Day 340	A Level Maths: S Tier 10-a-day
1 Solve $\cos 2\theta - 3\sin\theta - 2 = 0$ for $0 \leq \theta < 2\pi$, giving answers in terms of π.	
2 A ball is projected from a point O on horizontal ground at 45° to the horizontal. The ball just passes over the top of a vertical wall of height 4.8 m, at a horizontal distance of 93 m from O. Find (a) the speed of projection, (b) the greatest height of the ball above the ground, to 3 s.f. Take $g = 9.8$ m s^{-2}.	
3 (a) Express $20\cos\theta - 21\sin\theta$ in the form $R\cos(\theta + \alpha)$, where $R > 0$ and $0 < \alpha < 90°$. Give α to 1 d.p. (b) Hence solve $20\cos\theta - 21\sin\theta = 23$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	
4 $f(x) = x^3 + 3x^2 - 3x + 4$. Show that $(x + 4)$ is a factor of $f(x)$, and that the equation $f(x) = 0$ has exactly one real root.	
5 A shell is projected from level ground with horizontal and vertical velocity components 14.7 and 53.9 m s^{-1}. Find (a) the two times at which it moves at 45° to the horizontal, (b) the horizontal distance between those two points. Take $g = 9.8$ m s^{-2}.	

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6 The curve C has parametric equations $x = 2t$, $y = 2t^2$. The line $y = 5x - 8$ meets C at A and B. Find the exact length AB.	
7 $X \sim B(22, \frac{3}{10})$. (a) Show that $P(X = r + 1) \div P(X = r) = \frac{22 - r}{r + 1} \times \frac{3}{7}$. (b) Find the most likely value of X and its probability (3 s.f.).	
8 The points A, B, C have coordinates $(5, -1, 5)$, $(1, -1, 4)$, $(-2, 1, 3)$. Find angle ABC to 1 d.p., and the exact area of triangle ABC.	
9 A circle has its centre in the first quadrant and touches both the x-axis and the y-axis. It passes through the point (9, 8). Find the two possible equations of the circle.	
10 A binomial random variable X has mean 3 and variance 2.4. (a) Find n and p. (b) Find $P(X = 5)$, correct to 3 significant figures.	