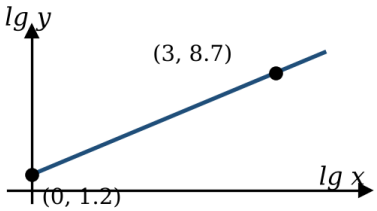
Day 119	A Level Maths: S Tier 10-a-day
1 A uniform plank AB of length 8 m and mass 30 kg rests on supports at C and D, where AC = 3 m and DB = 2 m. A girl of mass 50 kg stands on it at distance x m from A. Find the range of x for which the plank stays in equilibrium on both supports.	
2 $y = ax^n$. The graph of lg y against lg x is the straight line shown. Find a and n, giving a to 3 s.f. 	
3 A ball is thrown vertically upwards from ground level. It is more than 269.5 m above the ground for 6 s. Find the speed of projection and the greatest height reached. Take g = 9.8 m s^{-2}.	
4 The curve $y = 3^x - x$ has one stationary point. Find its coordinates to 3 s.f. and show that it is a minimum.	
5 Solve simultaneously, giving integer x and y: $2^x \times 16^y = 32$ $27^x \div 9^y = 3$	

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6 Use integration by parts to find the exact value of $\int_0^{\pi/6} x \cos 3x \, dx$	
7 A circle has its centre in the first quadrant and touches both the x-axis and the y-axis. It passes through the point (2, 9). Find the two possible equations of the circle.	
8 A bag has 4 red, 6 blue and 2 green counters. A player takes two without replacement. Two reds win £3, two blues win £7, anything else wins nothing. (a) Find the expected winnings. (b) The player pays £1 to play. Find the expected profit.	
9 $f(x) = x^3 - 4x^2 + 7x - 4$. Show that $(x - 1)$ is a factor of f(x), and that the equation f(x) = 0 has exactly one real root.	
10 $y = e^{-2x} \cos 2x$. Show that $dy/dx = e^{-2x}(-2 \cos 2x - 2 \sin 2x)$. Find the x coordinate of the stationary point with the smallest positive x (3 s.f.), and its nature.	