Inference Formulas & Procedures

Situation	Confidence Interval	Significance Test	Conditions
1 mean (**σ known**)	$\bar{x} \pm z^* \dfrac{\sigma}{\sqrt{n}}$	$H_o: \mu = \mu_o$ $Z = \dfrac{\bar{x} - \mu_o}{\frac{\sigma}{\sqrt{n}}}$	▪ SRS **and** ▪ population is normal, **or** ▪ $n \geq 30$
1 mean with σ unknown **or** **2 dependent means in matched pairs**	$\bar{x} \pm t^*_{n-1} \dfrac{s}{\sqrt{n}}$	$H_o: \mu = \mu_o$ $t = \dfrac{\bar{x} - \mu_o}{\frac{s}{\sqrt{n}}}$ degrees of freedom (df) = n - 1	SRS **and** ▪ population is normal, **or** ▪ large sample size ($n \geq 30$)
2 means (independent)	$(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\dfrac{s_1^2}{n_1} + \dfrac{s_2^2}{n_2}}$ (use df smaller of $n_1 - 1$ and $n_2 - 1$)	$H_o: \mu_1 = \mu_2$ $t = \dfrac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$	SRS **and** ▪ population is normal, **or** ▪ ($n_1, n_2 \geq 30$)

Situation	Confidence Interval	Significance Test	Conditions
1 proportion	$\hat{p} \pm z^* \sqrt{\dfrac{\hat{p}(1-\hat{p})}{n}}$	$H_o: \theta = \theta_o$ $z = \dfrac{\hat{p} - \theta_o}{\sqrt{\frac{\theta_o(1-\theta_o)}{n}}}$	1. SRS, **and** 2. pop $\geq$ 10 times sample, **and** 3. **TOS**: $n\theta_o$ & $n(1-\theta_o) \geq 10$
2 proportions	$(\hat{p}_1 - \hat{p}_2) \pm$ $z^* \sqrt{\dfrac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \dfrac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$	$H_o: p_1 = p_2$ $z = \dfrac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}_c(1-\hat{p}_c)(\frac{1}{n_1} + \frac{1}{n_2})}}$	1. SRS, **and** 2. pop $\geq$ 10 times sample, **and** 3. **TOS**: $n_1\hat{p}_c > 10, n_1(1-\hat{p}_c) > 10$ $n_2\hat{p}_c > 10, n_2(1-\hat{p}_c) > 10$

Inference Formulas & Procedures

Decisions:
Step 1: Decide if it is a test of means (μ) or a test of proportions (ρ).
Step 2: If it is a test of means, decide
- a) is it one set of data (1 mean) or two sets of data (2 means)
- b) If it is a one mean test, decide whether σ (the population st. deviation) is known
  - i) if σ is known, you are using a *z* test
  - ii) if σ is not known you will be using a *t* –test
- c) if it is a two means test, it is automatically a *t* – test

Step 3: If it is a test of proportions, decide whether it is one proportion or two proportions
- a) no matter which, you are using a *z* test

Hypotheses:
H_a - usually what you are asked to investigate: Ex: $H_a : \mu < 16$ or $H_a : p > .75$ or $H_a : \mu \neq 20$
H_o - the opposite of H_a Ex: $H_o : \mu \geq 16$ or $H_o : p \leq .75$ or $H_o : \mu = 20$

Procedures:
<u>*z* tests</u>
1) Calculate *z* statistic using the correct formula
2) Find your *p*-value by
   - i) finding up the correct value by looking up your *z* statistic from your chart.
   - ii) subtracting it from .5000
   - iii) if it is a two-tailed test – double it
3) Compare your *p*-value to the given value of α. If not given, use $\alpha = .05$
   - i) If *p*-value < α, reject H_0 and accept H_a
   - ii) if *p*-value >α, reject H_a and say that there is not enough evidence to support H_a
4) Make your conclusion in English.

<u>*t* tests</u>
1) Calculate *t* statistic using the correct formula
2) Find your *p*-value by
   - i) Using the correct row in the *t*-chart based on the degrees of freedom ($n - 1$)
   - ii) finding the approximate place that your *t*-statistic would fall
   - iii) read up to find the approximate *p*-value
   - iv) if it is a two-tailed test – double the value you just found
3) Compare your *p*-value to the given value of α. If not given, use $\alpha = .05$
   - i) If *p*-value < α, reject H_0 and accept H_a
   - ii) if *p*-value >α, reject H_a and say that there is not enough evidence to support H_a
4) Make your conclusion in English.