Day 225	A Level Maths: B Tier 10-a-day
1 A drone moves with constant velocity $(5\mathbf{i} + 12\mathbf{j})$ m s^{-1}, where $\mathbf{i}$ and $\mathbf{j}$ are unit vectors east and north. Find its speed and the acute angle its direction makes with $\mathbf{i}$, to 1 d.p.	
2 The random variable X has E(X) = 3 and Var(X) = 9. Find (a) $E(-2X + 5)$, (b) $Var(-2X + 5)$, (c) $E(X^2)$.	
3 Prove that $n^3 + 3n + 13$ is odd for all integers n.	
4 The probability that a student passes a driving test first time is thought to be 0.25. In a sample of 25 students, 13 pass first time. Test, at the 5% significance level, whether the probability is different from 0.25.	
5 The first term of an arithmetic series is 4 and the common difference is 4. The sum of the first n terms is 1200. Find the value of n.	

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6 A curve has parametric equations $x = 2 \sin t$, $y = 3 \cos 2t$. Find $\frac{dy}{dx}$ in terms of t, and its exact value when $t = \frac{\pi}{6}$.	
7 A train accelerates uniformly from rest at 2 m s^{-2} for 8 s, then travels at constant speed for 15 s, and finally decelerates uniformly at 1 m s^{-2} to rest. Find the total distance travelled and the total time of the journey.	
8 Find the coordinates of the stationary point of the curve $y = xe^{-3x}$, and determine its nature.	
9 A is the point $(-1, 2)$ and B is the point $(4, 6)$. Find the perpendicular bisector of AB as $ax + by + c = 0$, with integer a, b, c.	
10 A car's value, £V, after t years is given by $V = 12000 \times 0.8^t$. Find (a) the value after 3 years, (b) when it first falls below £2400, to 3 s.f.	