Day 66	A Level Maths: A Tier 10-a-day
1 The line $-3x + 4y = k$ is a tangent to the circle $(x - 1)^2 + (y - 3)^2 = 9$. Find the two possible values of k.	
2 Solve $7^{2x-3} = 2^{3x-1}$. Give your answer to 3 significant figures.	
3 A 2 kg particle moves on a smooth horizontal line. At time t s a single force of $(16 - 4t)$ N acts along the line. When t = 0 its speed is 2 m s^{-1}. Find (a) its speed when t = 2, (b) its greatest speed.	
4 Prove that $n^2 + n + 9$ is odd for every positive integer n.	
5 θ is obtuse and $\sin\theta = \frac{24}{25}$. Find the exact values of $\sin 2\theta$, $\cos 2\theta$ and $\tan 2\theta$.	

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6 X, the length (mm), is N(80, 2^2). Find the symmetric limits about the mean between which the central 98% of values lie (3 s.f.).	
7 θ is small and measured in radians. Use small angle approximations to show that $5\sin 2\theta + 2\cos 2\theta = 3.5$ can be written as $a\theta^2 + b\theta + c = 0$ with integers a, b, c. Hence find the approximate solution with $0 < \theta < 0.8$, to 3 s.f.	
8 For a sample of 22 pairs of values of hours of sunshine and plant height, $r = -0.322$. The critical value for a two-tailed test at the 5% level is 0.4227. Test, at this level, whether there is any correlation between the two variables.	
9 A curve has parametric equations $x = 3t - 1$, $y = 4t^2$. Find a Cartesian equation of the curve.	
10 The system is released from rest. Find (a) the magnitude of the acceleration and which particle moves down, (b) the tension. Take g = 9.8. Give answers to 3 s.f. if not exact. 	