Table A: Important Discrete Distributions

distribution / pmf	mean	variance	mgf
Poisson			
$e^{-\lambda}\dfrac{\lambda^x}{x!}$	λ	λ	$e^{-\lambda+\lambda e^t}$
Binomial			
$\binom{n}{x}\pi^x(1-\pi)^{n-x}$	$n\pi$	$n\pi(1-\pi)$	$(\pi e^t+1-\pi)^n$
Geometric(1)			
$\pi(1-\pi)^x$	$\dfrac{1}{\pi}-1$	$\dfrac{1-\pi}{\pi^2}$	$\dfrac{\pi}{1-(1-\pi)e^t}$
Negative Binomial(1)			
$\binom{s+x-1}{x}\pi^s(1-\pi)^x$	$\dfrac{s}{\pi}-s$	$\dfrac{s(1-\pi)}{\pi^2}$	$\left[\dfrac{\pi}{1-(1-\pi)e^t}\right]^s$
Hypergeometric(2)			
$\dfrac{\binom{m}{x}\binom{n}{k-x}}{\binom{m+n}{k}}$	$N\pi$	$N\pi(1-\pi)\frac{N-k}{N-1}$	

Notes:

(1) Some texts define the geometric and negative binomial distributions differently. Here X counts the number of failures before s successes ($s=1$ for the geometric random variables). Some authors prefer a random variable X_T that counts the total number of trials. This is simply a shifting of the distribution by a constant (the number of successes): $X_T = X + s$. The formulas for the pdf, mean, variance, and moment generating function of X_T all follow easily from this equation.

(2) For the hypergeometric distribution, the parameters are m items of the type being counted, n items of the other type, and k items selected without replacement. We define $N = m + n$ (total number of items) and $\pi = \frac{m}{N} = \frac{m}{m+n}$ (proportion of items that are of the first type).

Table B: Important Continuous Distributions

distribution / pdf	mean	variance	mgf
Uniform $\begin{cases} \frac{1}{b-a} & \text{if } x \in [a,b] \,, \\ 0 & \text{otherwise} \end{cases}$	$\dfrac{b+a}{2}$	$\dfrac{(b-a)^2}{12}$	$\begin{cases} \frac{e^{tb}-e^{ta}}{t(b-a)} & \text{if } t \neq 0 \,, \\ 1 & \text{if } t = 0. \end{cases}$
Standard normal $\dfrac{1}{\sqrt{2\pi}} e^{-\frac{1}{2}z^2}$	0	1	$e^{t^2/2}$
Normal $\dfrac{1}{\sigma\sqrt{2\pi}} \cdot e^{-\frac{1}{2}(\frac{x-\mu}{\sigma})^2}$	μ	σ^2	$e^{\mu t + \sigma^2 t^2/2}$
Exponential $\lambda e^{-\lambda x}$	$1/\lambda$	$1/\lambda^2$	$\dfrac{\lambda}{\lambda - t}$
Gamma $\dfrac{\lambda^\alpha}{\Gamma(\alpha)} x^{\alpha-1} e^{-\lambda x}$	α/λ	α/λ^2	$\left[\dfrac{\lambda}{\lambda - t}\right]^\alpha$
Weibull $\dfrac{\alpha}{\beta^\alpha} x^{\alpha-1} e^{-(x/\beta)^\alpha}$	$\beta\Gamma(1+\frac{1}{\alpha})$	$\beta^2 \left[\Gamma(1+\frac{2}{\alpha}) - \left[\Gamma(1+\frac{1}{\alpha})\right]^2\right]$	
Beta $\frac{\Gamma(\alpha+\beta)}{\Gamma(\alpha)\Gamma(\beta)} x^{\alpha-1}(1-x)^{\beta-1}$	$\dfrac{\alpha}{\alpha+\beta}$	$\dfrac{\alpha\beta}{(\alpha+\beta)^2(\alpha+\beta+1)}$	

Table C: Distributions Derived from the Normal Distributions

distribution / definition	mean	variance
$\mathsf{Chisq}(n) = \mathsf{Gamma}(\alpha = \frac{n}{2}, \lambda = \frac{1}{2})$ $X^2 = \sum_{i=1}^n Z_i^2$ where $\boldsymbol{Z} \overset{\text{iid}}{\sim} \mathsf{Norm}(0,1)$	n	$2n$
$\mathsf{F}(m,n)$ $F = \dfrac{U/m}{V/n}$ where $U \sim \mathsf{Chisq}(m)$, $V \sim \mathsf{Chisq}(n)$, and U and V are independent	$\dfrac{n}{n-2}$	$\dfrac{2n^2(m+n-2)}{m(n-2)^2(n-4)}$ if $n > 4$
$\mathsf{t}(n)$ $t = \dfrac{Z}{\sqrt{V/n}}$ where $Z \sim \mathsf{Norm}(0,1)$, $V \sim \mathsf{Chisq}(n)$, and Z and V are independent	0 if $n > 1$	$\dfrac{n}{n-2}$ if $n > 2$