Day 56	A Level Maths: S Tier 10-a-day
1 A ball is thrown vertically upwards from ground level. It is more than 58.8 m above the ground for 4 s. Find the speed of projection and the greatest height reached. Take g = 9.8 m s^{-2}.	
2 The curve $y = ab^x$ passes through (0, 2) and (4, 512). Find the exact values of a and b, and the value of y when x = 6.	
3 Find the set of values of x for which both $x^2 + 5x - 6 \leq 0$ and $2x + 7 \leq 6$.	
4 X takes values 2, 3, 4, 5 with $P(X = x) = k(6 - x)$. X_1 and X_2 are independent copies of X. (a) Find k. (b) Find $P(X_1 + X_2 = 6)$. (c) Find $P(X_1 = X_2)$ and $E(X_1 + X_2)$.	
5 Solve $3\sec^2\theta + 11\tan\theta + 3 = 0$ for $0 \leq \theta < 360°$, giving answers to 1 d.p.	

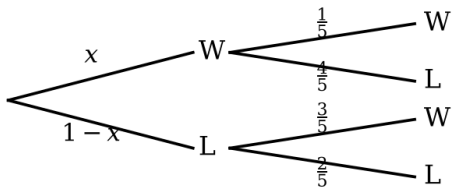
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6 A particle starts from rest at the top of a rough slope of length 5 m ($\sin\alpha = \frac{4}{5}$, $\mu = 0.25$), then slides along rough horizontal ground with the same μ.
Use energy to find (a) its speed at the foot of the slope (3 s.f.), (b) the distance it slides on the ground. Take $g = 9.8\ \text{m s}^{-2}$.

7 Express $\frac{x^3 - 7x^2 + 13x - 8}{(x-2)(x-3)}$ in the form $ax + b + \frac{C}{(x-2)} + \frac{D}{(x-3)}$.

8 Express $\frac{-x^2 - x}{(x-4)(x-2)^2}$ in the form $\frac{A}{(x-4)} + \frac{B}{(x-2)} + \frac{C}{(x-2)^2}$.

9 The tree diagram shows two games played in turn.
Given the second is a W, P(first was a W) = $\frac{1}{3}$.
Find x.



10 The line l has equation $\mathbf{r} = \begin{pmatrix} -8 \\ 8 \\ 8 \end{pmatrix} + t\begin{pmatrix} 2 \\ -2 \\ -2 \end{pmatrix}$.
The point P has coordinates $(-3, 0, 3)$.
Find the coordinates of the foot F of the perpendicular from P to l, and the exact distance PF.