Miner

The miner can reach the exit in 0 days (picks exist immediately), 2 days (picks the door of two days, then escapes), 3 days (picks the door of three days, then escapes) or 5 days (picks the 2 day door, then 3 day, then escapes, or first 3 day, 2 day, escape).

The expected number to days to escape is:

$$E(Days) = 0 \cdot P(0\ days) + 2 \cdot P(2\ days) + 3 \cdot P(3\ days) + 5 \cdot P(5\ days)$$

$$P(2\ days) = P(wrong\ door\ of\ 2\ days\ )P(escape|wrong\ door\ of\ 2\ days) = \left(\frac{1}{3}\right)\left(\frac{1}{2}\right)$$

$$P(3\ days) = P(wrong\ door\ of\ 3\ days\ )P(escape|wrong\ door\ of\ 3\ days) = \left(\frac{1}{3}\right)\left(\frac{1}{2}\right)$$

$$\begin{aligned} &P(5\ days) \\ &= P(wrong\ door\ of\ 2\ days\ )P(wrong\ door\ of\ 3\ days|wrong\ door\ of\ 2\ days)P(escape|all\ wrong\ doors\ chosen) \\ &+ P(wrong\ door\ of\ 3\ days\ )P(wrong\ door\ of\ 2\ days|wrong\ door\ of\ 3\ days)P(escape|all\ wrong\ doors\ chosen) \\ &= \left(\frac{1}{3}\right)\left(\frac{1}{2}\right)(1)\ + \left(\frac{1}{3}\right)\left(\frac{1}{2}\right)(1) \end{aligned}$$

$$E(Days) = 2\left(\frac{1}{3}\right)\left(\frac{1}{2}\right) + 3\left(\frac{1}{3}\right)\left(\frac{1}{2}\right) + 5\left[2\left(\frac{1}{3}\right)\left(\frac{1}{2}\right)\right] = \frac{1}{3} + \frac{1}{2} + \frac{5}{3} = 2.5\ days$$

The variance of the number to days to escape is:

$$\begin{aligned} V(Days) = E(Days^2) - E(Days)^2 &= 0 \cdot P(0\ days) + 4 \cdot P(2\ days) + 9 \cdot P(3\ days) + 25 \cdot P(5\ days) - 2.5^2 \\ &= 4\left(\frac{1}{3}\right)\left(\frac{1}{2}\right) + 9\left(\frac{1}{3}\right)\left(\frac{1}{2}\right) + 25\left[2\left(\frac{1}{3}\right)\left(\frac{1}{2}\right)\right] - (2.5\ days)^2 = \frac{2}{3} + \frac{3}{2} + \frac{25}{3} - 6.25 = 4.25\ days^2 \end{aligned}$$