Day 234	A Level Maths: A Tier 10-a-day
1 Find the coefficient of x^2 in the expansion of $(-3 + 3x)^9$.	
2 The 320 items in a list are numbered 1 to 320. A systematic sample of 16 items is taken, starting with a random item among the first few. The first item selected is number 4. Find the sampling interval and the number of the last item selected.	
3 Solve $2\sec^2\theta + 10\tan\theta + 6 = 0$ for $0° \leq \theta \leq 180°$. Give answers to 1 d.p.	
4 A stone is projected from a cliff top 14.4 m above the sea at 20 m s^{-1}, at angle α above the horizontal, $\tan\alpha = \frac{4}{3}$. Find (a) the time to reach the sea, (b) the horizontal distance travelled, (c) the speed on impact. Take g = 9.8. Give answers to 3 s.f. if not exact.	
5 X ~ B(21, 0.2). Find the smallest value of c such that $P(X \geq c) < 0.05$.	

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6 A stone is dropped from rest from the top of a cliff. In the last 2 seconds before it hits the sea it falls 117.6 m. Find the height of the cliff. Take $g = 9.8$.	
7 A curve has equation $3x^2 + 2xy + 4y^2 = 33$. Find the coordinates of the points where the tangent is parallel to the x-axis.	
8 The line $4x + 3y = k$ is a tangent to the circle $(x + 3)^2 + (y - 1)^2 = 36$. Find the two possible values of k.	
9 $u_1 = 0$ and $u_{n+1} = \frac{1}{4} u_n + 3$. (a) Find the limit L of the sequence as $n \to \infty$. (b) Find the least n for which $\lvert u_n - L \rvert < 0.1$.	
10 A curve has parametric equations $x = 3\sec t$, $y = 2\tan t$. Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{\pi}{6}$, in the form $y = mx + c$.	