Inference Procedure Template-Hypothesis Testing

PHANTOMS

- **P**arameter
- **H**ypothesis
- **A**ssumptions (Conditions)
- **N**ame the test
- **T**est Statistic
- **O**btain p-value
- **M**ake a decision
- **S**tate conclusion in context

Parameter of Interest	Support your reason for choosing the test by mentioning the parameter of interest and the populations.
Hypothesis- words and symbols	**Symbols:** Null Hypothesis Alternative Hypothesis Ho: Pm=Pf Ha: Pm≠Pf **Words:** where Pm and Pf are the proportion of male and female voters in the city. **Or** Define Ho and Ha in words. Ho: The true proportion of males in the city is equal to the true proportion of females in the city. Ha: The true proportion of males in the city is not equal to the true proportion of females in the city.
Conditions of Test or Assumptions • Random • Normality • Independence	Show actual counts and comparisons. • Name the condition you are addressing. • **Random**- SRS or randomized experiment • **Normality:** If data is given, you must graph it and check for skewness and outliers; pop. distribution is Normal or n ≥30 (for means) • **Normality:** Best to show- n(p-hat)=150(0.32)=48 ≥10 and n(1-p-hat)= 150(1-.32)=102 ≥10 (for proportions) If you are not sure about p, po, p-hat then just show the numbers for partial credit. • **Independence:** Pop ≥10n
Name the Test or Show Formula	**Name the test** 2 proportion z test 2 sample t test, 1 sample t test, 1 proportion z test Or **Show Formula** Show formula with values substituted in to it. Only show the formula with the variables if you are absolutely sure that you know the symbols. Don't confuse p with p-hat.

Test Statistic calculation	**Identify the following:** • Sample means: degrees of freedom • Proportions: show proportions, combined proportion (**Ideally, show these values in the formula**) • z or t test statistic
Obtain P-value	**If using the calculator:** normCDF, tCDF, etc. - show values and identify each value. The two sample t test gives t= 1.27, d.f= 11.7 and p-value of 0.11. This will earn you full credit on the Do part if the numbers are right. There is no chance to earn partial credit when reporting this if any numbers are wrong in the calculator. Recommended to sketch graph and label findings. Label sketch with mean 0 and the z-score. Show the shaded region with the p-value labeled.
Make a decision	• $P < \alpha$ Reject the null hypothesis, statistically significant • $P \geq \alpha$ Fail to reject null hypothesis, not statistically significant *Using the phrase "accept Ho" gets a point deduction on the AP exam
State conclusion	• Assuming Ho is true…. • Interpret P: The probability of getting a value from the sample as extreme as the one observed. • Because our p-value is (less than, greater than alpha we do/do not have evidence • Findings are statistically significant at the alpha= • Conclusion in context.

AP Tips

- If you attempt to answer a question in two different ways then you get graded on the worse of the two responses.
- If you show correct calculator work with wrong supplemental work then you will get graded as if the calculator work was not there.

Commonly used formulas

- Standard Deviation Known z*= $invnorm(\frac{1-c}{2})$
- Means: $n \geq z^*(\frac{\sigma}{me})^2$
- Standard Deviation Unknown t*= $invT(\frac{1-c}{2}), df$

P-values:

- Proportions: normcdf (LB, test statistic)
- Means: normcdf or tcdf (t, UB, DF)

Inference Procedure Template-Confidence Intervals

PANIC

- **P**arameter
- **A**ssumptions
- **N**ame the interval
- **I**nterval
- **C**onclusion in context

Parameter of Interest	Support your reason for choosing the interval you are choosing by mentioning the parameter of interest, the confidence level and the populations.
Conditions of Test or Assumptions • Random • Normality • Independence	Show actual counts and comparisons. • Name the condition you are addressing. • **Normality:** If data is given, you must graph it and check for skewness and outliers; pop. distribution is Normal or n ≥30 (for means) • **Normality:** Best to show- n(p-hat)=150(0.32)=48 ≥10 and n(1-p-hat)= 150(1-.32)=102 ≥10 (for proportions) If you are not sure about p, po, p-hat then just show the numbers for partial credit. • **Independence:** Pop ≥10n
Name the Interval	**Name the interval** 2 proportion z interval, 1 proportion z-interval 2 sample t interval, 1 sample t-interval Or **Show Formula** Only show the formula with the variables if you are absolutely sure that you know the symbols. Don't confuse p with p-hat or po
Test Statistic Calculation (Interval)	Ideally, show formula with values substituted in to it. Then state the Interval endpoints (lower bound-upper bound) **If using the calculator:** normCDF, tCDF, ect. -show values and identify each value The two-proportion z interval gives us the interval -.12234 to .3454. This will earn you full credit on the Do part if the numbers are right. There is no chance to earn partial credit when reporting this if any numbers are wrong in the calculator.
State Conclusion	We can be 95% confidence that the interval from _____to ____ captures the true parameter of the population (in context).