Poisson Process: a sequence of discrete occurrences where the average number of occurrences in a fixed time interval is known, but the exact timing of occurrences is unknown

Examples:
- cars passing by a point on a road
- drips from a faucet
- customers entering a store
- spacecraft encountering orbital debris
- radioactive decay

Poisson Distribution: $X \sim \text{Poisson}(\mu)$ if X counts the occurrences in a Poisson process with mean μ occurrences per time interval

pmf: $P(X=x) = p(x;\mu) = e^{-\mu}\dfrac{\mu^x}{x!}$ for $x = 0, 1, 2, 3, \ldots$

nonnegative

Check: do the probabilities add up to 1?

$$\sum_{k=0}^{\infty} e^{-\mu}\frac{\mu^k}{k!} = e^{-\mu}\sum_{k=0}^{\infty}\frac{\mu^k}{k!} = e^{-\mu}\cdot e^{\mu} = 1$$

Recall: Taylor series for $\boxed{e^x = \sum_{k=0}^{\infty}\frac{x^k}{k!}}$