$$S = G \cdot P_0 = G \cdot \frac{G^0 e^{-G}}{0!} = G e^{-G}$$

$$P_k = e^{-G} \cdot \left(1 - e^{-G}\right)^{k-1}$$

$$E = \sum_{k=1}^{\infty} k P_k = \sum_{k=1}^{\infty} k e^{-G} \left(1 - e^{-G}\right)^{k-1} = e^{-G} \sum_{k=1}^{\infty} k \left(1 - e^{-G}\right)^{k-1}$$

$$\left[\; q = 1 - e^{-G} \Rightarrow e^{-G} = 1 - q \right.$$

$$E = (1-q) \sum_{k=1}^{\infty} k q^{k-1} = (1-q) \cdot \overbrace{\left[1 \cdot q^0 + 2 \cdot q^1 + 3 \cdot q^2 + \dots\right]}^{R}$$

$$R = 1 + 2q + 3 \cdot q^2 + \dots$$

$$qR = q + 2q^2 + 3 \cdot q^3 + \dots$$

$$R(1-q) = 1 + q + q^2 + q^3 + \dots = 1 \cdot \frac{1}{1-q} \Rightarrow$$

$$R = \frac{1}{(1-q)^2}$$

$$E = \cancel{(1-q)} \cdot \frac{1}{(1-q)^{\cancel{2}}} = \frac{1}{1-q} = e^{G}$$