Day 35	A Level Maths: S Tier 10-a-day
1 Solve $2\cos 2\theta + 6\sin\theta - 4 = 0$ for $0 \leq \theta < 2\pi$, giving answers in terms of π.	
2 Solve $x - 3\sqrt{x} - 10 = 0$.	
3 A ladder of length 13 m leans against a vertical wall. Its foot slides away from the wall at 1 m s^{-1}. When the foot is 5 m from the wall, find the rate at which the top is moving down.	
4 A particle P of mass 5 kg moves under a single force F N, where $F = (30t + 10)\mathbf{i} + (15t^2 + 10)\mathbf{j}$ and t is the time in seconds. At t = 0, P is at the origin with velocity $(3\mathbf{i} - 2\mathbf{j})$ m s^{-1}. Find (a) the velocity of P at t = 2, (b) the position vector of P at t = 2.	
5 A biased coin lands on 'win' with the same unknown probability p each time. It is used 8 times in round 1 and 8 times in round 2. Given that exactly 9 wins occur altogether, find the probability that exactly 3 of them were in round 1.	

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6 A plank of mass 4 kg lies on a smooth horizontal table, with a block of mass 4 kg on it ($\mu = 0.3$ between them). A horizontal force P N acts on the block. (a) Find the greatest P for which the block does not slip. (b) Find the accelerations of block and plank when P = 47.04. Take g = 9.8 m s^{-2}.	
7 The curve C has parametric equations $x = t$, $y = t^2$. The line $y = 4x - 3$ meets C at A and B. Find the exact length AB.	
8 Find the coordinates of the stationary points of $y = 4\cos 2x + 8\cos x$ for $0 < x < 2\pi$, and determine their nature.	
9 $X \sim N(\mu, 49)$. H_0: $\mu = 47$ is tested against H_1: $\mu < 47$ using the mean of a sample of size 25 at the 10% level. (a) Find the critical region for the sample mean. (b) Find the probability of a Type II error when $\mu = 44$.	
10 $f(x) = \frac{10x - 7}{(1 - x)(1 - 2x)}$. (a) Express f(x) in partial fractions. (b) Hence expand f(x) in ascending powers of x up to x^3, stating the range of validity.	