Day 274	A Level Maths: A Tier 10-a-day
1 Solve $8^{3x-3} = 16^{2x+3}$.	
2 Find the exact value of $\int_1^2 \left(\frac{4}{x} + \frac{1}{x^2}\right) dx$.	
3 X, the score (marks), is N(54, 12^2). The highest 10% of values exceed k. Find k to 3 significant figures.	
4 Use the substitution u = ln x to find the exact value of $\int_1^e \frac{(\ln x)^2}{x} dx$.	
5 A 3 kg particle rests on a rough plane inclined at α, $\tan\alpha = \frac{12}{5}$, μ = 0.4. A force of P N acts up a line of greatest slope and the particle stays at rest. Find the range of values of P. Take g = 9.8. Give answers to 3 s.f. if not exact.	

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6 A curve has parametric equations $x = 3\sec t$, $y = 3\tan t$. Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{\pi}{3}$, in the form $y = mx + c$.	
7 A uniform plank AB (mass 10 kg, length 4 m) rests horizontally on supports at C and D, where AC = 1 m and DB = 1.5 m. A 5 kg particle is placed at E, AE = x m, and the plank is about to tilt about D. Find x.	
8 A circle touches both coordinate axes and passes through the point $(-8, -1)$. Its centre lies in the third quadrant. Find the equations of the two possible circles.	
9 The line $-4x + 3y = 48$ meets the circle $(x + 2)^2 + (y - 2)^2 = 49$ at the points A and B. Find the exact length of AB.	
10 X has pdf $f(x) = \frac{2}{16}x$ for $0 \leq x \leq 4$, and 0 otherwise. Find E(X), Var(X) and the standard deviation of X (3 s.f.).	