| Day 364 | A Level Maths: S Tier 10-a-day |
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| **1** $g(x) = \sqrt{-x^2 + x + 30}$.<br>Find the largest possible domain of g, and the corresponding range. | |
| **2** (a) Express $15\cos\theta + 8\sin\theta$ in the form $R\cos(\theta - \alpha)$, where $R > 0$ and $0 < \alpha < 90°$. Give $\alpha$ to 1 d.p.<br>(b) Hence solve $15\cos\theta + 8\sin\theta = 16$ for $0 \leq \theta < 360°$, giving answers to 1 d.p. | |
| **3** A javelin is projected from a point O on horizontal ground with speed 63.7 m $s^{-1}$ at an angle $\theta$ above the horizontal, where $\tan\theta = \frac{5}{12}$. Find (a) the time of flight, (b) the range, (c) the greatest height. Take $g = 9.8$ m $s^{-2}$. | |
| **4** The fill volume of a bottle is $N(\mu, 16)$ with known variance 16. The mean was claimed to be 44 ml.<br>A random sample of 9 has mean 40.25. Test at the 5% level whether the mean is greater than 44. | |
| **5** Solve $2\sec^2\theta - 5\tan\theta - 5 = 0$<br>for $0 \leq \theta < 360°$, giving answers to 1 d.p. | |

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| **6** Solve simultaneously:<br>$x - 2y = 8$<br>$x^2 - 2xy + y^2 = 16$ | |
| **7** Particles A and B are projected from a point O at the same instant, with initial velocities $(12\mathbf{i} + 29\mathbf{j})$ m s$^{-1}$ and $(16\mathbf{i} + 32\mathbf{j})$ m s$^{-1}$ respectively (i horizontal, j vertically upwards).<br>Both are still in flight after 5 s. Find (a) the distance AB at this time, (b) the angle AB makes with the horizontal, to 1 d.p. | |
| **8** $u_{n+1} = \frac{1}{4}u_n + 12$, $u_1 = 25$.<br>(a) Find the limit L of the sequence.<br>(b) Find the least n such that $\lvert u_n - L\rvert < 0.01$. | |
| **9** X and Y are independent, X ~ Po(4) and Y ~ Po(1).<br>(a) State the distribution of X + Y.<br>(b) Given that X + Y = 3, find the probability that X = 2. | |
| **10** (a) Express $\frac{x - 1}{(x + 5)(x + 3)}$ in partial fractions.<br>(b) Hence find the exact value of $\int_0^2 \frac{x - 1}{(x + 5)(x + 3)}\,dx$. | |