Geometric(p): **[Memoryless]** Consider a potentially infinite sequence of independent Bernoulli(p) random variables $X_1, X_2, \ldots$. Suppose we define a quantity X by $X = \min\{i | i \geq 1, X_i = 1\}$ to be the **index of the first Bernoulli trial to result in a 1**. Then X is a random variable taking values in $supp(X) = \{1, 2, \ldots\}$: $X \sim Geometric(p)$.

Pmf: $p(x) = p(1-p)^{x-1}, x = 1, 2, \ldots$. **Mean:** $\mu = \frac{1}{p}$. **Variance:** $\sigma^2 = \frac{1-p}{p^2}$. **Skewness**: $\gamma_1 = \frac{2-p}{\sqrt{1-p}}$ and is always positive.

E.g. Tossing a coin: X is the number of tosses until the first head is obtained.

Poi(λ) (Poisson): Let X be a random variable on $\mathbb{N} = \{0,1,2, \ldots\}$. Define $\boldsymbol{p(x)} = \frac{e^{-\lambda}\lambda^x}{x!}, x = 0, 1, 2, \ldots, (i.e. x \in \mathbb{N})$, for some $\boldsymbol{\lambda > 0}$, **otherwise** $\boldsymbol{p(x) = 0}$. X is said to follow a Poisson distribution with parameter λ: $X \sim Poi(\lambda)$.

Mean: $\mu = \lambda$. **Variance:** $\sigma^2 = \lambda$. **Skewness:** $\gamma_1 = \frac{1}{\sqrt{\lambda}}$ is always positive but decreasing as λ grows.