Day 290	A Level Maths: A Tier 10-a-day
1 The number of fish in a lake is modelled by $N = 400\,e^{kt}$, where t is time in years. After 4 years, N = 2400. Find (a) the exact value of k, (b) the time for N to reach 20000, to 3 s.f.	
2 An arithmetic series has first term -6 and common difference 3. The sum of the first n terms is 126. Find n.	
3 A stone is projected vertically upwards from the ground. It passes a ledge 1 s after projection and again 8 s after projection. Find (a) the speed of projection, (b) the height of the ledge, (c) the greatest height. Take g = 9.8.	
4 $f(x) = x^3 - 2x - 11$. Show that the equation f(x) = 0 has a root α in the interval [2, 3].	
5 A particle is projected at 12.6 m s^{-1} up a line of greatest slope of a rough plane inclined at α, where $\tan\alpha = \frac{12}{5}$. The coefficient of friction is 0.3. Find (a) the greatest distance it moves up the plane, (b) its speed on returning to the start. Take g = 9.8. Give answers to 3 s.f. if not exact.	

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6 Express $\frac{-6x^2 + 22x - 5}{(x + 3)(x - 2)^2}$ in the form $\frac{A}{(x + 3)} + \frac{B}{(x - 2)} + \frac{C}{(x - 2)^2}$, and find A, B and C.	
7 The times in seconds of two groups: group X has n = 9, mean 68, sd 9; group Y has n = 20, mean 39, sd 9. Find the mean and standard deviation of all 29 values (3 s.f. for the sd).	
8 Solve $\sin 2\theta = \cos \theta$ for $0 \leq \theta \leq 2\pi$.	
9 X ~ B(33, p). H_0: p = 0.4 is tested against H_1: p < 0.4 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 = 0.2 (3 s.f.).	
10 $f(x) = \frac{6x + 7}{(1 - 2x)(1 + 3x)}$. (a) Express f(x) in partial fractions. (b) Hence expand f(x) up to x^2. (c) State the range of x for which the expansion is valid.	