Day 312	A Level Maths: A Tier 10-a-day
1 Find the coefficient of x^5 in the expansion of $(x^2 + \frac{1}{x})^{10}$.	
2 X ~ B(15, 0.3). Find the largest value of c such that $P(X \leq c) < 0.05$.	
3 A driver at constant speed sees a hazard 91.2 m ahead. After a reaction time of 0.8 s she brakes with deceleration 4 m s^{-2} and stops exactly at the hazard. Find (a) her initial speed, (b) the total time from seeing the hazard to stopping.	
4 The equation $x^2 = x + 7$ has a root α. Use the iteration $x_{n+1} = \sqrt{x + 7}$ with $x_0 = 3$ to find x_1, x_2 and x_3 to 4 d.p., and hence the value of α to 2 d.p. (continue until the 2 d.p. value is settled).	
5 The equation $x^2 + (2k)x + (2k) = 0$ has no real roots. Find the set of possible values of k.	

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6 The number of fish in a lake is modelled by $N = 2000\,e^{kt}$, where t is time in years. After 4 years, N = 4000. Find (a) the exact value of k, (b) the time for N to reach 100000, to 3 s.f.	
7 Find the coefficient of x^3 in the expansion of $(1 - 2x)(2 - x)^5$.	
8 $X \sim B(24, p)$. H_0: $p = 0.3$ is tested against H_1: $p < 0.3$ using a 5% significance level. (a) Find the critical region. (b) State the probability of a Type I error. (c) Find the probability of a Type II error when $p = 0.1$ (3 s.f.).	
9 A curve has equation $2x^2y + y^3 + 3x = 15$. Find $\frac{dy}{dx}$ in terms of x and y, and the gradient of the normal at (1, 2).	
10 A 4 kg particle is in equilibrium on a rough plane inclined at α, $\tan\alpha = \frac{3}{4}$, $\mu = 0.2$. A horizontal force of P N, in the vertical plane through a line of greatest slope, pushes it towards the plane. Find the least and greatest values of P. Take $g = 9.8$. Give answers to 3 s.f. if not exact.	