Day 312	A Level Maths: B Tier 10-a-day
1 A golf ball is projected from ground level with initial velocity components 19 m s^{-1} horizontally and 19.6 m s^{-1} vertically upwards. Take g = 9.8 m s^{-2}. Find (a) the greatest height, (b) the speed at the greatest height.	
2 Statement: "4n + 13 is prime for every positive integer n." Show that this statement is false by finding a counter-example.	
3 The random variable X has E(X) = 10 and Var(X) = 5. Find (a) E(4X + 5), (b) Var(4X + 5), (c) $E(X^2)$.	
4 A particle moves in a straight line. At time t seconds its velocity is v = $3t^2$ + t m s^{-1}. Find the distance moved between t = 1 and t = 5. (The particle does not change direction.)	
5 The mass of a radioactive sample, M grams, after t days is M = 40 $e^{-0.1t}$. Find (a) the half-life, (b) the rate of decrease in mass when t = 5, each to 3 s.f.	

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6 A geometric sequence has first term 100 and common ratio 0.9. Find the smallest n for which the nth term is less than 0.01.	
7 A curve has parametric equations $x = 3 \sec t$, $y = 2 \tan t$. Find $\frac{dy}{dx}$ in terms of t, and its exact value when $t = \frac{\pi}{4}$.	
8 Prove by contradiction that there are no integers x and y such that $x^2 - y^2 = 6$.	
9 $X \sim B(50, 0.6)$. Use a normal approximation to find $P(X \leq 31)$, to 3 significant figures.	
10 Given that $5 \cos \theta + 12 \sin \theta \equiv 13 \cos(\theta - 67.4°)$, solve $5 \cos \theta + 12 \sin \theta = -5$ for $0 \leq \theta \leq 360°$. (1 d.p.)	