Day 173	A Level Maths: S Tier 10-a-day
1 $f(x) = x^3 - 3x^2 + x - 3$. Show that $(x - 3)$ is a factor of $f(x)$, and that the equation $f(x) = 0$ has exactly one real root.	
2 A golf ball is hit from a point O on horizontal ground. It lands 40 m from O, and reaches a maximum height of 15 m above the ground. Find the angle of projection and the speed of projection, to 3 s.f. Take $g = 9.8$ m s^{-2}.	
3 A binomial random variable X has mean 14 and variance 8.4. (a) Find n and p. (b) Find P(X = 15), correct to 3 significant figures.	
4 Solve $12\sec^2\theta + 22\tan\theta - 6 = 0$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
5 Prove by contradiction that $\sqrt{11}$ is irrational.	

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6 A train accelerates uniformly from rest at 0.75 m s^{-2} to a speed of V m s^{-1}, travels at this speed, then decelerates uniformly at 0.75 m s^{-2} to rest. The journey takes 60 s and covers 432 m. Find V and the time spent at constant speed.	
7 $X \sim B(9, \frac{2}{3})$. (a) Show that $P(X = r + 1) \div P(X = r) = \frac{9 - r}{r + 1} \times 2$. (b) Find the most likely value of X and its probability (3 s.f.).	
8 $y = e^{2x} \sin 2x$. Show that $dy/dx = e^{2x}(2 \sin 2x + 2 \cos 2x)$. Find the x coordinate of the stationary point with the smallest positive x (3 s.f.), and its nature.	
9 Express $\sqrt{22 + 8\sqrt{6}}$ in the form $a + b\sqrt{6}$, where a and b are positive integers.	
10 Use integration by parts to find the exact value of $\int_0^2 xe^{3x}\,dx$	