Day 315	A Level Maths: S Tier 10-a-day
1 A ball is projected from a point O on horizontal ground with speed 63.7 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{5}{12}$. Find the horizontal distance between the two points at which the ball is 11.025 m above the ground. Take g = 9.8 m s^{-2}.	
2 Solve $\cos(3\theta + 30°) = -\frac{\sqrt{2}}{2}$ for $-180° \leq \theta \leq 180°$.	
3 For events A and B, P(A) = 0.85, P(B) = 0.2 and P(A | B) = 0.9. (a) Find $P(A \cap B)$. (b) Find P(A′ | B′).	
4 $f(x) = x^3 + 4x^2 + 12x + 16$. Show that (x + 2) is a factor of f(x), and that the equation f(x) = 0 has exactly one real root.	
5 (a) Show that $\tan\theta + \cot\theta \equiv 2\,\text{cosec}\,2\theta$. (b) Hence solve $\tan\theta + \cot\theta = 10$ for $0 \leq \theta < 360°$ (1 d.p.).	

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6 At time t = 0 hours, ship A is at the point with position vector $(10\mathbf{i} + 12\mathbf{j})$ km relative to a port O, and moves with constant velocity $(-2\mathbf{i} - 2\mathbf{j})$ km h^{-1}. Ship B leaves O at t = 0 with constant speed 5 km h^{-1} and intercepts A. Find (a) the time at which B intercepts A, (b) the velocity of B as a vector.	
7 The size of a battery is $N(116, 9^2)$ hours. A battery is 'large' if it exceeds 125. (a) Find the probability that a battery is large. (b) 20 batterys are chosen at random. Find the probability that at least 2 are large.	
8 $u_{n+1} = u_n + 4n - 2$, $u_1 = 0$. (a) Show that $u_n = an^2 + bn + c$ and find a, b, c. (b) Find the least n for which $u_n > 833$.	
9 Find the exact coordinates of the stationary point of $y = x \ln x$ for $x > 0$, and determine its nature.	
10 Express $\frac{3x^3 - x^2 - 17x - 2}{(x - 2)(x + 2)}$ in the form $ax + b + \frac{C}{(x - 2)} + \frac{D}{(x + 2)}$.	