STA 205 Formula Sheet

Normal Distribution	$z = \dfrac{x-\mu}{\sigma}$	$x = \mu + z\sigma$

Sampling Distribution of the Mean	$\mu_{\bar{x}} = \mu$	$\sigma_{\bar{x}} = \dfrac{\sigma}{\sqrt{n}}$	$\bar{x}$ is approx'ly normal if $n \geq 30$	$z = \dfrac{\bar{x}-\mu_{\bar{x}}}{\sigma_{\bar{x}}}$
Sampling Distribution of the Proportion	$\mu_p = \pi$	$\sigma_p = \sqrt{\dfrac{\pi(1-\pi)}{n}}$	p is approx'ly normal if $\mu_p - 3\sigma_p > 0$ and $\mu_p + 3\sigma_p < 1$	$z = \dfrac{p-\mu_p}{\sigma_p}$

	Type of Inference	Validity
Mean One Sample	**CI**: $\bar{x} \pm z\left(\dfrac{\sigma}{\sqrt{n}}\right)$	1. Random Sample 2. $n \geq 30$ 3. σ is known
	Test: $z = \dfrac{\bar{x}-\mu_0}{\left(\dfrac{\sigma}{\sqrt{n}}\right)}$	
	Sample Size: $n = \left(\dfrac{z \cdot \sigma}{E}\right)^2$	
	CI: $\bar{x} \pm t\left(\dfrac{s}{\sqrt{n}}\right)$ df = n - 1	1. Random Sample 2. Either the population is normal or $n \geq 30$ 3. σ is unknown
	Test: $t = \dfrac{\bar{x}-\mu_0}{\left(\dfrac{s}{\sqrt{n}}\right)}$ df = n - 1	
Proportion One Sample	**CI**: $p \pm z\sqrt{\dfrac{p(1-p)}{n}}$	1. Random Sample 2. $p - 3\sqrt{\dfrac{p(1-p)}{n}} > 0$ and $p + 3\sqrt{\dfrac{p(1-p)}{n}} < 1$
	Test: $z = \dfrac{p-\pi_0}{\sqrt{\dfrac{\pi_0(1-\pi_0)}{n}}}$	1. Random Sample 2. $\pi_0 - 3\sqrt{\dfrac{\pi_0(1-\pi_0)}{n}} > 0$ and $\pi_0 + 3\sqrt{\dfrac{\pi_0(1-\pi_0)}{n}} < 1$

	Type of Inference	Validity
Means Two Independent Samples	**CI**: $(\bar{x}_1 - \bar{x}_2) \pm t\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ **Test**: $t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$	1. Random Samples 2. Independent Samples 3. Either the populations are normal or n_1 and $n_2 \geq 30$ 4. σ_1 and σ_2 are unknown
Means Two Dependent Samples	**CI**: $\bar{x}_D \pm t\left(\frac{s_D}{\sqrt{n_D}}\right)$ **Test**: $t = \frac{\bar{x}_D}{\left(\frac{s_D}{\sqrt{n_D}}\right)}$	1. Random Sample of Paired Observations 2. Either the population of differences is normal or $n_D \geq 30$ 3. σ_D is unknown
Means Three or More Independent Samples	**Test**: F = $\frac{\text{Variation among the sample means}}{\text{Variation expected by chance}}$	1. Independent random samples 2. All k populations are normal 3. $\sigma_1 = \sigma_2 = \sigma_3 = \ldots = \sigma_k$ 4. All population standard deviations are unknown
Relationship Between Two Quantitative Variables	**CI:** Y ± (margin of error for estimation) **PI:** Y ± (margin of error of prediction) **Test**: r	1. At each value of X, the distribution of the values of Y in the population is normal. 2. For all values of X, the standard deviations of the distributions of the corresponding values of Y in the population are the same. 3. The sampled values of Y are independent from one another.
Relationship Between Two Qualitative Variables	**Test**: $\chi^2 = \sum \frac{(o-e)^2}{e}$ where o = observed counts and e = expected counts	1. Random sample(s) 2. All expected cell counts must be ≥ 5