| Day 37 | A Level Maths: B Tier 10-a-day |
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| **1** Find the quotient and the remainder when $2x^3 - 11x^2 + 4x + 25$ is divided by $(x - 4)$. | |
| **2** Differentiate $y = 3 \cot 2x$ with respect to x, and find the exact gradient when $x = \frac{\pi}{12}$. | |
| **3** Express $\frac{-1 + 3\sqrt{7}}{3 + \sqrt{7}}$ in the form $p + q\sqrt{7}$, where p and q are integers. | |
| **4** X ~ Po(1.2), modelling the number of calls to a helpline per minute.<br>Find, to 3 significant figures,<br>(a) $P(X \leq 1)$<br>(b) $P(X \geq 1)$ | |
| **5** The curve C has equation $y = x^2e^{3-3x} + 2$.<br>Find the equation of the tangent to C at the point where $x = 1$, in the form $y = mx + c$. | |

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| **6** A battery lasts X hours, normal with mean 30, s.d. 2.<br>Find k (3 s.f.): (a) P(X < k) = 0.25,<br>(b) P(X > k) = 0.2. | |
| **7** A stone is projected from ground level with initial velocity components 17 m $s^{-1}$ horizontally and 9.8 m $s^{-1}$ vertically upwards.<br>Take g = 9.8 m $s^{-2}$.<br>Find (a) the greatest height, (b) the speed at the greatest height. | |
| **8** For small $\theta$ (in radians), use the small angle approximations<br>to find the value of $\lim_{\theta \to 0} \frac{\tan 3\theta \sin 3\theta}{1 - \cos 3\theta}$. | |
| **9** The line segment AB is a diameter of a circle, where A is (6, 4) and B is (0, −2).<br>Find an equation of the circle in the form<br>$(x - a)^2 + (y - b)^2 = k$. | |
| **10** Particles A (4 kg) and B (12 kg) are joined by a light string over a smooth pulley. Both are held with the string taut, B is 1.25 m above the ground, then released.<br>Take g = 9.8 m $s^{-2}$.<br>Find the speed with which B hits the ground. | |