| Name | PDF | CDF | $E(X)$ | $V(X)$ | Parameters |
|---|---|---|---|---|---|
| Uniform | $f(x) = \begin{cases} \frac{1}{b-a} & a \leq x \leq b \\ 0 & \text{otherwise} \end{cases}$ | $F(x) = \begin{cases} 0 & x < a \\ \frac{x-a}{b-a} & a \leq x \leq b \\ 1 & x > b \end{cases}$ | $\frac{a+b}{2}$ | $\frac{(b-a)^2}{12}$ | $a, b$ endpoints |
| | Example: A bus is going to arrive at the bus stop sometime within the next 30 minutes. Every arrival time $X$ is equally likely. | | | | |
| Exponential | $f(x) = \begin{cases} \lambda e^{-\lambda x} & x \geq 0 \\ 0 & \text{otherwise} \end{cases}$ | $F(x) = \begin{cases} 0 & x < 0 \\ 1 - e^{-\lambda x} & x \geq 0 \end{cases}$ | $\frac{1}{\lambda}$ | $\frac{1}{\lambda^2}$ | $\lambda$ = average rate of events per time unit |
| | Example: On average, 5 busses stop at the bus stop per hour. $X$ is the time you have to wait until the *next* bus arrives.<br>Note: Like the discrete waiting time distribution (Geometric), the Exponential has the "Lack-of-Memory" property. | | | | |
| Gamma | $f(x) = \begin{cases} \frac{\lambda^k x^{k-1} e^{-\lambda x}}{\Gamma(k)} & x > 0 \\ 0 & \text{otherwise} \end{cases}$ | $F(x) =$ (incomplete gamma function) | $\frac{k}{\lambda}$ | $\frac{k}{\lambda^2}$ | $\lambda$ = average rate of events per time unit<br>$k$ = number of events to wait for |
| | Example: On average, 5 busses stop at the bus stop per hour. $X$ is the time you have to wait until the *third* bus arrives. | | | | |
| Normal | $f(x) = \frac{1}{\sqrt{2\pi}\sigma} e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ | $\Phi(x)$ - Standardize your random variable and then use the table or your calculator to find specific values. | $\mu$ | $\sigma^2$ | $\mu$ = mean<br>$\sigma^2$ = variance |
| | Example: Normal distributions are most often used to measure quantities like heights, weights, etc. They arise when we take averages of any kind of random variable (CLT). | | | | |