Day 277	A Level Maths: S Tier 10-a-day
1 The curve $y = ab^x$ passes through (1, 16) and (5, 4096). Find the exact values of a and b, and the value of y when x = 7.	
2 A tennis ball is projected from a point O on horizontal ground with speed 49 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{3}{4}$. 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 $f(x) = x^3 + x^2 + 7x - 9$. Show that $(x - 1)$ is a factor of f(x), and that the equation f(x) = 0 has exactly one real root.	
4 A ball is projected horizontally at 39.2 m s^{-1} from the top of a vertical cliff of height 19.6 m, and lands on horizontal ground. Find (a) the time of flight and the distance from the cliff, (b) the speed and direction on landing. Take g = 9.8 m s^{-2}.	
5 A company claims that 60% of its customers renew their policy. A sample of 15 customers is taken, and 7 renew. Test, at the 5% significance level, the claim that the proportion is lower. Give your conclusion in context.	

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6 $f(x) = x^3 + 2x - 10$. (a) Show that $f(x) = 0$ has a root α with $1 < \alpha < 2$. (b) Use Newton-Raphson with $x_0 = 1$ to find x_1 and x_2 to 4 decimal places.	
7 Given that $\sum_{r=1}^{n}(7r - 2) = 1161$, find n.	
8 The curve $y = 2x^2 + 3x - 6$ is translated by $\begin{pmatrix} -1 \\ -2 \end{pmatrix}$ and then a reflection in the y-axis. Find the equation of the resulting curve in the form $y = ax^2 + bx + c$.	
9 The points A, B, C have coordinates $(-2, 0, 2)$, $(-1, -1, 4)$, $(5, 4, 2)$. Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
10 A bulb's lifetime, in hours, is $N(86, 8^2)$. Given that it exceeds 94, find the probability that it exceeds 104.	