| Day 111 | A Level Maths: A Tier 10-a-day |
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| **1** A and B have position vectors $\begin{pmatrix}1\\1\end{pmatrix}$ and $\begin{pmatrix}-5\\-2\end{pmatrix}$.<br>The point P lies on AB with AP : PB = 1 : 2.<br>Find the position vector of P and the exact distance OP. | |
| **2** The curve y = f(x) has a maximum point at (2, 3).<br>Find the coordinates of the corresponding point on:<br>(a) $y = -f(x)$<br>(b) $y = f(x) - 5$<br>(c) $y = f(-x)$ | |
| **3** X has a binomial distribution with mean 4 and variance 3.<br>(a) Find n and p.<br>(b) Find P(X = 3) to 3 significant figures. | |
| **4** A ball is projected horizontally at 15 m $s^{-1}$ from a point 4.9 m above horizontal ground. Find (a) the horizontal distance to the landing point, (b) the speed and direction (angle below the horizontal, 1 d.p.) on landing. Take g = 9.8. Give answers to 3 s.f. if not exact. | |
| **5** Find the sum of all the integers from 1 to 87 inclusive that are not multiples of 13. | |

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| **6** Water pours into a cone, vertex down, at 20 $cm^3s^{-1}$. The surface radius is always $\frac{h}{2}$.<br>Find the rate at which the depth is rising when h = 5 cm. | |
| **7** In the expansion of $(1 + kx)^n$, where n is a positive integer, the coefficient of x is $-8$ and the coefficient of $x^2$ is 28.<br>Find n and k. | |
| **8** Solve $2\sec^2\theta - 6\tan\theta + 2 = 0$<br>for $-180° \leq \theta \leq 180°$. Give answers to 1 d.p. | |
| **9** A 3 kg particle is in equilibrium on a rough plane inclined at $\alpha$, $\tan\alpha = \frac{4}{3}$, $\mu = 0.2$. A horizontal force of P N, in the vertical plane through a line of greatest slope, pushes it towards the plane. Find the least and greatest values of P. Take g = 9.8. Give answers to 3 s.f. if not exact. | |
| **10** X ~ B(20, 0.4). Find $P(X = 6 \mid X \geq 4)$ to 3 significant figures. | |