Symbols You Must Know		
Population		**Sample**
N	Size	n
μ	Mean	$\overline{x}$
σ^2	Variance	s^2
σ	Standard Deviation	s
p	Proportion	p'

Single Data Set Formulae		
Population		**Sample**
$\mu = E(x) = \frac{1}{N}\sum_{i=1}^{N}(x_i)$	Arithmetic Mean	$\overline{x} = \frac{1}{n}\sum_{i=1}^{n}(x_i)$
$Q_3 = \frac{3(n+1)}{4}, Q_1 = \frac{(n+1)}{4}$	Inter-Quartile Range *IQR = Q_3 - Q_1*	$Q_3 = \frac{3(n+1)}{4}, Q_1 = \frac{(n+1)}{4}$
$\sigma^2 = \frac{1}{N}\sum_{i=1}^{N}(x_i - \mu)^2$	Variance	$s^2 = \frac{1}{n-1}\sum_{i=1}^{n}(x_i - \overline{x})^2$

Grouped Data Set Formulae		
Population		**Sample**
$\mu = E(x) = \frac{1}{N}\sum_{i=1}^{k}(m_i * f_i)$	Arithmetic Mean	$\overline{x} = \frac{1}{n}\sum_{i=1}^{k}(m_i * f_i)$
$\sigma^2 = \frac{1}{N}\sum_{i=1}^{k}(m_i - \mu)^2 * f_i$	Variance	$s^2 = \frac{1}{n-1}\sum_{i=1}^{k}(m_i - \overline{x})^2 * f_i$
$CV = \frac{\sigma}{\mu} * 100$	Coefficient of Variation	$CV = \frac{s}{\overline{x}} * 100$

Basic Probability Rules	
$P(A \cap B) = P(A \mid B) * P(B)$	Multiplication Rule
$P(A \cup B) = P(A) + P(B) - P(A \cap B)$	Addition Rule
$P(A \cap B) = P(A) * P(B)$ or $P(A \mid B) = P(A)$	Independence Test

Hypergeometric Distribution Formulae	
$nCx = \binom{n}{x} = \frac{n!}{x!\,(n-x)!}$	Combinatorial Equation
$P(x) = \frac{\binom{N_1}{x}\binom{N-N_1}{n-x}}{\binom{N}{n}}$	Probability Equation
$E(X) = \mu = np$	Mean
$\sigma^2 = \left(\frac{N-n}{N-1}\right) np(q)$	Variance
Binomial Distribution Formulae	
$P(x) = \frac{n!}{x!\,(n-x)!} p^x (q)^{n-x}$	Probability Density Function
$E(X) = \mu = np$	Arithmetic Mean
$\sigma^2 = np(q)$	Variance
Geometric Distribution Formulae	
$P(X = x) = (1-p)^{x-1}(p)$	Probability when x is the first success
$\mu = \frac{1}{p}$	Mean
$\sigma^2 = \frac{(1-p)}{p^2}$	Variance
Poisson Distribution Formulae	
$P(x) = \frac{e^{-\mu}\mu^x}{x!}$	Probability Equation
$E(X) = \mu$	Mean
$\sigma^2 = \mu$	Variance
Uniform Distribution Formulae	
$f(x) = \frac{1}{b-a}\ for\ a \le x \le b$	PDF
$E(X) = \mu = \frac{a+b}{2}$	Mean
$\sigma^2 = \frac{(b-a)^2}{12}$	Variance
Exponential Distribution Formulae	
$P(X \le x) = 1 - e^{-mx}$	Cumulative Probability
$E(X) = \mu = \frac{1}{m}\ or\ m = \frac{1}{\mu}$	Mean and Decay Factor
$\sigma^2 = \frac{1}{m^2} = \mu^2$	Variance

The following page of formulae require the use of the "Z", "t", and "χ^2" tables.	
$Z = \frac{x-\mu}{\sigma}$	**Z-transformation for Normal Distribution**
$Z = \frac{x-np'}{\sqrt{np'(q')}}$	**Normal Approximation to the Binomial**
Probability (ignore subscripts) **Hypothesis Testing**	**Confidence Intervals** [bracketed symbols equal margin of error] (subscripts denote locations on respective distribution tables)
$Z_c = \frac{\overline{x}-\mu_0}{\frac{\sigma}{\sqrt{n}}}$	*Interval for the population mean when sigma is known* $\overline{x} \pm \left[Z_{(\alpha/2)}\frac{\sigma}{\sqrt{n}}\right]$
$t_c = \frac{\overline{x}-\mu_0}{\frac{s}{\sqrt{n}}}$	*Interval for the population mean when sigma is unknown* $\overline{x} \pm \left[t_{(n-1),(\alpha/2)}\frac{s}{\sqrt{n}}\right]$
$Z_c = \frac{p'-p_0}{\sqrt{\frac{p_0q_0}{n}}}$	*Interval for the population proportion* $p' \pm \left[Z_{(\alpha/2)}\sqrt{\frac{p'q'}{n}}\right]$
$t_c = \frac{\overline{d}-\delta_0}{\frac{s_d}{\sqrt{n}}}$	*Interval for difference between two means with matched pairs* $\overline{d} \pm \left[t_{(n-1),(\alpha/2)}\frac{s_d}{\sqrt{n}}\right]$ ***where*** s_d ***is the deviation of the differences***
$Z_c = \frac{(\overline{x}_1-\overline{x}_2)-\delta_0}{\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}}$	*Interval for difference between two means when sigmas are known* $(\overline{x}_1-\overline{x}_2) \pm \left[Z_{(\alpha/2)}\sqrt{\frac{\sigma_1^2}{n_1}+\frac{\sigma_2^2}{n_2}}\right]$
$t_c = \frac{(\overline{x}_1-\overline{x}_2)-\delta_0}{\sqrt{\left(\frac{(s_1)^2}{n_1}+\frac{(s_2)^2}{n_2}\right)}}$	*Interval for difference between two means with equal variances when sigmas are unknown* $(\overline{x}_1-\overline{x}_2) \pm \left[t_{df,(\alpha/2)}\sqrt{\left(\frac{(s_1)^2}{n_1}+\frac{(s_2)^2}{n_2}\right)}\right]$ *where* $df = \frac{\left(\frac{(s_1)^2}{n_1}+\frac{(s_2)^2}{n_2}\right)^2}{\left(\frac{1}{n_1-1}\right)\left(\frac{(s_1)^2}{n_1}\right)^2+\left(\frac{1}{n_2-1}\right)\left(\frac{(s_2)^2}{n_2}\right)^2}$
$Z_c = \frac{(p'_1-p'_2)-\delta_0}{\sqrt{\frac{p'_1(q'_1)}{n_1}+\frac{p'_2(q'_2)}{n_2}}}$	*Interval for the difference between two population proportions* $(p'_1-p'_2) \pm \left[Z_{(\alpha/2)}\sqrt{\frac{p'_1(q'_1)}{n_1}+\frac{p'_2(q'_2)}{n_2}}\right]$
$\chi_c^2 = \frac{(n-1)s^2}{\sigma_0^2}$	*Tests for GOF, Independence, and Homogeneity* $\chi_c^2 = \sum\frac{(O-E)^2}{E}$ ***where*** O ***= observed values and*** E ***= expected values***

The Next 3 Formulae are for Determining Sample Size with Confidence Intervals (note: E represents the margin of error)		
$n = \frac{Z_{\left(\frac{\alpha}{2}\right)}^2\sigma^2}{E^2}$ ***Use when sigma is known***	$n = \frac{Z_{\left(\frac{\alpha}{2}\right)}^2(0.25)}{E^2}$ ***Use when*** p' ***is unknown***	$n = \frac{Z_{\left(\frac{\alpha}{2}\right)}^2[p'(q')]}{E^2}$ ***Use when*** p' ***is known***

Simple Linear Regression Formulae for $y = a + b(x)$	
$r = \frac{\sum[(x-\bar{x})(y-\bar{y})]}{\sqrt{\sum(x-\bar{x})^2 * \sum(y-\bar{y})^2}} = \frac{S_{xy}}{S_x S_y} = \sqrt{\frac{SSR}{SST}}$	**Correlation Coefficient**
$b = \frac{\sum[(x-\bar{x})(y-\bar{y})]}{\sum(x-\bar{x})^2} = \frac{S_{xy}}{SS_x} = r_{y,x}\left(\frac{s_y}{s_x}\right)$	**Coefficient *b* (slope)**
$a = \bar{y} - b(\bar{x})$	**y-intercept**
$s_e^2 = \frac{\sum(y_i - \hat{y}_i)^2}{n-k} = \frac{\sum_{i=1}^{n} e_i^2}{n-k}$	**Estimate of the Error Variance**
$S_b = \frac{s_e^2}{\sqrt{(x_i-\bar{x})^2}} = \frac{s_e^2}{(n-1)S_x^2}$	**Standard Error for Coefficient *b***
$t_c = \frac{b-\beta_0}{s_b}$	**Hypothesis Test for Coefficient *β***
$b \pm [t_{n-2,\propto/2} S_b]$	**Interval for Coefficient *β***
$\hat{y} \pm \left[t_{\propto/2} * s_e\left(\sqrt{\frac{1}{n} + \frac{(x_p-\bar{x})^2}{s_x}}\right)\right]$	**Interval for Expected Value of y**
$\hat{y} \pm \left[t_{\propto/2} * s_e\left(\sqrt{1 + \frac{1}{n} + \frac{(x_p-\bar{x})^2}{s_x}}\right)\right]$	**Prediction Interval for an Individual y**

ANOVA Formulae	
$SSR = \sum_{i=1}^{n}(\hat{y}_i - \bar{y})^2$	**Sum of Squares Regression**
$SSE = \sum_{i=1}^{n}(y_i - \hat{y}_i)^2$	**Sum of Squares Error**
$SST = \sum_{i=1}^{n}(y_i - \bar{y})^2$	**Sum of Squares Total**

The Following is the breakdown of a one-way ANOVA table for linear regression

$Source\ of\ Variation$	$Sum\ of\ Squares$	$Degrees\ of\ Freedom$	$Mean\ Squares$	$F-Ratio$
$Regression$	SSR	$1\ or\ k-1$	$MSR = \frac{SSR}{df_R}$	$F = \frac{MSR}{MSE}$
$Error$	SSE	$n-k$	$MSE = \frac{SSE}{df_E}$	
$Total$	SST	$n-1$		