Day 65	A Level Maths: S Tier 10-a-day
1 A faulty component is present in 5% of a population. A test is positive for 95% of those with it and for 10% of those without it. Find P(positive) and P(has it | positive).	
2 A ball is projected from a point O on horizontal ground with speed 63.7 m s^{-1} at an angle α above the horizontal, where $\tan\alpha = \frac{5}{12}$. Find (a) the greatest height, (b) the speed when it is at half of this height (3 s.f.). Take g = 9.8 m s^{-2}.	
3 X ~ N(μ, 9). H_0: $\mu = 58$ is tested against H_1: $\mu < 58$ 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 $\mu = 57.5$.	
4 A ball is dropped from a height of 4 m. After each bounce it rises to $\frac{3}{4}$ of its previous height. (a) Find the total distance it travels before it stops. (b) After how many bounces does it rise less than 0.01 m?	
5 A is acute and B is acute. $\cos A = \frac{20}{29}$ and $\cos B = \frac{15}{17}$. Find the exact values of cos(A + B) and tan(A + B).	

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6 Find the set of values of x for which both $x^2 + 4x + 3 > 0$ and $2x + 4 < 2$.	
7 A curve is given by $x = e^y + 4y$. Find dy/dx and d^2y/dx^2 when $y = 0$.	
8 The tangent to $y = x\sqrt{3x + 6}$ at the point where $x = 1$ meets the axes at A and B. Find the exact area of triangle OAB, where O is the origin.	
9 A plank of mass 5 kg lies on a smooth horizontal table, with a block of mass 3 kg on it ($\mu = 0.25$ 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 = 35.28. Take g = 9.8 m s^{-2}.	
10 Find the term independent of x in the expansion of $(3x + \frac{1}{x})^{10}$.	