Day 186	A Level Maths: A Tier 10-a-day
1 Show by counter-example that the statement "If $x^2 > 49$ then $x > 7$" is false.	
2 For n = 10 pairs of (x, y): $\Sigma x = 172$, $\Sigma y = 712$, $\Sigma x^2 = 3630$, $\Sigma y^2 = 56922$, $\Sigma xy = 14225$. Calculate the product moment correlation coefficient, and describe the correlation.	
3 $y = 2 \times 3^{3x}$. Find the exact gradient of the curve at x = 1 and the equation of the tangent there.	
4 The line $4x + 3y = k$ is a tangent to the circle $(x - 4)^2 + (y - 4)^2 = 9$. Find the two possible values of k.	
5 For small x (in radians), use the small angle approximations to find the value that $\frac{\sin 3x \tan 4x}{1 - \cos 3x}$ approaches as $x \to 0$.	

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6 A non-uniform rod AB (length 2 m, mass 8 kg) has its centre of mass at G, AG = 0.75 m. It hangs horizontally from vertical strings at A and B. A particle of mass m kg is fixed at P, AP = 1.5 m, making the tensions equal. Find (a) m, (b) the tension. Take g = 9.8.	
7 X ~ B(36, 0.5). Find the smallest value of c such that $P(X \geq c) < 0.1$.	
8 Solve $x(\sqrt{6} - 2) = 4 - \sqrt{6}$, writing x in the form $p + q\sqrt{6}$.	
9 A uniform rod AB (20 kg, 4 m) is smoothly hinged at A to a vertical wall, with a 2 kg particle at B. A light string from B to the wall above A holds the rod horizontal, at angle θ to it, $\tan\theta = \frac{5}{12}$. Find (a) the tension, (b) the magnitude of the hinge force. Take g = 9.8. Give answers to 3 s.f. if not exact.	
10 The vectors $\begin{pmatrix} k \\ k \\ 2 \end{pmatrix}$ and $\begin{pmatrix} k \\ 1 \\ -1 \end{pmatrix}$ are perpendicular. Find the possible values of k and, for the larger value, the exact length of the first vector.	