Day 154	A Level Maths: A Tier 10-a-day
1 Show by counter-example that the statement "$|x + y| = |x| + |y|$ for all real x and y" is false.	
2 A 2 kg particle rests on a smooth plane inclined at α, $\tan\alpha = \frac{5}{12}$, held by a string in the vertical plane through a line of greatest slope, at angle θ above the slope, $\tan\theta = \frac{4}{3}$. Find the tension and the normal reaction. Take $g = 9.8$. Give answers to 3 s.f. if not exact.	
3 An arithmetic series has first term -8 and common difference 2. The sum of the first n terms is 136. Find n.	
4 $y = (2x + 5)e^{-2x}$. Find the exact coordinates of the stationary point and determine its nature.	
5 The curve with equation $y = -x^2 - 3x - 1$ is transformed by a stretch, scale factor 2, parallel to the y-axis, followed by a stretch, scale factor 3, parallel to the x-axis. Find the equation of the image curve.	

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6 A group of 9 men and 8 women. A team of 3 is chosen at random. Find the probability that the team has exactly 1 of the women.	
7 $g(\theta) = \frac{1}{13 + 3\sin\theta + 4\cos\theta}$ (a) Write $3\sin\theta + 4\cos\theta$ in the form $R\sin(\theta + \alpha)$, with α acute. (b) Find the greatest and least values of $g(\theta)$ and the smallest positive θ at which the greatest value occurs (1 d.p.).	
8 $X \sim Po(30)$. Use a suitable approximation to find $P(X \geq 38)$, to 3 significant figures.	
9 A particle is projected up a line of greatest slope of a smooth plane inclined at α. It passes A, 23.52 m from the start, after 4 s and again after 6 s. Find (a) the speed of projection, (b) α to 1 d.p. Take $g = 9.8$.	
10 The line l has equation $\mathbf{r} = \begin{pmatrix}3\\0\\1\end{pmatrix} + t\begin{pmatrix}-2\\-2\\-3\end{pmatrix}$. Find the coordinates of the foot of the perpendicular from P(1, −5, 0) to l, and the exact distance from P to l.	