| Day 96 | A Level Maths: B Tier 10-a-day |
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| **1** (a) Write $-x^2 - 12x - 42$ in the form $a(x + p)^2 + q$.<br>(b) Write down the coordinates of the maximum point of $y = -x^2 - 12x - 42$. | |
| **2** Regression line (x from 2 to 10): $y = 3.2 + 0.8x$.<br>x is the advertising spend, y the weekly sales.<br>(a) Interpret the gradient.<br>(b) Estimate y when x = 4 and comment. | |
| **3** Use integration by parts to find the exact value of<br>$\int_0^1 xe^{-2x}\,dx$. | |
| **4** An arithmetic sequence has 3rd term 21 and 10th term 84.<br>(a) Find the first term and the common difference.<br>(b) Find the sum of the first 25 terms. | |
| **5** Meteors are seen at random at an average rate of 0.5 per hour.<br>Find the probability that in 90 minutes there are exactly 0 (3 s.f.). | |

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| **6** Given that $21\cos\theta + 20\sin\theta \equiv 29\cos(\theta - 43.6°)$, solve $21\cos\theta + 20\sin\theta = 4$ for $0 \leq \theta \leq 360°$. (1 d.p.) | |
| **7** A trolley of mass 8 kg is moving on a smooth horizontal surface at 0 m $s^{-1}$ when a constant horizontal force of 6 N, in the direction of motion, acts for 6 s. Find the speed of the trolley at the end of this time and the distance it moves. | |
| **8** $f(x) = x^2 - 6x + 11$ for $x \leq 6$. Find the range of f. | |
| **9** A uniform rod AB of length 6 m and mass 6 kg hangs horizontally from two vertical strings attached 0.5 m from A and 0.5 m from B. A particle of mass 1 kg is attached 1.5 m from A. Take g = 9.8 m $s^{-2}$. Find the tension in each string. | |
| **10** The function $f(x) = 2\cos x - x$. Show that $f(x) = 0$ has a root between $x = 1$ and $x = 1.5$ (x in radians). | |