Useful Formulas

	Discrete case	**Continuous case**
$P(a \le X \le b)$	$\sum_{i: a \le x_i \le b} P(X = x_i)$	$\int_a^b f(x)\,dx$
$\mu = E[X]$	$\sum_i x_i P(X = x_i)$	$\int_{-\infty}^{\infty} x f(x)\,dx$
$\mathrm{Var}(X)$	$\sum_i (x_i - \mu)^2 P(X = x_i)$	$\left(\int_{-\infty}^{\infty} x^2 f(x)\,dx\right) - \mu^2$
$\mathrm{SD}(X)$	$\sqrt{\mathrm{Var}(X)}$	$\sqrt{\mathrm{Var}(X)}$

Distribution	**probability function or density**	$E[X]$	$\mathrm{SD}(X)$
Binomial(n, p)	$P(X = k) = \binom{n}{k} p^k (1-p)^{n-k}$ for $k = 0, 1, ..., n$	np	$\sqrt{np(1-p)}$
Poisson(λ)	$P(X = k) = e^{-\lambda}\lambda^k / k!$ for $k = 0, 1, \ldots$	λ	$\sqrt{\lambda}$
Geometric(p)	$P(X = k) = (1-p)^{k-1} p$ for $k = 1, 2, ...$	$1/p$	$\sqrt{1-p}/p$
Uniform(a, b)	$f(x) = 1/(b-a)$ for $a < x < b$	$(a+b)/2$	$(b-a)/\sqrt{12}$
Exponential(λ)	$f(x) = \lambda e^{-\lambda x}$ for $x > 0$	$1/\lambda$	$1/\lambda$
Normal(μ, σ^2)	$f(x) = (2\pi\sigma^2)^{-1/2} e^{-(x-\mu)^2/2\sigma^2}$	μ	σ

$$E[X + c] = E[X] + c \qquad E[cX] = cE[X] \qquad E[X + Y] = E[X] + E[Y].$$

$$\mathrm{Var}(X + c) = \mathrm{Var}(X) \qquad \mathrm{Var}(cX) = c^2 \mathrm{Var}(X)$$

$$\mathrm{Var}(X + Y) = \mathrm{Var}(X) + \mathrm{Var}(Y) \text{ if } X \text{ and } Y \text{ are independent.}$$

$$E[\bar{X}] = \mu \qquad \mathrm{SD}(\bar{X}) = \sigma/\sqrt{n} \qquad E[\hat{p}] = p \qquad \mathrm{SD}(\hat{p}) = \sqrt{\frac{p(1-p)}{n}}$$

$$ME = z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}} \qquad Z = \frac{p - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$$