FRED Technique – Confidence Intervals

F – Formulate

- State the population (who is being studied)
- State the sample (taken from the population)
- State the variable (what is being measured)
- State the parameter and give correct notation
    - We do not know the parameter numerically, so it should be given in words.
    - Notation depends on if you are using means or proportions.

R – Review Conditions

1 Proportion	1 Mean
1) $n(\hat{p}) \geq 10$ 2) $n(1-\hat{p}) \geq 10$	1) Data is roughly symmetric or only slightly skewed. 2) Data has few outliers relative to sample size.

E – Execute Calculations

Find upper and lower bounds using

Point Estimate $\pm$ Confidence Level Multiplier * Standard Error

	Point Estimate	Confidence Level Multiplier	Standard Error
1 Proportion	$\hat{p}$	z^*	$\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$
2 Proportions	$\hat{p}_1 - \hat{p}_2$	z^*	$\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$
1 Mean	$\bar{x}$	t^*, $df = n-1$	$\frac{s}{\sqrt{n}}$
Paired Data	$\bar{x}_d$	t^*, $df = n-1$	$\frac{s_d}{\sqrt{n_d}}$
2 Independent Means	$\bar{x}_1 - \bar{x}_2$	t^*, df will be given	$\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$

D – Draw Conclusions

We are ___% confident that the population variable (parameter) is between Lower Bound and Upper Bound (more/less than other population if two groups).

FRED Technique – Hypothesis Testing

F – Formulate

- State the population (who is being studied)
- State the sample (taken from the population)
- State the variable (what is being measured)
- State the parameter and give correct notation (if appropriate)
- Write the null hypothesis Ho and alternative hypothesis Ha (different for each test)

R – Review Conditions

Chi-Square	Paired T-Test	2 Sample Independent T-Test
1) No expected cell count is <1 2) No more than 20% of expected cell counts are <5	1) Data is roughly symmetric or only slightly skewed 2) Data has few outliers relative to sample size	1) Data for each group is roughly symmetric or only slightly skewed 2) Data for each group has few outliers relative to sample size

E – Execute Calculations
Find the test statistic, degrees of freedom, and p-value. Then make a decision to either reject or fail to reject Ho. Decision is made by comparing p-value to level of significance. If p-value < significance level, reject Ho.

	Test Statistic	Degrees of Freedom	p-value
Chi-Square Test	$\chi^2 = \sum \frac{(observed-expected)^2}{expected}$	(*# rows - 1) * (# columns -1)*	Table A.3 or Calculator
Paired T-Test	$t = \frac{\overline{x_d}}{(\frac{s_d}{\sqrt{n_d}})}$	$n_d - 1$	Table A.4 (if one-tailed, divide by two) or calculator
2 Samples Independent T-Test	$t = \frac{\overline{x_1} - \overline{x_2}}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$	Will be given	Table A.4 (if one-tailed, divide by two) or calculator

D – Draw Conclusions

If reject Ho: We have statistically significant evidence to suggest that for <u>population</u>, <u>Ha (in words not symbols)</u>.
If fail to reject Ho: We do not have statistically significant evidence to suggest that for <u>population</u>, <u>Ha (in words not symbols)</u>.