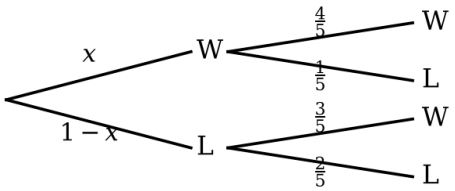
Day 314 **A Level Maths: S Tier 10-a-day**

1 Express $\frac{-3x^2 - 8x - 13}{(x + 3)(x - 1)^2}$ in the form $\frac{A}{(x + 3)} + \frac{B}{(x - 1)} + \frac{C}{(x - 1)^2}$.

2 A particle P moves on a straight line. At time t seconds its velocity is v m s^{-1}, where $v = 2t^2 - 18t + 40$ for $0 \leq t \leq 7$
Find (a) the times at which P is at instantaneous rest, (b) the total distance travelled by P in the first 7 seconds.

3 The tree diagram shows two games played in turn.
Given the second is a W, P(first was a W) = $\frac{4}{13}$. Find x.



4 Solve $e^{2x} - 9 \times e^x + 14 = 0$,
giving each answer exactly and, where not an integer, to 3 s.f.

5 A school has 100 students in Year 10, 60 in Year 11 and 140 in the sixth form.
A stratified sample of 30 students is taken.
(a) Find the number sampled from each group.
(b) Two students are chosen at random from the sample. Find the probability they are from the same group.

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6 Find the set of values of x for which both $x^2 - 6x - 7 \geq 0$ and $x + 4 > -6$.	
7 The curve $y = x^2\sqrt{45 - x}$, for $0 < x < 45$, has one stationary point. Find its exact coordinates and determine its nature.	
8 A particle P moves on a straight line. At time t seconds, where $t \geq 0$, its velocity is v m s^{-1}, where $v = 12\sqrt{t} - 2t$. Find (a) the greatest speed of P, (b) the greatest displacement of P from its starting point.	
9 Solve $\lvert 4x + 6 \rvert \leq \lvert 2x - 4 \rvert$.	
10 Two boats P and Q move so that, t hours after noon, their position vectors in km are $\mathbf{r}_P = \begin{pmatrix} -5 \\ 4 \end{pmatrix} + t\begin{pmatrix} 3 \\ 1 \end{pmatrix}$ and $\mathbf{r}_Q = \begin{pmatrix} -7 \\ 6 \end{pmatrix} + t\begin{pmatrix} 5 \\ 1 \end{pmatrix}$. Find the time at which they are closest and the exact minimum distance between them.	