Day 235	A Level Maths: A Tier 10-a-day
1 A stone is projected from a cliff top 128.4 m above the sea at 10 m s^{-1}, at angle α above the horizontal, $\tan\alpha = \frac{4}{3}$. Find (a) the time to reach the sea, (b) the horizontal distance travelled, (c) the speed on impact. Take g = 9.8. Give answers to 3 s.f. if not exact.	
2 Prove the identity $\operatorname{cosec} 2\theta + \cot 2\theta \equiv \cot\theta$	
3 A lift of mass 250 kg carries a person of mass 80 kg. The cable tension is 3168 N and the lift is accelerating. Find (a) the magnitude and direction of the acceleration, (b) the force of the floor on the person. Take g = 9.8.	
4 Solve $8^{3x-2} = 4^{3x+3}$.	
5 Solve $\sec^2 x - 7\tan x + 11 = 0$ for $0° \leq x \leq 360°$. Give answers to 1 d.p.	

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6 The curve $y = f(x)$, where $f(x) = \frac{3}{x-2} - 2$, is translated by $\begin{pmatrix} -1 \\ 1 \end{pmatrix}$. Write down the equations of the asymptotes of the new curve, and find where it crosses the x-axis.	
7 The probability that a customer buys a drink is 0.08 on each independent trial. Find the least number of trials needed so that the probability of this happening at least once is greater than 0.99.	
8 Solve $x(\sqrt{3} - 1) = 4 + \sqrt{3}$, writing x in the form $p + q\sqrt{3}$.	
9 $X \sim B(21, p)$. H_0: $p = 0.3$ is tested against H_1: $p \neq 0.3$ at the 5% level. (a) Find the critical region. (b) Find the actual significance level of the test (3 s.f.).	
10 (a) Express $\frac{2x + 9}{(x + 3)(x + 6)}$ in partial fractions. (b) Hence find $\int_0^4 \frac{2x + 9}{(x + 3)(x + 6)}\,dx$, giving the answer in the form ln k.	