

123. Solution: C

Observe

$$\begin{aligned}\Pr[4 < S < 8] &= \Pr[4 < S < 8 | N = 1] \Pr[N = 1] + \Pr[4 < S < 8 | N > 1] \Pr[N > 1] \\ &= \frac{1}{3} \left(e^{-4/5} - e^{-8/5} \right) + \frac{1}{6} \left(e^{-1/2} - e^{-1} \right) * \\ &= 0.122\end{aligned}$$

*Uses that if X has an exponential distribution with mean μ

$$\Pr(a \leq X \leq b) = \Pr(X \geq a) - \Pr(X \geq b) = \int_a^{\infty} \frac{1}{\mu} e^{-t/\mu} dt - \int_b^{\infty} \frac{1}{\mu} e^{-t/\mu} dt = e^{-\frac{a}{\mu}} - e^{-\frac{b}{\mu}}$$