (a) the greatest speed of P, (b) the greatest displacement of P from its starting point.	

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6 A curve has parametric equations $x = 2\cos t$, $y = 4\sin t$. Find a cartesian equation of the curve, with no fractions.	
7 Solve $\sqrt{4x + 12} = 2x + 2$.	
8 Find the coordinates of the points of inflection of $y = \frac{3}{x^2 + 27}$.	
9 In the expansion of $(1 + kx)^n$, where n is a positive integer, the coefficient of x is -15 and the coefficient of x^2 is 90. Find n and k.	
10 A curve has parametric equations $x = 4\sin t$, $y = 4\cos t$, for $0 \leq t \leq \frac{\pi}{2}$. Find the exact area bounded by the curve and the coordinate axes.	