| Name | Range | $P(X=i)$ or $F_X(x)$ | $f_X$ | $E(X)$ | $\sigma_X$ | MGF |
|---|---|---|---|---|---|---|
| Indicator $1(p)$ | {0,1} | $P(X=1)=p$ | | $p$ | $\sqrt{pq}$ | $1-p+pe^t$ |
| Binomial $Bin(n,p)$ | {0,1,...,n} | $\binom{n}{i}p^i(1-p)^{n-i}$ | | $np$ | $\sqrt{np(1-p)}$ | $(1-p+pe^t)^n$ |
| Poisson $Pois(\lambda)$ | {0,1,...} | $\frac{\lambda^i}{i!}e^{-\lambda}$ | | $\lambda$ | $\sqrt{\lambda}$ | $e^{\lambda(e^t-1)}$ |
| Geometric $Geo(p)$ | {1,2,...} | $=(1-p)^{i-1}p$ | | $\frac{1}{p}$ | $\frac{\sqrt{1-p}}{p}$ | $\frac{pe^t}{1-(1-p)e^t}, e^t < \frac{1}{1-p}$ |
| Uniform $U(a,b)$ | $(a,b)$ | $\frac{x-a}{b-a}$ | $\frac{1}{b-a}$ | $\frac{a+b}{2}$ | $\frac{b-a}{2\sqrt{3}}$ | $\frac{e^{tb}-e^{ta}}{t(b-a)}$ |
| Exponential $Exp(\lambda)$ | $\mathbf{R}^+$ | $1-e^{-\lambda x}$ | $\lambda e^{-\lambda x}$ | $\frac{1}{\lambda}$ | $\frac{1}{\lambda}$ | $(1-t\lambda^{-1})^{-1}, t<\lambda$ |
| Normal $N(\mu,\sigma^2)$ | $\mathbf{R}$ | $\Phi(\frac{x-\mu}{\sigma})$ | $\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ | $\mu$ | $\sigma$ | $e^{t\mu+\frac{1}{2}\sigma^2t^2}$ |
| Multivariate Normal $N_n(\boldsymbol{\mu},\boldsymbol{\Sigma})$ | $\mathbf{R}^n$ | $f_{\boldsymbol{X}}(\boldsymbol{x}) = \frac{1}{(2\pi)^{\frac{n}{2}}det(\boldsymbol{\Sigma})^{\frac{1}{2}}}e^{-\frac{1}{2}(\boldsymbol{x}-\boldsymbol{\mu})^T\boldsymbol{\Sigma}^{-1}(\boldsymbol{x}-\boldsymbol{\mu})}$ | | $\boldsymbol{\mu}$ | Covariance matrix $\boldsymbol{\Sigma}$ | |


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| Binomial $Bin(n,p)$ | {0,1,...,n} | $\binom{n}{i}p^i(1-p)^{n-i}$ | | $np$ | $\sqrt{np(1-p)}$ | $(1-p+pe^t)^n$ |
| Poisson $Pois(\lambda)$ | {0,1,...} | $\frac{\lambda^i}{i!}e^{-\lambda}$ | | $\lambda$ | $\sqrt{\lambda}$ | $e^{\lambda(e^t-1)}$ |
| Geometric $Geo(p)$ | {1,2,...} | $=(1-p)^{i-1}p$ | | $\frac{1}{p}$ | $\frac{\sqrt{1-p}}{p}$ | $\frac{pe^t}{1-(1-p)e^t}, e^t < \frac{1}{1-p}$ |
| Uniform $U(a,b)$ | $(a,b)$ | $\frac{x-a}{b-a}$ | $\frac{1}{b-a}$ | $\frac{a+b}{2}$ | $\frac{b-a}{2\sqrt{3}}$ | $\frac{e^{tb}-e^{ta}}{t(b-a)}$ |
| Exponential $Exp(\lambda)$ | $\mathbf{R}^+$ | $1-e^{-\lambda x}$ | $\lambda e^{-\lambda x}$ | $\frac{1}{\lambda}$ | $\frac{1}{\lambda}$ | $(1-t\lambda^{-1})^{-1}, t<\lambda$ |
| Normal $N(\mu,\sigma^2)$ | $\mathbf{R}$ | $\Phi(\frac{x-\mu}{\sigma})$ | $\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ | $\mu$ | $\sigma$ | $e^{t\mu+\frac{1}{2}\sigma^2t^2}$ |
| Multivariate Normal $N_n(\boldsymbol{\mu},\boldsymbol{\Sigma})$ | $\mathbf{R}^n$ | $f_{\boldsymbol{X}}(\boldsymbol{x}) = \frac{1}{(2\pi)^{\frac{n}{2}}det(\boldsymbol{\Sigma})^{\frac{1}{2}}}e^{-\frac{1}{2}(\boldsymbol{x}-\boldsymbol{\mu})^T\boldsymbol{\Sigma}^{-1}(\boldsymbol{x}-\boldsymbol{\mu})}$ | | $\boldsymbol{\mu}$ | Covariance matrix $\boldsymbol{\Sigma}$ | |



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| Uniform $U(a,b)$ | $(a,b)$ | $\frac{x-a}{b-a}$ | $\frac{1}{b-a}$ | $\frac{a+b}{2}$ | $\frac{b-a}{2\sqrt{3}}$ | $\frac{e^{tb}-e^{ta}}{t(b-a)}$ |
| Exponential $Exp(\lambda)$ | $\mathbf{R}^+$ | $1-e^{-\lambda x}$ | $\lambda e^{-\lambda x}$ | $\frac{1}{\lambda}$ | $\frac{1}{\lambda}$ | $(1-t\lambda^{-1})^{-1}, t<\lambda$ |
| Normal $N(\mu,\sigma^2)$ | $\mathbf{R}$ | $\Phi(\frac{x-\mu}{\sigma})$ | $\frac{1}{\sigma\sqrt{2\pi}}e^{-\frac{(x-\mu)^2}{2\sigma^2}}$ | $\mu$ | $\sigma$ | $e^{t\mu+\frac{1}{2}\sigma^2t^2}$ |
| Multivariate Normal $N_n(\boldsymbol{\mu},\boldsymbol{\Sigma})$ | $\mathbf{R}^n$ | $f_{\boldsymbol{X}}(\boldsymbol{x}) = \frac{1}{(2\pi)^{\frac{n}{2}}det(\boldsymbol{\Sigma})^{\frac{1}{2}}}e^{-\frac{1}{2}(\boldsymbol{x}-\boldsymbol{\mu})^T\boldsymbol{\Sigma}^{-1}(\boldsymbol{x}-\boldsymbol{\mu})}$ | | $\boldsymbol{\mu}$ | Covariance matrix $\boldsymbol{\Sigma}$ | |