DISCRETE DISTRIBUTIONS

	RANGE $\mathbb{X}$	PARAMETERS	MASS FUNCTION f_X	CDF F_X	$\mathrm{E}_{f_X}[X]$	$\mathrm{Var}_{f_X}[X]$	MGF M_X
$Bernoulli(\theta)$	$\{0,1\}$	$\theta \in (0,1)$	$\theta^x(1-\theta)^{1-x}$		θ	$\theta(1-\theta)$	$1-\theta+\theta e^t$
$Binomial(n,\theta)$	$\{0,1,...,n\}$	$n \in \mathbb{Z}^+, \theta \in (0,1)$	$\binom{n}{x}\theta^x(1-\theta)^{n-x}$		$n\theta$	$n\theta(1-\theta)$	$(1-\theta+\theta e^t)^n$
$Poisson(\lambda)$	$\{0,1,2,...\}$	$\lambda \in \mathbb{R}^+$	$\dfrac{e^{-\lambda}\lambda^x}{x!}$		λ	λ	$\exp\{\lambda(e^t-1)\}$
$Geometric(\theta)$	$\{1,2,...\}$	$\theta \in (0,1)$	$(1-\theta)^{x-1}\theta$	$1-(1-\theta)^x$	$\dfrac{1}{\theta}$	$\dfrac{(1-\theta)}{\theta^2}$	$\dfrac{\theta e^t}{1-e^t(1-\theta)}$
$NegBinomial(n,\theta)$	$\{n,n+1,...\}$	$n \in \mathbb{Z}^+, \theta \in (0,1)$	$\binom{x-1}{n-1}\theta^n(1-\theta)^{x-n}$		$\dfrac{n}{\theta}$	$\dfrac{n(1-\theta)}{\theta^2}$	$\left(\dfrac{\theta e^t}{1-e^t(1-\theta)}\right)^n$
or	$\{0,1,2,...\}$	$n \in \mathbb{Z}^+, \theta \in (0,1)$	$\binom{n+x-1}{x}\theta^n(1-\theta)^x$		$\dfrac{n(1-\theta)}{\theta}$	$\dfrac{n(1-\theta)}{\theta^2}$	$\left(\dfrac{\theta}{1-e^t(1-\theta)}\right)^n$

For **CONTINUOUS** distributions (see over), define the **GAMMA FUNCTION**

$$\Gamma(\alpha) = \int_0^\infty x^{\alpha-1}e^{-x}\,dx$$

and the LOCATION/SCALE transformation $Y = \mu + \sigma X$ gives

$$f_Y(y) = f_X\left(\frac{y-\mu}{\sigma}\right)\frac{1}{\sigma} \qquad F_Y(y) = F_X\left(\frac{y-\mu}{\sigma}\right) \qquad M_Y(t) = e^{\mu t}M_X(\sigma t) \qquad \mathrm{E}_{f_Y}[Y] = \mu + \sigma\mathrm{E}_{f_X}[X] \qquad \mathrm{Var}_{f_Y}[Y] = \sigma^2\mathrm{Var}_{f_X}[X]$$

CONTINUOUS DISTRIBUTIONS

	RANGE $\mathbb{X}$	PARAMETERS	PDF f_X	CDF F_X	$\mathrm{E}_{f_X}[X]$	$\mathrm{Var}_{f_X}[X]$	MGF M_X
$Uniform(\alpha, \beta)$ (standard model $\alpha = 0, \beta = 1$)	(α, β)	$\alpha < \beta \in \mathbb{R}$	$\dfrac{1}{\beta - \alpha}$	$\dfrac{x - \alpha}{\beta - \alpha}$	$\dfrac{(\alpha + \beta)}{2}$	$\dfrac{(\beta - \alpha)^2}{12}$	$\dfrac{e^{\beta t} - e^{\alpha t}}{t(\beta - \alpha)}$
$Exponential(\lambda)$ (standard model $\lambda = 1$)	$\mathbb{R}^+$	$\lambda \in \mathbb{R}^+$	$\lambda e^{-\lambda x}$	$1 - e^{-\lambda x}$	$\dfrac{1}{\lambda}$	$\dfrac{1}{\lambda^2}$	$\left(\dfrac{\lambda}{\lambda - t}\right)$
$Gamma(\alpha, \beta)$ (standard model $\beta = 1$)	$\mathbb{R}^+$	$\alpha, \beta \in \mathbb{R}^+$	$\dfrac{\beta^\alpha}{\Gamma(\alpha)} x^{\alpha - 1} e^{-\beta x}$		$\dfrac{\alpha}{\beta}$	$\dfrac{\alpha}{\beta^2}$	$\left(\dfrac{\beta}{\beta - t}\right)^\alpha$
$Weibull(\alpha, \beta)$ (standard model $\beta = 1$)	$\mathbb{R}^+$	$\alpha, \beta \in \mathbb{R}^+$	$\alpha \beta x^{\alpha - 1} e^{-\beta x^\alpha}$	$1 - e^{-\beta x^\alpha}$	$\dfrac{\Gamma(1 + \alpha^{-1})}{\beta^{1/\alpha}}$	$\dfrac{\Gamma(1 + 2\alpha^{-1}) - \Gamma(1 + \alpha^{-1})^2}{\beta^{2/\alpha}}$	
$Normal(\mu, \sigma^2)$ (standard model $\mu = 0, \sigma = 1$)	$\mathbb{R}$	$\mu \in \mathbb{R}, \sigma \in \mathbb{R}^+$	$\dfrac{1}{\sqrt{2\pi\sigma^2}} \exp\left\{-\dfrac{(x - \mu)^2}{2\sigma^2}\right\}$		μ	σ^2	$\exp\left\{\mu t + \dfrac{\sigma^2 t^2}{2}\right\}$
$Student(\nu)$	$\mathbb{R}$	$\nu \in \mathbb{R}^+$	$\dfrac{\Gamma\left(\dfrac{\nu + 1}{2}\right)}{\Gamma\left(\dfrac{\nu}{2}\right) \sqrt{\pi\nu} \left\{1 + \dfrac{x^2}{\nu}\right\}^{(\nu+1)/2}}$		0 (if $\nu > 1$)	$\dfrac{\nu}{\nu - 2}$ (if $\nu > 2$)	
$Pareto(\theta, \alpha)$	$\mathbb{R}^+$	$\theta, \alpha \in \mathbb{R}^+$	$\dfrac{\alpha \theta^\alpha}{(\theta + x)^{\alpha + 1}}$	$1 - \left(\dfrac{\theta}{\theta + x}\right)^\alpha$	$\dfrac{\theta}{\alpha - 1}$ (if $\alpha > 1$)	$\dfrac{\alpha \theta^2}{(\alpha - 1)(\alpha - 2)}$ (if $\alpha > 2$)	
$Beta(\alpha, \beta)$	$(0, 1)$	$\alpha, \beta \in \mathbb{R}^+$	$\dfrac{\Gamma(\alpha + \beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha - 1}(1 - x)^{\beta - 1}$		$\dfrac{\alpha}{\alpha + \beta}$	$\dfrac{\alpha\beta}{(\alpha + \beta)^2(\alpha + \beta + 1)}$	