| Day 266 | A Level Maths: A Tier 10-a-day |
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| **1** $y = \sin^2(3x)$. Find $\frac{dy}{dx}$ and its exact value at $x = \frac{\pi}{9}$. | |
| **2** Particles A (12 kg) and B (2 kg) hang on a light string over a smooth pulley, A being 2 m above the ground. Released from rest; A lands without rebounding. Find (a) the tension while both move, (b) the greatest height of B above its start. Take g = 9.8. Give answers to 3 s.f. if not exact. | |
| **3** Evaluate $\sum_{r=6}^{18} (r - 2)$. | |
| **4** $y = 5 \times 5^{2x}$.<br>Find the exact gradient of the curve at x = 2 and the equation of the tangent there. | |
| **5** X ~ B(40, 0.2).<br>Find the largest value of c such that $P(X \leq c) < 0.01$. | |

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| **6** Expand $(2 + 3x)^{-1}$ in ascending powers of x, up to and including $x^2$.<br>State the range of x for which the expansion is valid. | |
| **7** A curve has parametric equations $x = 2\cos t$, $y = \sin t$.<br>Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{\pi}{4}$, in the form $y = mx + c$. | |
| **8** X ~ Po(40). Use a suitable approximation to find $P(X \geq 44)$, to 3 significant figures. | |
| **9** Prove by contradiction that $\sqrt{2}$ is irrational. | |
| **10** A uniform ladder AB (20 m, 15 kg) rests with A on rough ground, $\mu = 0.4$, and B against a smooth wall, B being 16 m above the ground. A man of mass 75 kg climbs the ladder. How far along the ladder from A can he climb before it slips? | |