Day 17	A Level Maths: S Tier 10-a-day
1 A ball is thrown vertically upwards from ground level with speed 49 m s^{-1}. Find the length of time for which the ball is more than 117.6 m above the ground, and the greatest height it reaches. Take g = 9.8 m s^{-2}.	
2 Solve $\sqrt{2x - 4} = x - 6$.	
3 Find the exact coordinates of the stationary points of $y = 4x - 8\sin x$ for $0 \leq x \leq 2\pi$, and determine their nature.	
4 Express $\frac{3 + 5\sqrt{2}}{2 + 3\sqrt{2}}$ in the form $p + q\sqrt{2}$, where p and q are rational numbers.	
5 The size of a battery is N(120, 5^2) hours. A battery is 'large' if it exceeds 127. (a) Find the probability that a battery is large. (b) 15 batterys are chosen at random. Find the probability that at least 4 are large.	

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6 A particle P moves on a straight line. At time t seconds, where $t \geq 0$, its velocity is v m s^{-1}, where $v = 24\sqrt{t} - 6t$. Find (a) the greatest speed of P, (b) the greatest displacement of P from its starting point.	
7 The tangent to $y = \frac{x^2 + 1}{x + 2}$ at the point where $x = 1$ meets the axes at A and B. Find the exact area of triangle OAB, where O is the origin.	
8 A student's time on a task, in minutes, is N(63, 8^2). Given that it exceeds 55, find the probability that it exceeds 63.	
9 The function f is defined by $f(x) = 2x^2 - 4x + 4$ for $x \geq k$. Given that k is the least value for which f is one-one, find k, $f^{-1}(x)$, and the domain of f^{-1}.	
10 Line l_1: $\mathbf{r} = \begin{pmatrix} 11 \\ -7 \\ 9 \end{pmatrix} + s\begin{pmatrix} -2 \\ 2 \\ -2 \end{pmatrix}$, line l_2: $\mathbf{r} = \begin{pmatrix} 3 \\ -2 \\ 2 \end{pmatrix} + t\begin{pmatrix} -2 \\ -1 \\ -1 \end{pmatrix}$. Show whether the lines meet, giving the point of intersection if they do, and find the acute angle between them to 1 d.p.	