Formula Sheet

Review of Basic Concepts

Measure	Sample	Population
Mean	$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n}$	$\mu = \frac{\sum_{i=1}^{N} x_i}{N}$
Range	$\max(x_i) - \min(x_i)$	
Interquartile Range (IQR)	$Q_3 - Q_1$	
Variance	$s^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}$	$\sigma^2 = \frac{\sum_{i=1}^{N} (x_i - \mu)^2}{N}$
Std. Deviation	$s = \sqrt{s^2}$	$\sigma = \sqrt{\sigma^2}$
Skewness	$\frac{n}{(n-1)(n-2)} \sum_{i=1}^{n} \left(\frac{x_i - \bar{x}}{s}\right)^3$	$\frac{1}{N} \sum_{i=1}^{n} \left(\frac{x_i - \mu}{\sigma}\right)^3$
Normal Probability Density Function	$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} e^{\frac{-(x-\mu)^2}{2\sigma^2}}$	
Standard Normal Probability Density Function	$f(z) = \frac{1}{\sqrt{2\pi}} e^{\frac{-z^2}{2}}$	
Z-Score	$z = \frac{x - \mu}{\sigma}$	
Z-Score for $\bar{x}$	$z_{\bar{x}} = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$	
Interval Estimate of Population Mean	$\bar{x} \pm t_{\alpha/2} \times \frac{s}{\sqrt{n}}$	
Sample Size for an Interval Estimate of the Population Mean	$n = \frac{z_{\alpha/2}^2 \sigma^2}{E^2}$	
Test Statistic for Means	$t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$	
Interval Estimate for Difference Between 2 Means (Equal Variance)	$\bar{x}_1 - \bar{x}_2 \pm t_{\alpha/2} \times s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$	
Test Statistic for Difference Between 2 Means (Equal Variance)	$t = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$	
Interval Estimate for Difference Between 2 Means (Unequal Variance)	$\bar{x}_1 - \bar{x}_2 \pm t_{\alpha/2} \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$	

Test Statistic for Difference Between 2 Means (Unequal Variance)	$$t = \frac{(\bar{x}_1 - \bar{x}_2) - D_0}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$
t-distribution Degrees of Freedom for Two Means (Unequal Variance)	$$df = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{1}{n_1 - 1}\left(\frac{s_1^2}{n_1}\right)^2 + \frac{1}{n_2 - 1}\left(\frac{s_2^2}{n_2}\right)^2}$$
Test Statistic for Difference Between 2 Variances	$$F = \frac{s_i^2}{s_j^2}$$