Day 24	A Level Maths: A Tier 10-a-day
1 A curve has equation $3x^2y - y^3 - 3x = -5$. Find $\frac{dy}{dx}$ in terms of x and y, and the gradient of the normal at $(-2, -1)$.	
2 A claim is that the probability p that a seed germinates is 0.2. In a sample of 18, the number of successes is 6. Test at the 5% level whether p has increased.	
3 $y = 5 \times 3^x$. Find the exact gradient of the curve at $x = 2$ and the equation of the tangent there.	
4 Express $\frac{10x^2 + 2x - 16}{(x - 3)(x + 1)^2}$ in the form $\frac{A}{(x - 3)} + \frac{B}{(x + 1)} + \frac{C}{(x + 1)^2}$, and find A, B and C.	
5 A non-uniform rod AB (length 4 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 = 2.5 m, making the tensions equal. Find (a) m, (b) the tension. Take g = 9.8.	

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6 The volume of a cube of edge x cm is increasing at 18 cm^3s^{-1}. Find the rate of increase of its total surface area when x = 3.	
7 Solve $\|4x + 6\| > \|2x - 6\|$.	
8 A stone is projected vertically upwards from the ground. It passes a ledge 4 s after projection and again 6 s after projection. Find (a) the speed of projection, (b) the height of the ledge, (c) the greatest height. Take g = 9.8.	
9 The second term of a geometric series is 2 and its sum to infinity is 9. Find the two possible values of the first term.	
10 X ~ B(22, p). H_0: p = 0.25 is tested against H_1: p ≠ 0.25 at the 5% level. (a) Find the critical region. (b) Find the actual significance level of the test (3 s.f.).	