Day 339	A Level Maths: A Tier 10-a-day
1 Use the trapezium rule with 4 strips to estimate $\int_0^2 2(2^x)\,dx$, giving your answer to 3 s.f. State, with a reason, whether your estimate is an overestimate or an underestimate.	
2 P(A) = 0.3, P(B) = 0.6 and P(A ∩ B) = 0.1. Find (a) P(A ∪ B) (b) P(B′ | A′) (c) P(B | A)	
3 $f(x) = x^2 - 10x + 20$. (a) Write f(x) in the form $a(x + p)^2 + q$. (b) State the minimum value of f(x) and the value of x at which it occurs. (c) Solve f(x) = 0, giving surds in simplest form.	
4 $f(x) = e^x + 2x - 8$. Use the Newton-Raphson method with $x_0 = 1.5$ to find x_1 and x_2, giving your answers to 4 d.p.	
5 Find the coefficient of x^{12} in the expansion of $(2x^2 - \frac{1}{x^2})^8$.	

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6 A 4 kg box is pulled along rough horizontal ground, $\mu = \frac{1}{3}$, 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 the differential equation $(1 + x^2)\frac{dy}{dx} = xy$, given that y = 1 when x = 0 (y > 0). Give y in terms of x.	
8 $u_1 = 0$ and $u_{n+1} = \frac{1}{2}u_n + 3$. (a) Find the limit L of the sequence as $n \to \infty$. (b) Find the least n for which $\lvert u_n - L\rvert < 0.01$.	
9 $X \sim B(31, p)$. H_0: p = 0.3 is tested against H_1: $p \neq 0.3$ at the 5% level. (a) Find the critical region. (b) Find the actual significance level of the test (3 s.f.).	
10 A uniform ladder AB (20 m, 30 kg) rests with A on rough ground, $\mu = 0.5$, and B against a smooth wall, B being 16 m above the ground. A man of mass 60 kg climbs the ladder. How far along the ladder from A can he climb before it slips?	