

Let $X_i \in [0, 36]$ be the current state, or position of the traveler. The traveler always starts at position $X_0 = 0$. The final state must be $X_N \in [19, 36]$.

Now that we've defined some notation, we can write the transition matrix P . Because a 37×37 matrix is cumbersome, we combine the states $[19, 36]$ into a

$$P = \begin{pmatrix} p_{0,0}=0 & p_{0,1}=\frac{1}{6} & p_{0,2}=\frac{1}{6} & p_{0,3}=\frac{1}{6} & p_{0,4}=\frac{1}{6} & p_{0,5}=\frac{1}{6} & p_{0,6}=\frac{1}{6} & p_{0,7}=0 & p_{0,8}=0 & p_{0,9}=0 & p_{0,10}=0 & p_{0,11}=0 & p_{0,12}=0 & p_{0,13}=0 & p_{0,14}=0 & p_{0,15}=0 & p_{0,16}=0 & p_{0,17}=0 & p_{0,18}=0 & p_{0,19}=0 \\ p_{1,0}=\frac{1}{6} & p_{1,1}=0 & p_{1,2}=\frac{1}{6} & p_{1,3}=0 & p_{1,4}=0 & p_{1,5}=0 & p_{1,6}=\frac{1}{6} & p_{1,7}=\frac{1}{6} & p_{1,8}=\frac{1}{6} & p_{1,9}=\frac{1}{6} & p_{1,10}=0 & p_{1,11}=0 & p_{1,12}=0 & p_{1,13}=0 & p_{1,14}=0 & p_{1,15}=0 & p_{1,16}=0 & p_{1,17}=0 & p_{1,18}=0 & p_{1,19}=0 \\ p_{2,0}=0 & p_{2,1}=\frac{1}{6} & p_{2,2}=0 & p_{2,3}=\frac{1}{6} & p_{2,4}=0 & p_{2,5}=0 & p_{2,6}=0 & p_{2,7}=0 & p_{2,8}=0 & p_{2,9}=\frac{1}{6} & p_{2,10}=\frac{1}{6} & p_{2,11}=\frac{1}{6} & p_{2,12}=0 & p_{2,13}=0 & p_{2,14}=0 & p_{2,15}=0 & p_{2,16}=0 & p_{2,17}=0 & p_{2,18}=0 & p_{2,19}=0 \\ p_{3,0}=\frac{1}{6} & p_{3,1}=0 & p_{3,2}=\frac{1}{6} & p_{3,3}=0 & p_{3,4}=\frac{1}{6} & p_{3,5}=0 & p_{3,6}=0 & p_{3,7}=0 & p_{3,8}=0 & p_{3,9}=0 & p_{3,10}=0 & p_{3,11}=\frac{1}{6} & p_{3,12}=\frac{1}{6} & p_{3,13}=\frac{1}{6} & p_{3,14}=0 & p_{3,15}=0 & p_{3,16}=0 & p_{3,17}=0 & p_{3,18}=0 & p_{3,19}=0 \\ p_{4,0}=\frac{1}{6} & p_{4,1}=0 & p_{4,2}=0 & p_{4,3}=\frac{1}{6} & p_{4,4}=0 & p_{4,5}=\frac{1}{6} & p_{4,6}=0 & p_{4,7}=0 & p_{4,8}=0 & p_{4,9}=0 & p_{4,10}=0 & p_{4,11}=\frac{1}{6} & p_{4,12}=0 & p_{4,13}=\frac{1}{6} & p_{4,14}=\frac{1}{6} & p_{4,15}=\frac{1}{6} & p_{4,16}=0 & p_{4,17}=0 & p_{4,18}=0 & p_{4,19}=0 \\ p_{5,0}=0 & p_{5,1}=0 & p_{5,2}=0 & p_{5,3}=0 & p_{5,4}=\frac{1}{6} & p_{5,5}=0 & p_{5,6}=\frac{1}{6} & p_{5,7}=0 & p_{5,8}=0 & p_{5,9}=0 & p_{5,10}=0 & p_{5,11}=0 & p_{5,12}=0 & p_{5,13}=0 & p_{5,14}=0 & p_{5,15}=\frac{1}{6} & p_{5,16}=\frac{1}{6} & p_{5,17}=\frac{1}{6} & p_{5,18}=0 & p_{5,19}=0 \\ p_{6,0}=\frac{1}{6} & p_{6,1}=\frac{1}{6} & p_{6,2}=0 & p_{6,3}=0 & p_{6,4}=0 & p_{6,5}=\frac{1}{6} & p_{6,6}=0 & 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$$Q = \left(\begin{array}{ccccccccc} P_{0,0}=0 & P_{0,1}=\frac{1}{6} & P_{0,2}=\frac{1}{6} & P_{0,3}=\frac{1}{6} & P_{0,4}=\frac{1}{6} & P_{0,5}=\frac{1}{6} & P_{0,6}=\frac{1}{6} & P_{0,7}=0 & P_{0,8}=0 & P_{0,9}=0 & P_{0,10}=0 & P_{0,11}=0 & P_{0,12}=0 & P_{0,13}=0 & P_{0,14}=0 & P_{0,15}=0 & P_{0,16}=0 & P_{0,17}=0 & P_{0,18}=0 \\ P_{1,0}=\frac{1}{6} & P_{1,1}=0 & P_{1,2}=\frac{1}{6} & P_{1,3}=0 & P_{1,4}=0 & P_{1,5}=0 & P_{1,6}=\frac{1}{6} & P_{1,7}=\frac{1}{6} & P_{1,8}=\frac{1}{6} & P_{1,9}=\frac{1}{6} & P_{1,10}=0 & P_{1,11}=0 & P_{1,12}=0 & P_{1,13}=0 & P_{1,14}=0 & P_{1,15}=0 & P_{1,16}=0 & P_{1,17}=0 & P_{1,18}=0 \\ P_{2,0}=\frac{1}{6} & P_{2,1}=\frac{1}{6} & P_{2,2}=0 & P_{2,3}=\frac{1}{6} & P_{2,4}=0 & P_{2,5}=0 & P_{2,6}=0 & P_{2,7}=0 & P_{2,8}=0 & P_{2,9}=\frac{1}{6} & P_{2,10}=\frac{1}{6} & P_{2,11}=\frac{1}{6} & P_{2,12}=0 & P_{2,13}=0 & P_{2,14}=0 & P_{2,15}=0 & P_{2,16}=0 & P_{2,17}=0 & P_{2,18}=0 \\ P_{3,0}=\frac{1}{6} & P_{3,1}=0 & P_{3,2}=\frac{1}{6} & 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& P_{13,12}=\frac{1}{6} & P_{13,13}=0 & P_{13,14}=\frac{1}{6} & P_{13,15}=0 & P_{13,16}=0 & P_{13,17}=0 & P_{13,18}=0 \\ P_{14,0}=0 & P_{14,1}=0 & P_{14,2}=0 & P_{14,3}=0 & P_{14,4}=\frac{1}{6} & P_{14,5}=0 & P_{14,6}=0 & P_{14,7}=0 & P_{14,8}=0 & P_{14,9}=0 & P_{14,10}=0 & P_{14,11}=0 & P_{14,12}=0 & P_{14,13}=\frac{1}{6} & P_{14,14}=\frac{1}{6} & P_{14,15}=\frac{1}{6} & P_{14,16}=0 > P_{14,17}=0 & P_{14,18}=0 \\ P_{15,0}=0 & P_{15,1}=0 & P_{15,2}=0 & P_{15,3}=0 & P_{15,4}=\frac{1}{6} & P_{15,5}=\frac{1}{6} & P_{15,6}=0 & P_{15,7}=0 & P_{15,8}=0 & P_{15,9}=0 & P_{15,10}=0 & P_{15,11}=0 & P_{15,12}=0 & P_{15,13}=0 & P_{15,14}=\frac{1}{6} & P_{15,15}=0 & P_{15,16}=\frac{1}{6} & P_{15,17}=0 & P_{15,18}=0 \\ P_{16,0}=0 & P_{16,1}=0 & P_{16,2}=0 & P_{16,3}=0 & P_{16,4}=0 & P_{16,5}=\frac{1}{6} & P_{16,6}=0 & P_{16,7}=0 & P_{16,8}=0 & P_{16,9}=0 & P_{16,10}=0 & P_{16,11}=0 & P_{16,12}=0 & P_{16,13}=0 & P_{16,14}=\frac{1}{6} & P_{16,15}=\frac{1}{6} & P_{16,16}=0 & P_{16,17}=\frac{1}{6} & P_{16,18}=0 \\ P_{17,0}=0 & P_{17,1}=0 & P_{17,2}=0 & P_{17,3}=0 & P_{17,4}=0 & P_{17,5}=0 & P_{17,6}=\frac{1}{6} & P_{17,7}=0 & P_{17,8}=0 & P_{17,9}=0 & P_{17,10}=0 &$$

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$N =$	$P_{0,0} = \frac{45}{16}$		$P_{0,1} = \frac{15}{16}$		$P_{0,2} = \frac{15}{16}$		$P_{0,3} = \frac{15}{16}$		$P_{0,4} = \frac{15}{16}$		$P_{0,5} = \frac{15}{16}$		$P_{0,6} = \frac{15}{16}$		$P_{0,7} = \frac{15}{16}$		$P_{0,8} = \frac{15}{16}$		$P_{0,9} = \frac{15}{16}$		$P_{0,10} = \frac{15}{16}$		$P_{0,11} = \frac{15}{16}$		$P_{0,12} = \frac{15}{16}$		$P_{0,13} = \frac{15}{16}$		$P_{0,14} = \frac{15}{16}$		$P_{0,15} = \frac{15}{16}$		$P_{0,16} = \frac{15}{16}$		$P_{0,17} = \frac{15}{16}$		$P_{0,18} = \frac{15}{16}$		$P_{0,19} = \frac{15}{16}$		$P_{0,20} = \frac{15}{16}$		$P_{0,21} = \frac{15}{16}$		$P_{0,22} = \frac{15}{16}$		$P_{0,23} = \frac{15}{16}$		$P_{0,24} = \frac{15}{16}$		$P_{0,25} = \frac{15}{16}$		$P_{0,26} = \frac{15}{16}$		$P_{0,27} = \frac{15}{16}$		$P_{0,28} = \frac{15}{16}$		$P_{0,29} = \frac{15}{16}$		$P_{0,30} = \frac{15}{16}$		$P_{0,31} = \frac{15}{16}$		$P_{0,32} = \frac{15}{16}$		$P_{0,33} = \frac{15}{16}$		$P_{0,34} = \frac{15}{16}$		$P_{0,35} = \frac{15}{16}$		$P_{0,36} = \frac{15}{16}$		$P_{0,37} = \frac{15}{16}$		$P_{0,38} = \frac{15}{16}$		$P_{0,39} = \frac{15}{16}$		$P_{0,40} = \frac{15}{16}$		$P_{0,41} = \frac{15}{16}$		$P_{0,42} = \frac{15}{16}$		$P_{0,43} = \frac{15}{16}$		$P_{0,44} = \frac{15}{16}$		$P_{0,45} = \frac{15}{16}$		$P_{0,46} = \frac{15}{16}$		$P_{0,47} = \frac{15}{16}$		$P_{0,48} = \frac{15}{16}$		$P_{0,49} = \frac{15}{16}$		$P_{0,50} = \frac{15}{16}$		$P_{0,51} = \frac{15}{16}$		$P_{0,52} = \frac{15}{16}$		$P_{0,53} = \frac{15}{16}$		$P_{0,54} = \frac{15}{16}$		$P_{0,55} = \frac{15}{16}$		$P_{0,56} = \frac{15}{16}$		$P_{0,57} = \frac{15}{16}$		$P_{0,58} = \frac{15}{16}$		$P_{0,59} = \frac{15}{16}$		$P_{0,60} = \frac{15}{16}$		$P_{0,61} = \frac{15}{16}$		$P_{0,62} = \frac{15}{16}$		$P_{0,63} = \frac{15}{16}$		$P_{0,64} = \frac{15}{16}$		$P_{0,65} = \frac{15}{16}$		$P_{0,66} = \frac{15}{16}$		$P_{0,67} = \frac{15}{16}$		$P_{0,68} = \frac{15}{16}$		$P_{0,69} = \frac{15}{16}$		$P_{0,70} = \frac{15}{16}$		$P_{0,71} = \frac{15}{16}$		$P_{0,72} = \frac{15}{16}$		$P_{0,73} = \frac{15}{16}$		$P_{0,74} = \frac{15}{16}$		$P_{0,75} = \frac{15}{16}$		$P_{0,76} = \frac{15}{16}$		$P_{0,77} = \frac{15}{16}$		$P_{0,78} = \frac{15}{16}$		$P_{0,79} = \frac{15}{16}$		$P_{0,80} = \frac{15}{16}$		$P_{0,81} = \frac{15}{16}$		$P_{0,82} = \frac{15}{16}$		$P_{0,83} = \frac{15}{16}$		$P_{0,84} = \frac{15}{16}$		$P_{0,85} = \frac{15}{16}$		$P_{0,86} = \frac{15}{16}$		$P_{0,87} = \frac{15}{16}$		$P_{0,88} = \frac{15}{16}$		$P_{0,89} = \frac{15}{16}$		$P_{0,90} = \frac{15}{16}$		$P_{0,91} = \frac{15}{16}$		$P_{0,92} = \frac{15}{16}$		$P_{0,93} = \frac{15}{16}$		$P_{0,94} = \frac{15}{16}$		$P_{0,95} = \frac{15}{16}$		$P_{0,96}$
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$$t = N\mathbf{1}$$
[illegible]

Finally, we see that $t_0 = \boxed{\frac{213}{29} \approx 7.345}$