Day 81	A Level Maths: A Tier 10-a-day
1 (a) Solve $5x + 3 > -3$. (b) Solve $x^2 - x - 6 \geq 0$. (c) Hence find the values of x satisfying both inequalities.	
2 The random variable X has $P(X = x) = k(x^2 + 1)$ for $x = 0, 1, 2, 3$. (a) Show that $k = \frac{1}{18}$. (b) Find E(X) and Var(X). (c) Find $P(X \geq 2)$.	
3 The line $y = 2x + 3$ meets the curve $y = x^2 + 7x + 3$ at A and B. (a) Find the coordinates of A and B. (b) Find the exact length AB.	
4 The vectors $\begin{pmatrix} k \\ k \\ -2 \end{pmatrix}$ and $\begin{pmatrix} k \\ -2 \\ 4 \end{pmatrix}$ are perpendicular. Find the possible values of k and, for the larger value, the exact length of the first vector.	
5 A ball is projected horizontally at 20 m s^{-1} from a point 4.9 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.	

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6 Solve $4\sec^2\theta - 10\tan\theta + 2 = 0$ for $-180° \leq \theta \leq 180°$. Give answers to 1 d.p.	
7 n = 9 pairs of (x, y): $\Sigma x = 151$, $\Sigma y = 455$, $\Sigma x^2 = 3005$, $\Sigma xy = 8340$. (a) Find the equation of the regression line of y on x (3 s.f.). (b) Estimate y when x = 8.	
8 A sequence is defined by $u_1 = \frac{3}{2}$ and $u_{n+1} = \frac{1}{1 - u_n}$. (a) Find u_2 and u_3. (b) Find u_{50} and $\sum_{r=1}^{50} u_r$.	
9 The volume of a cube of edge x cm is increasing at 36 $cm^3 s^{-1}$. Find the rate of increase of its total surface area when x = 2.	
10 Car A passes P at constant speed 11 m s^{-1}. 11 s later car B leaves P from rest, in the same direction, with acceleration 1.5 m s^{-2}. B overtakes A at Q. Find (a) the time B takes to reach Q, (b) PQ, (c) the speed of B at Q.	