Day 1	A Level Maths: S Tier 10-a-day
1 Solve $\|3x - 3\| > x + 5$.	
2 Emails arrive in an inbox at an average rate of 4 per hour, independently and at random. (a) Find the probability of at least 3 in a 30-minute period. (b) Find the probability that, of 10 separate 30-minute periods, exactly 3 have no arrivals.	
3 A curve is given by $x = e^y + y$. Find dy/dx and d^2y/dx^2 when $y = 0$.	
4 A particle is projected at 15 m s^{-1} up a line of greatest slope of a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{3}{5}$ and $\mu = 0.25$. Find (a) the distance it travels up the plane, to 3 s.f., (b) its speed on returning to its starting point. Take g = 9.8 m s^{-2}.	
5 $f(x) = x^3 - 9x + 28$. Show that $(x + 4)$ is a factor of $f(x)$, and that the equation $f(x) = 0$ has exactly one real root.	

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6 Find the exact coordinates of the stationary point of $y = \frac{\ln x}{x^3}$ for $x > 0$, and determine its nature.	
7 The curve $y = x^2 - x + 6$ is translated by $\begin{pmatrix} -3 \\ 3 \end{pmatrix}$ and then a stretch, scale factor 3, parallel to the x-axis. Find the equation of the resulting curve in the form $y = ax^2 + bx + c$.	
8 The points A, B, C have coordinates (4, 1, 1), (1, 3, 5), (−1, −3, 0). Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
9 At time t = 0 hours, ship A is at the point with position vector $(52\mathbf{i} + 20\mathbf{j})$ km relative to a port O, and moves with constant velocity $(-\mathbf{i})$ km h^{-1}. Ship B leaves O at t = 0 with constant speed 13 km h^{-1} and intercepts A. Find (a) the time at which B intercepts A, (b) the velocity of B as a vector.	
10 A manufacturer says that 10% of its screens have no flaws. A sample of 15 screens is checked, and 3 have no flaws. Test, at the 5% significance level, the claim that the proportion is higher. Give your conclusion in context.	