# Distribution Overview

| | Uniform(Continuous) | Binomial(Discrete) | Poisson(Discrete) | Normal(Continuous) | CRVs(Continuous) |
|---|---|---|---|---|---|
| Conditions | All outcomes have the same probability | • There are a fixed number of trials<br>• There are two outcomes<br>• Each trial is independent<br>• The probability of success is constant | • Events occur at random<br>• Events are independent<br>• Constant rate of occurrence<br>• No simultaneous events | Probabilities symmetrical about the mean | None |
| Notation | $\mathcal{U}(a,b)$ | $B(n,p)$ | $P_o(\lambda)$ | $\mathcal{N}(\mu,\sigma^2)$ | $f(x)=\begin{cases} f(x), & \text{for } a\le x\le b \\ 0, & \text{otherwise}\end{cases}$ |
| Parameters | a= Start value<br>b= End value | n= Number of trials<br>p= Probability of success | $\lambda$= Mean number of occurrences in the time period | $\mu$= Mean<br>$\sigma$= Standard Deviation | a= Start value<br>b= End value |
| PDF or PMF | $f(x)=\begin{cases} \frac{1}{b-a}, & \text{for } a\le x\le b \\ 0, & \text{otherwise}\end{cases}$ | $f(r)=\begin{cases} \binom{n}{r}p^r(1-p)^{n-r}, & \text{for } 0\le r\le n \\ 0, & \text{otherwise}\end{cases}$ | $f(r)=\begin{cases} \frac{e^{-\lambda}\lambda^x}{x!}, & \text{for } 0\le r\le n \\ 0, & \text{otherwise}\end{cases}$ | | Given in question or: $\frac{d}{dx}(F(x))$ |
| CDF | $f(x)=\begin{cases} 0, & \text{for } x<a \\ \frac{x-a}{b-a}, & \text{for } a\le x<b \\ 1, & \text{for } x\ge b\end{cases}$ | Use tables | Use tables | $z=\frac{x-\mu}{\sigma}$<br>Then use tables | $F(x)=\int_a^x f(x)dx$ |
| Mean | $\frac{1}{2}(a+b)$ | np | $\lambda$ | $\mu$ | $\int_a^b xf(x)dx$ |
| Variance | $\frac{1}{12}(b-a)^2$ | $np(1-p)$ | $\lambda$ | $\sigma^2$ | $\int_a^b x^2f(x)\ dx-\mu^2$ |
| Median | $\frac{1}{2}(a+b)$ | | | $\mu$ | Where F(x)=0.5 |
| Mode | Any Value | | | $\mu$ | Where $f'(x)=0$ |
| $\approx$ Poisson | | **Where p $<$ 0.1 and n $>$ 50**<br>$X\sim B(n,p)\approx Y\sim P_o(np)$ | | | |
| $\approx$ Normal | | **Where n $>$ 10 and P $<$ 0.5**<br>$X\sim B(n,p)\approx\mathcal{N}\big(np,np(1-p)\big)$<br>Don't forget continuity correction | **Where $\lambda>10$**<br>$X\sim P_o(\lambda)\approx\mathcal{N}(\lambda,\lambda)$<br>Don't forget continuity correction | | |