Day 3	A Level Maths: B Tier 10-a-day
1 A curve has parametric equations $x = 4 + 4\cos t$, $y = 4\sin t$, for $0 \leq t < 2\pi$. Find a Cartesian equation of the curve.	
2 A boat moves with constant velocity $(-10\mathbf{i} + 24\mathbf{j})$ m s^{-1}, where $\mathbf{i}$ and $\mathbf{j}$ are unit vectors east and north. Find its speed and the acute angle its direction makes with $\mathbf{i}$, to 1 d.p.	
3 Differentiate $y = \text{cosec } x$ with respect to x, and find the exact gradient when $x = \frac{\pi}{4}$.	
4 The points A, B and C are $(-7, 4)$, $(-3, 2)$ and $(1, 10)$. (a) Show that angle ABC = 90°. (b) Find the area of triangle ABC.	
5 Large data set: mean temperature (°C) at Heathrow has mean 16, sd 2. Outliers are more than 2 sd from the mean. Are the values 21 and 15 outliers?	

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6 A block slides from rest down a line of greatest slope of a smooth plane inclined at α, where $\sin\alpha = \frac{3}{5}$ to the horizontal.

Take $g = 9.8$ m s^{-2}.
Find its acceleration, and the distance it travels in 5 s.

7 Line l_1: $\mathbf{r} = \begin{pmatrix}7\\0\\2\end{pmatrix} + \lambda\begin{pmatrix}3\\2\\0\end{pmatrix}$.

Line l_2: $\mathbf{r} = \begin{pmatrix}4\\-2\\2\end{pmatrix} + \mu\begin{pmatrix}3\\1\\-2\end{pmatrix}$.

Show that l_1 and l_2 intersect and find the point.

8 The mass, X g, of a loaf is normally distributed with mean 20 and s.d. 6.
A random sample of 16 is taken. Find the probability that the mean mass is less than 17.75 (3 s.f.).

9 A is the point $(-5, -2)$ and B is the point $(-3, -6)$.
Find the perpendicular bisector of AB as $ax + by + c = 0$, with integer a, b, c.

10 Solve $2\tan^2 x + \sec x - 1 = 0$ for $0 \leq x \leq 360°$, giving answers to 1 d.p.