This is to complement the part of the solution about finding the probability at all in points.

First, because it is an all in point, if we lose, we are done so the equation reduces to just

$$\begin{aligned} P_y &= p * P_{2y} + (1-p) * P_0 \\ P_y &= \qquad\qquad p * P_{2y} \end{aligned} \tag{1}$$

Given x is amt of money, and P is probability of winning / getting to V

From one all in point to the next

Make a line from (i, P_i) to (k, P_k) since it is linear.

where i is the all in point we are calculating P_i.

Let $j = 2 * i$ and $P_i = p * P_j$

To start off k, P_k is the final state $(V, 1)$ afterwards, it will be the last all in point calculated. That means k, P_k, i, j, k, p are all known, we are looking for P_i and P_j.

p is calculated from $p = \frac{A-L}{V-L}$ or in this case $p = \frac{i-L}{j-L}$

L is given by $-2i * (2^{\text{infnum}} - 1)$

Goal is to get P_i and P_j on left side

$$\begin{aligned} P - P_k &= \frac{P_k - P_i}{k - i} * (x - k) \\ P_j - P_k &= \frac{P_k - P_i}{k - i} * (j - k) \\ (P_j - P_k) * (k - i) &= (P_k - P_i) * (j - k) \\ P_j * (k - i) - P_k * (k - i) &= P_k * (j - k) - P_i * (j - k) \\ P_j * (k - i) + P_i * (j - k) &= P_k * (j - k) + P_k * (k - i) \\ P_j * (k - i) + p * P_j * (j - k) &= P_k * (j - k) + P_k * (k - i) \\ P_j &= \frac{P_k * ((j - k) + (k - i)}{(k - i) + p * (j - k)} \\ P_j &= \frac{P_k * (j - i)}{(k - i) + p * (j - k)} \\ a &= b \end{aligned} \tag{2}$$