Day 86	A Level Maths: A Tier 10-a-day
1 X ~ B(14, 0.15). Find, to 3 significant figures: (a) P(X = 3) (b) P(X ≥ 3) (c) P(X ≤ 2)	
2 The curve y = f(x) has a minimum point at (2, 3). Find the coordinates of the corresponding point on: (a) $y = -f(x)$ (b) $y = f(\frac{x}{2})$ (c) $y = 3f(x)$	
3 Summary statistics for the daily mean windspeed (knots) in the same month are: Perth: mean 10.5, standard deviation 3.2; Jacksonville: mean 20, standard deviation 5.4. Make two comparisons.	
4 A curve has parametric equations $x = t^2 - 1$, $y = t^3 - 3t$. Find $\frac{dy}{dx}$ in terms of t, and the equation of the normal at the point where $t = -\frac{1}{2}$, in the form $ax + by + c = 0$ (integers).	
5 $f(x) = x^2 - 8x + 18$, $x \in \mathbb{R}$, and $g(x) = \frac{2}{x-1}$, $x > 1$. (a) Find the range of f. (b) Show that gf is defined and find its range.	

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6 A 4 kg box is pulled along rough horizontal ground, $\mu = 0.2$, by a rope at angle θ above the horizontal, where $\tan\theta = \frac{5}{12}$. The tension is 35 N. Find (a) the normal reaction, (b) the acceleration of the box. Take $g = 9.8$. Give answers to 3 s.f. if not exact.	
7 Solve $2\sin^2 x - 6\cos x - 2 = 0$ for $0° \leq x \leq 180°$.	
8 A stone is projected from a cliff top 42.4 m above the sea at 15 m s^{-1}, at angle α above the horizontal, $\tan\alpha = \frac{3}{4}$. Find (a) the time to reach the sea, (b) the horizontal distance travelled, (c) the speed on impact. Take $g = 9.8$. Give answers to 3 s.f. if not exact.	
9 Solve $5^{2x} - 295^x + 100 = 0$. Give exact roots, or 3 s.f. where the answer is not exact.	
10 The line $y = kx + 1$ is a tangent to the curve $y = 3x^2 - 2x + 4$. (a) Find the possible values of k. (b) For the larger value of k, find the coordinates of the point of contact.	