Table 1: Summary of Discrete Distributions

Distribution, notation	Probability Function	Cumulative Distribution	Statistics	Generating Functions
One point $\delta(a)$	$p(a) = 1$	$F_X(k) = 0, \text{if } a < 0$ $F_X(k) = q, \text{if } a \geq 0$	$EX = a$ $VarX = 0$	$g_X(t) = ta$ $\psi_X(t) = e^{ta}$ $\varphi_X(t) = e^{ita}$
Pretentious to have this, i know, but i guess it needs to be complete or whatevs				
Bernoulli $B(p)$ $0 \leq p \leq 1$	$p(0) = q, p(1) = p; q = 1 - p$	$F_X(k) = 0, \text{if } k < 0$ $F_X(k) = q, \text{if } 0 \leq k < 1$ $F_X(k) = 1, \text{if } k \geq 1$	$EX = p$ $VarX = pq$	$g_X(t) = q + pt$ $\psi_X(t) = q + pe^t$ $\varphi_X(t) = q + pe^{it}$
Lorem ipsum				
Symetric Bernouli $B(.5)$	$p(0) = .5, p(1) = .5$	$F_X(k) = 0, \text{if } k < 0$ $F_X(k) = .5, \text{if } 0 \leq k < 1$ $F_X(k) = 1, \text{if } k \geq 1$	$EX = .5$ $VarX = pq$	$g_X(t) = q + pt$ $\psi_X(t) = q + pe^t$ $\varphi_X(t) = q + pe^{it}$
Lorem ipsum				
Binomial $B(n, p)$ $n = 1, 2, ...; 0 \leq p \leq 1$	$p(k) = \binom{n}{k} p^k q^{n-k}; k = 0, 1, ...n; q = 1 - p$	$I_q(n - \lfloor k \rfloor, 1 + \lfloor k \rfloor)$	$EX = np$ $VarX = npq$	$g_X(t) = (q + pt)^n$ $\psi_X(t) = (q + pe^t)^n$ $\varphi_X(t) = (q + pe^{it})^n$
Lorem ipsum				
Poisson $Po(\lambda)$ $\lambda > 0$	$p(k) = \frac{\lambda^k}{k!} e^{-\lambda}, k = 0, 1, 2...$	$F_X(x) = 1 - q^{\lfloor x \rfloor + 1}$	$EX = \lambda$ $VarX = \lambda$	$g_X(t) = exp\{t - 1\}$ $\psi_X(t) = exp\{e^t - 1\}$ $\varphi_X(t) = exp\{e^{it} - 1\}$
Lorem ipsum				
Geometric $G(p)$ $0 \leq p \leq 1$	$p(k) = pq^k, k = 0, 1, 2...; q = 1 - p$	$F_X(x) = 1 - q^{\lfloor x \rfloor + 1}$	$EX = \frac{q}{p}$ $VarX = \frac{q}{p^2}$	$g_X(t) = \frac{p}{1 - qt}$ $\psi_X(t) = \frac{p}{1 - qe^t}$ $\varphi_X(t) = \frac{p}{1 - qe^{it}}$
Lorem ipsum				
First success $F(p)$ $0 \leq p \leq 1$	$p(k) = pq^{k-1}, k = 1, 2...; q = 1 - p$	$F_X(x) = 1 - q^{\lfloor x \rfloor}$	$EX = \frac{1}{p}$ $VarX = \frac{q}{p^2}$	$g_X(t) = \frac{pt}{1 - qt}$ $\psi_X(t) = \frac{pe^t}{1 - qe^t}$ $\varphi_X(t) = \frac{pe^{it}}{1 - qe^{it}}$
Identical to Geometric, but always 1 larger				

Table 2: Summary of Probability Distributions

Distribution, notation	Density Function $f_X(x)$	Cumulative Distribution $F_X(x)$	Statistics	Generating Functions
Normal $\mathcal{N}(\mu, \sigma^2)$ $\sigma > 0$	$\frac{1}{\sqrt{2\pi\sigma^2}} exp\Big\{-\frac{1}{2}\frac{(x-\mu)^2}{\sigma^2}\Big\}$	$\Phi\left(\frac{x-\mu}{\sigma}\right)$	$EX = \mu$ $VarX = \sigma^2$	$\psi_X(t) = e^{t\mu + \frac{1}{2}\sigma^2 t^2}$ $\varphi_X(t) = e^{it\mu - \frac{1}{2}\sigma^2 t^2}$
The Normal distribution is central to the central limit theorem				
Exponential $Exp(\lambda)$ $\lambda > 0$	$\frac{1}{\lambda} e^{-x/\lambda}$	$1 - e^{-x/\lambda}$	$EX = \lambda$ $VarX = \lambda^2$	$\psi_X(t) = \frac{1}{(1-\lambda t)}$ $\varphi_X(t) = \frac{1}{(1-\lambda it)}$
Gamma is crucial in modeling waiting times and life data.				
Gamma $\Gamma(p, a)$ $a > 0, p > 0$	$\frac{1}{\Gamma(p)} x^{p-1} \frac{1}{a^p} e^{-x/a}$	$\frac{1}{\Gamma(p)} \gamma\left(p, \frac{x}{a}\right)$	$EX = pa$ $VarX = pa^2$	$\psi_X(t) = \frac{1}{(1-at)^p}$ $\varphi_X(t) = \frac{1}{(1-ait)^p}$
Gamma is crucial in modeling waiting times and life data.				
Laplace $L(a)$ $n = 1, 2, ...$	$\frac{1}{2a} e^{-\lvert x \rvert/a}, -\infty < x < \infty$	$\begin{cases} \frac{1}{2}\exp\left(\frac{x-\mu}{b}\right) & \text{if } x \leq \mu \\ 1 - \frac{1}{2}\exp\left(-\frac{x-\mu}{b}\right) & \text{if } x \geq \mu \end{cases}$	$EX = 0$ $VarX = 2a^2$	$\psi_X(t) = \frac{1}{1-a^2t^2}, \lvert t \rvert < 1/a$ $\varphi_X(t) = \frac{1}{1+a^2t^2}$
Laplace is kinda cool				
Beta $\beta(r, s)$ $r, s > 0$	$\frac{\Gamma(r+s)}{\Gamma(r)\Gamma(s)} x^{r-1}(1-x)^{s-1}, 0 < x < 1$	$No.$	$EX = \frac{r}{r+s}$ $VarX = \frac{rs}{(r+s)^2(r+s+1)}$	$\psi_X(t) = 1 + \sum_{k=1}^{\infty}\left(\prod_{r=0}^{k-1}\frac{\alpha+r}{\alpha+\beta+r}\right)\frac{t^k}{k!}$ $\varphi_X(t) = \frac{1}{1+a^2t^2}$
Laplace is kinda cool				
(Student's) t $t(n)$ $n = 1, 2, ...$	$\frac{\Gamma\left(\frac{n+1}{2}\right)}{\sqrt{\pi n}\,\Gamma\left(\frac{n}{2}\right)}\left(1 + \frac{x^2}{n}\right)^{-\frac{n+1}{2}}$	$No.$	$EX = 0$ $VarX = \frac{n}{n-2}, n > 2$	$\psi_X(t) = undefined$ $\varphi_X(t) = No.$
Student t is crucial in modeling waiting times and life data. The inventor worked at Guiness, and published under a pseudonym so that their competitors wouldn't know they were using advanced statsistics				