BIOS 600 · Final Exam Cheat Sheet

$$\bar{X} = \frac{1}{N}\sum_{i=1}^{N} X_i$$

$$s^2 = \frac{1}{N-1}\sum_{i=1}^{N}(X_i - \bar{X})^2$$

$$P(A) = 1 - P(\,\bar{A}\,)$$

$$P(A) = \sum_i P(\,A \cap B_i\,)$$

$$P(A) = \sum_i P(\,B_i\,)P(\,A \mid B_i\,)$$

$$P(\,A \cup B\,) = P(A) + P(B) - P(A \cap B)$$

$$P(A \cap B) = \begin{array}{ll} P(A)P(B) & \text{if } A \text{ and } B \text{ are independent} \\ P(A)P(B|A) \text{ or } P(B)P(A|B) & \text{if } A \text{ and } B \text{ are not independent} \end{array}$$

$$P(B|A) = \frac{P(B)P(A|B)}{P(A)}$$

$$\text{If } X \sim BIN(n,p) \text{ and } n \text{ is large, then } P(X \le a) \approx P\left(Z \le \frac{a - np}{\sqrt{np(1-p)}}\right)$$

$$\text{If } Y \sim POI(\mu) \text{ and } \mu \text{ is large, then } P(Y \le b) \approx P\left(Z \le \frac{b + .5 - \mu}{\sqrt{\mu}}\right)$$

$$r = \frac{n\sum X_i Y_i - (\sum X_i)(\sum Y_i)}{\sqrt{\left[n\sum X_i^2 - (\sum X_i)^2\right]\left[n\sum Y_i^2 - (\sum Y_i)^2\right]}}$$

$$\bar{X} \pm Z_{1-\alpha/2}\frac{\sigma}{\sqrt{n}}$$

$$\bar{X} \pm t_{n-1,1-\alpha/2}\frac{s}{\sqrt{n}}$$

$$\bar{X}_1 - \bar{X}_2 \pm t_{n_1+n_2-2,1-\alpha/2} s_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}$$

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

$$(\hat{p}_1 - \hat{p}_2) \pm Z_{1-\alpha/2} \sqrt{\frac{\hat{p}_1(1 - \hat{p}_1)}{n_1} + \frac{\hat{p}_2(1 - \hat{p}_2)}{n_2}}$$

$$\sum_i \frac{(O_i - E_i)^2}{E_i}$$

$$\exp\left\{\ln(\widehat{OR}) \pm Z_{1-\alpha/2} \sqrt{\frac{1}{a} + \frac{1}{b} + \frac{1}{c} + \frac{1}{d}}\right\}$$

$$X_{(a+1)} \times .b + X_{(a)} \times (1 - .b)$$

$$X_{(\lceil R \rceil)}(R - \lfloor R \rfloor) + X_{(\lfloor R \rfloor)}(\lceil R \rceil - R)$$

		Test Stat	Distrib of TS
μ	$X \sim$ NORMAL σ known	$Z = \sqrt{n}\frac{\bar{X}-\mu_0}{\sigma}$	$Z \sim N(0,1)$
	$X \sim$ NORMAL σ unknown	$T = \sqrt{n}\frac{\bar{X}-\mu_0}{s}$	$T \sim t(n-1)$
	$X \sim$ UNKNOWN large n	$T = \sqrt{n}\frac{\bar{X}-\mu_0}{s}$	$T \sim t(n-1)$
p	$Y \sim$ BINOMIAL small n	Y	$Y \sim BIN(n, p_0)$ (Use Table)
	$Y \sim$ BINOMIAL large n	$Z = \sqrt{n}\frac{Y-np_0-c}{\sqrt{Y(n-Y)}}$	$Z \sim N(0,1)$

	Test Stat	Distrib of TS
$\Delta = \mu_1 - \mu_2$ $\sigma_1 \approx \sigma_2$	$T = \sqrt{n_1 n_2}\frac{(\bar{X}_1-\bar{X}_2)-\Delta_0}{\sqrt{n_1+n_2}s_p}$	$T \sim t(n_1+n_2-2)$
$\Delta = \mu_1 - \mu_2$ $\sigma_1 \neq \sigma_2$	$T = \sqrt{n_1 n_2}\frac{(\bar{X}_1-\bar{X}_2)-\Delta_0}{\sqrt{n_2\, s_1^2+n_1\, s_2^2}}$ $df = \frac{(s_1^2/n_1+s_2^2/n_2)^2}{(s_1^2/n_1)^2/(n_1-1)+(s_2^2/n_2)^2/(n_2-1)}$	$T \sim t(df)$
$\delta = p_1 - p_2$	$Z = \frac{(\hat{p}_1-\hat{p}_2)-\delta_0}{\sqrt{\hat{p}_1(1-\hat{p}_1)/n_1+\hat{p}_2(1-\hat{p}_2)/n_2}}$	$Z \sim N(0,1)$

$100 \times (1-\alpha)$ Confidence Interval about ...	
A Single Mean, μ	$$n = \left(\frac{Z_{1-\alpha/2}\sigma}{d}\right)^2$$
Difference of Two Means, $\mu_1 - \mu_2$	$$n = 2\left(\frac{Z_{1-\alpha/2}\sigma}{d}\right)^2$$ n is the sample size for each group
A Single Binomial Proportion, p	$$n = \left(\frac{Z_{1-\alpha/2}\sqrt{p(1-p)}}{d}\right)^2$$
Difference of Two Binomial Proportions, $p_1 - p_2$	$$n = 2\left(\frac{Z_{1-\alpha/2}\sqrt{p_1(1-p_1)+p_2(1-p_2)}}{d}\right)^2$$ n is the sample size for each group

Hypothesis Test ...	
Single Mean $$H_o: \quad \mu = \mu_o$$ $$H_a: \quad \mu = \mu_a$$	$$n = \sigma^2\left[\frac{Z_{1-\alpha/2} - Z_\beta}{\mu_a - \mu_o}\right]^2$$
Difference of 2 means $$H_o: \quad \mu_1 - \mu_2 = \Delta_o$$ $$H_a: \quad \mu_1 - \mu_2 = \Delta_a$$	$$n = 2\sigma^2\left[\frac{Z_{(1-\alpha/2)} - Z_\beta}{\Delta_a - \Delta_o}\right]^2$$ n is the sample size of each group
Single Binomial Proportion $$H_o: \quad p = p_o$$ $$H_a: \quad p = p_a$$	$$n = \left[\frac{Z_{(1-\alpha/2)}\sqrt{p_o(1-p_o)} - Z_\beta\sqrt{p_a(1-p_a)}}{p_a - p_o}\right]^2$$