Day 333	A Level Maths: S Tier 10-a-day
1 Solve $\cot(3\theta - 20°) = \frac{1}{\sqrt{3}}$ for $-180° \leq \theta \leq 180°$.	
2 A uniform plank AB of length 8 m and mass 30 kg rests on supports at C and D, where AC = 3 m and DB = 2 m. A girl of mass 60 kg stands on it at distance x m from A. Find the range of x for which the plank stays in equilibrium on both supports.	
3 A geometric series has first term 4 and common ratio $\frac{4}{5}$. Find the least n for which S_n exceeds 99% of the sum to infinity.	
4 The fill volume of a bottle is N(μ, 25) with known variance 25. The mean was claimed to be 30 ml. A random sample of 36 has mean 30.5. Test at the 1% level whether the mean is less than 30.	
5 Evaluate $\sum_{r=6}^{11}(5 \times 2^r + 3r)$.	

Day 333	A Level Maths: S Tier 10-a-day
6 A drink cools according to $\theta = 15 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 85$, and after 10 minutes $\theta = 57$. Find A and k, then find when $\theta = 34$ (3 s.f.).	
7 A car of mass 1500 kg, with engine power 35.4 kW, climbs a straight road with $\sin\alpha = \frac{1}{10}$ against a constant resistance of 300 N. Find (a) the greatest steady speed up the hill, (b) the acceleration at 5 m s^{-1}. Take g = 9.8 m s^{-2}.	
8 A curve has parametric equations $x = 3\sin t$, $y = 2\cos 2t$. Find a cartesian equation of the curve in the form y = f(x).	
9 Solve $\frac{3}{(x+2)} > \frac{5}{(x-3)}$.	
10 $X \sim N(\mu, 25)$. H_0: $\mu = 84$ is tested against H_1: $\mu > 84$ using the mean of a sample of size 9 at the 10% level. (a) Find the critical region for the sample mean. (b) Find the probability of a Type II error when $\mu = 85.5$.	