Day 362	A Level Maths: S Tier 10-a-day
1 Solve $3\cos 2\theta + 9\cos\theta + 6 = 0$ for $0 \leq \theta < 360°$.	
2 Data pairs (x, y) are coded by $u = x - 2$ and $v = \frac{y}{2}$. The regression line of v on u is $v = 12 + 0.4u$. (a) Find the regression line of y on x in the form $y = a + bx$. (b) Use it to estimate y when $x = 6$.	
3 A tennis ball is projected from a point O on horizontal ground with speed 49 m s^{-1} at an angle α above the horizontal, where $\tan\alpha = \frac{4}{3}$. Find (a) the greatest height, (b) the speed when it is at half of this height (3 s.f.). Take g = 9.8 m s^{-2}.	
4 The first term of an arithmetic sequence is 12 and its common difference d is non-zero. The 1st, 5th and 13th terms are the first three terms of a geometric sequence. Find d and the common ratio.	
5 $f(x) = x^3 + 3x - 11$. (a) Show that $f(x) = 0$ has a root α with $1 < \alpha < 2$. (b) Use Newton-Raphson with $x_0 = 1$ to find x_1 and x_2 to 4 decimal places.	

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6 X ~ B(200, 0.015). (a) Explain why a Poisson approximation is suitable and state its distribution. (b) Use it to estimate P(X > 3), to 4 s.f. (c) Find the exact value of P(X > 3), to 4 s.f.	
7 Find the exact coordinates of the stationary points of $y = x + 2\cos x$ for $0 \leq x \leq \pi$, and determine their nature.	
8 A circle passes through P(1, −1), Q(8, 0) and R(4, 8). Find its equation.	
9 A box of weight 130 N is pulled at constant speed up a line of greatest slope of a rough plane ($\tan\alpha = \frac{5}{12}$, $\mu = \frac{7}{24}$) by a force P N at angle β above the plane. (a) Find P when $\tan\beta = \frac{12}{5}$. (b) Find the least possible value of P as β varies.	
10 The sum of the first n terms of a sequence is $S_n = 4n^2 + 3n$. (a) Find an expression for u_n. (b) Find the least n for which $u_n > 178$.	