Day 32	A Level Maths: A Tier 10-a-day
1 Show by counter-example that the statement "If $x^2 > 64$ then $x > 8$" is false.	
2 The vectors $\begin{pmatrix} k \\ k \\ -1 \end{pmatrix}$ and $\begin{pmatrix} k \\ -3 \\ 10 \end{pmatrix}$ are perpendicular. Find the possible values of k and, for the larger value, the exact length of the first vector.	
3 Express $\frac{5x + 20}{(x + 1)(2x + 5)}$ in partial fractions.	
4 The 380 items in a list are numbered 1 to 380. A systematic sample of 19 items is taken, starting with a random item among the first few. The first item selected is number 13. Find the sampling interval and the number of the last item selected.	
5 A sequence is defined by $u_1 = k$ and $u_{n+1} = 4u_n + 3$. Given that $u_3 = 47$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.	

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6 A curve has parametric equations $x = 2\sec t$, $y = 2\tan t$. Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{\pi}{4}$, in the form $y = mx + c$.	
7 A ball is projected horizontally at 24 m s^{-1} from a point 19.6 m above horizontal ground. Find (a) the horizontal distance to the landing point, (b) the speed and direction (angle below the horizontal, 1 d.p.) on landing. Take g = 9.8. Give answers to 3 s.f. if not exact.	
8 Solve $4\sec^2\theta - 2\tan\theta - 6 = 0$ for $0° \leq \theta \leq 360°$. Give answers to 1 d.p.	
9 X has a binomial distribution with mean 9 and variance 7.2. (a) Find n and p. (b) Find P(X = 11) to 3 significant figures.	
10 A uniform ladder AB (15 m, 15 kg) rests with A on rough ground, $\mu = 0.2$, and B against a smooth wall, B being 12 m above the ground. A man of mass 70 kg climbs the ladder. How far along the ladder from A can he climb before it slips?	