$$I, S$$

$$P\left(\overline{I \to I_s, k}\right)$$

$$P\left(S \to S_I, k\right)$$

$$P\left(\text{Infected in the k turn}\right) = \left(1 - P_{SI}\right)^{k-1} P_{SI} \left(1 - P_{IR}\right)^{k}$$

$$\begin{aligned}
P_Q &= \sum_{k=1}^{\infty} \left(1 - P_{SI}\right)^{k-1} P_{SI} \left(1 - P_{IR}\right)^{k} \\
&= \sum_{k=1}^{\infty} \left[\left(1 - P_{SI}\right)\left(1 - P_{IR}\right)\right]^{k-1} \frac{P_{SI}}{\left(1 - P_{IR}\right)} \\
&= \frac{P_{SI}}{\left(1 - P_{IR}\right)} \sum_{k=1}^{\infty} \left[\left(1 - P_{SI}\right)\left(1 - P_{IR}\right)\right]^{k-1} \\
&= \frac{P_{SI}}{\left(1 - P_{IR}\right)} \sum_{k=0}^{\infty} \left[\left(1 - P_{SI}\right)\left(1 - P_{IR}\right)\right]^{k} \\
&= \frac{P_{SI}}{\left(1 - P_{IR}\right)} \cdot \frac{1}{1 - \left(1 - P_{SI}\right)\left(1 - P_{IR}\right)} \\
&= \frac{P_{SI}}{\left(1 - P_{IR}\right)} \cdot \frac{1}{P_{SI} + P_{IR} - P_{SI} P_{IR}}
\end{aligned}$$