Binomial Probability Distribution	**Hypergeometric Probability Distributio**
$P(x=k)=C_k^n p^k q^{n-k}=\dfrac{n!}{k!(n-k)!}p^k q^{n-k}$ $\text{Mean}: \mu = np$ $\text{Variance}: \sigma^2 = npq$ $\text{Standard deviation}: \sigma = \sqrt{npq}$	$P(x=k)=\dfrac{C_k^M C_{n-k}^{N-M}}{C_n^N}$ ***M*** → successes, ***N-M*** → failures, ***n*** → size of the random sample space $\text{Mean}: \mu = n\left(\dfrac{M}{N}\right)$ $\text{Variance}: \sigma^2 = n\left(\dfrac{M}{N}\right)\left(\dfrac{N-M}{N}\right)\left(\dfrac{N-n}{N-1}\right)$
Poisson Probability Distribution $P(x=k)=\dfrac{\mu^k e^{-\mu}}{k!}$ Mean: $E(x)=\mu$ $\text{Variance}: \sigma^2 = \mu$ Standard deviation: $\sigma=\sqrt{\mu}$	**Variance of a Sample** $s^2=\dfrac{\Sigma(x_i-\bar{x})^2}{n-1}=\dfrac{\Sigma x_i^2-\dfrac{(\Sigma x_i)^2}{n}}{n-1}$ **Variance of Population:** $\sigma^2=\dfrac{\Sigma(x_i-\mu)^2}{N}$
Correlation coefficient, $r=\dfrac{s_{xy}}{s_x s_y}$	**Normal Distribution, $N(\mu, \sigma^2)$**

Standardizing the value of $\bar{x}$:	**Standardizing the value $\hat{p}$:**
$z=\dfrac{\bar{x}-\mu}{\sigma/\sqrt{n}}$	$z=\dfrac{\hat{p}-p}{\sqrt{\dfrac{pq}{n}}}$
Statistical Process Control $\text{LCL}: \bar{\bar{x}}-3\dfrac{s}{\sqrt{n}} \quad \text{UCL}: \bar{\bar{x}}+3\dfrac{s}{\sqrt{n}}$ $\text{LCL}: \bar{p}-3\sqrt{\dfrac{\bar{p}(1-\bar{p})}{n}} \quad \text{UCL}: \bar{p}+3\sqrt{\dfrac{\bar{p}(1-\bar{p})}{n}}$	Confidence interval for a population mean μ: $\bar{x}\pm z_{\alpha/2}\dfrac{s}{\sqrt{n}}$ Confidence interval for a population proportion p: $\hat{p}\pm z_{\alpha/2}\sqrt{\dfrac{\hat{p}\hat{q}}{n}}$
Point estimator of population mean $\mu : \bar{x}$ The 95% margin of error $(n \geq 30): \pm 1.96\dfrac{s}{\sqrt{n}}$	Point estimator of population proportion $p : \hat{p}=x/n$ The 95% margin of error $(n \geq 30): \pm 1.96\sqrt{\dfrac{\hat{p}\hat{q}}{n}}$

Standardizing the value of a test statistic :

$$\begin{Bmatrix} z \\ t \end{Bmatrix} = \frac{(test\_statistic) - (population\ parameter)}{SE}$$

Standard Error (SE)

$$SE = \frac{\sigma}{\sqrt{n}}, \quad \text{or}$$

$$SE = \sqrt{\frac{\hat{p}\hat{q}}{n}}, \quad \text{or}$$

$$SE = \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}, \quad \text{or}$$

$$SE = \sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}, \quad \text{or}$$

$$SE = \sqrt{s^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}$$ (for two small samples with common variance)

Parameter	Test Statistic
μ	$z = \dfrac{\bar{x} - \mu_0}{s/\sqrt{n}}$
p	$z = \dfrac{\hat{p} - p_0}{\sqrt{\dfrac{p_0 q_0}{n}}}$
$\mu_1 - \mu_2$	$z = \dfrac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}}$
$p_1 - p_2$	$z = \dfrac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}\hat{q}\left(\dfrac{1}{n_1} + \dfrac{1}{n_2}\right)}}$ or $z = \dfrac{(\hat{p}_1 - \hat{p}_2) - D_0}{\sqrt{\dfrac{\hat{p}_1\hat{q}_1}{n_1} + \dfrac{\hat{p}_2\hat{q}_2}{n_2}}}$

Bound, B

$$z_{\alpha/2}\left(\frac{\sigma}{\sqrt{n}}\right) \prec B, \quad \text{or}$$

$$z_{\alpha}\left(\frac{\sigma}{\sqrt{n}}\right) \prec B, \quad \text{or}$$

$$z_{\alpha/2}\left(\sqrt{\frac{pq}{n}}\right) \prec B, \quad \text{or}$$

$$z_{\alpha}\left(\sqrt{\frac{pq}{n}}\right) \prec B$$

pooled estimate for the common value of p (large samples)

$$\hat{p} = \frac{x_1 + x_2}{n_1 + n_2}$$

Common variance for two samples (small samples)

$$s^2 = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}$$

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

$$F = \frac{s_1^2}{s_2^2}$$

Variance of a Sample

$$s^2 = \frac{\sum (x_i - \bar{x})^2}{n-1} = \frac{\sum x_i^{\,2} - \dfrac{(\sum x_i)^2}{n}}{n-1}$$

Variance of Population:

$$\sigma^2 = \frac{\sum (x_i - \mu)^2}{N}$$

Confidence Interval for σ^2

$$\frac{(n-1)s^2}{\chi^2_{\propto/2}} < \sigma^2 < \frac{(n-1)s^2}{\chi^2_{(1-\propto/2)}}$$

Confidence Interval for $\sigma_1^2\ /\sigma_2^2$

$$\left(\frac{s_1^2}{s_2^2}\right)\frac{1}{F_{df_1,df_2}} < \frac{\sigma_1^2}{\sigma_2^2} < \left(\frac{s_1^2}{s_2^2}\right)F_{df_2,df_1}$$