Day 155	A Level Maths: A Tier 10-a-day
1 A curve has parametric equations $x = t^3$, $y = 3t^2$. Find $\frac{dy}{dx}$ in terms of t, and the equation of the normal at the point where $t = -1$, in the form $ax + by + c = 0$ (integers).	
2 A ball is thrown vertically upwards at 14.7 m s^{-1} from a point h m above horizontal ground, and hits the ground 4 s later. Find (a) h, (b) the greatest height above the ground. Take $g = 9.8$.	
3 At one location, the daily mean wind speed is modelled by $N(7.8, 2.9^2)$. (a) Find the probability that on a randomly chosen day the value exceeds 12 knots. (b) Estimate the number of such days in a period of 92 days.	
4 Solve $\cos 2\theta + 5\cos\theta = -4$ for $0° \leq \theta \leq 360°$.	
5 The line $-3x + 4y = k$ is a tangent to the circle $(x + 2)^2 + (y - 3)^2 = 4$. Find the two possible values of k.	

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6 A particle slides from rest down a rough plane inclined at α to the horizontal, where $\tan\alpha = \frac{3}{4}$. It moves 44.1 m in 5 s. Find (a) the coefficient of friction, (b) the speed after 5 s. Take g = 9.8.	
7 P(B) = 0.5, P(A) = 0.1 and P(A | B) = 0.1. (a) Find $P(A \cap B)$ and $P(A \cup B)$. (b) Find P(B | A). (c) Determine whether A and B are independent.	
8 The second term of a geometric series is 4 and its sum to infinity is 18. Find the two possible values of the first term.	
9 l_1: $\mathbf{r} = \begin{pmatrix}6\\4\\1\end{pmatrix} + \lambda\begin{pmatrix}0\\2\\-1\end{pmatrix}$ l_2: $\mathbf{r} = \begin{pmatrix}6\\0\\-6\end{pmatrix} + \mu\begin{pmatrix}0\\2\\2\end{pmatrix}$ Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.	
10 A circle touches both coordinate axes and passes through the point (−6, 12). Its centre lies in the second quadrant. Find the equations of the two possible circles.	