Inference Summary

STEP 4

How to Organize a Statistical Problem: A Four-Step Process		
	Confidence intervals (CIs)	**Significance tests**
STATE:	What *parameter* do you want to estimate, and at what confidence level?	What *hypotheses* do you want to test, and at what significance level? Define any *parameters* you use.
PLAN:	Choose the appropriate inference *method*. Check *conditions*.	Choose the appropriate inference *method*. Check *conditions*.
DO:	If the conditions are met, perform *calculations*.	If the conditions are met, perform *calculations*. • Compute the **test statistic.** • Find the ***P*-value**.
CONCLUDE:	*Interpret* your interval in the context of the problem.	*Interpret* the result of your test in the context of the problem.

CI: statistic ± (critical value) · (standard deviation of statistic)

$$\text{Standardized test statistic} = \frac{\text{statistic} - \text{parameter}}{\text{standard deviation of statistic}}$$

Inference about	Number of samples (groups)	Estimate or test	Name of procedure (TI Calculator function) Formula	Conditions
Proportions	1	Estimate	One-sample z interval for p (1-PropZInt) $\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$	**Random** Data from a random sample or randomized experiment **Normal** At least 10 successes and failures; that is, $n\hat{p} \geq 10$ and $n(1-\hat{p}) \geq 10$ **Independent** observations; *10% condition* if sampling without replacement
		Test	One-sample z test for p (1-PropZTest) $z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$	**Random** Data from a random sample or randomized experiment **Normal** $np_0 \geq 10$ and $n(1-p_0) \geq 10$ **Independent** observations; *10% condition* if sampling without replacement
	2	Estimate	Two-sample z interval for $p_1 - p_2$ (2-PropZInt) $(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$	**Random** Data from random samples or randomized experiment **Normal** At least 10 successes and failures in both samples/groups; that is, $n_1\hat{p}_1 \geq 10, n_1(1-\hat{p}_1) \geq 10,$ $n_2\hat{p}_2 \geq 10, n_2(1-\hat{p}_2) \geq 10$ **Independent** observations and independent samples/groups; *10% condition* if sampling without replacement
		Test	Two-sample z test for $p_1 - p_2$ (2-PropZTest) $z = \frac{(\hat{p}_1 - \hat{p}_2) - (p_1 - p_2)}{\sqrt{\frac{\hat{p}_C(1-\hat{p}_C)}{n_1} + \frac{\hat{p}_C(1-\hat{p}_C)}{n_2}}}$ where $\hat{p}_C = \frac{\text{total successes}}{\text{total sample size}} = \frac{X_1 + X_2}{n_1 + n_2}$	**Random** Data from random samples or randomized experiment **Normal** At least 10 successes and failures in both samples/groups; that is, $n_1\hat{p}_1 \geq 10, n_1(1-\hat{p}_1) \geq 10,$ $n_2\hat{p}_2 \geq 10, n_2(1-\hat{p}_2) \geq 10$ **Independent** observations and independent samples/groups; *10% condition* if sampling without replacement

Inference about	Number of samples (groups)	Estimate or test	Name of procedure (TI Calculator function) Formula	Conditions
Means	1 (or paired data)	Estimate	One-sample *t* interval for μ (TInterval) $\bar{x} \pm t^* \frac{s_x}{\sqrt{n}}$ with df $= n - 1$	**Random** Data from a random sample or randomized experimen **Normal** Population distribution Normal or large sample ($n \geq 30$ **Independent** observations; *10% condition* if sampling without replacement
		Test	One-sample *t* test for μ (T-Test) $t = \frac{\bar{x} - \mu_0}{s_x / \sqrt{n}}$ with df $= n - 1$	**Random** Data from a random sample or randomized experimen **Normal** Population distribution Normal or large sample ($n \geq 30$ **Independent** observations; *10% condition* if sampling without replacement
	2	Estimate	Two-sample *t* interval for $\mu_1 - \mu_2$ (2-SampTInt) $(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}$ df $= \min(n_1 - 1, n_2 - 1)$ or use technology	**Random** Data from random samples or randomized experiment **Normal** Population distributions Normal or large samples ($n_1 \geq 30$ and $n_2 \geq 30$) **Independent** observations and independent samples/groups; *10% condition* if sampling without replacement
		Test	Two-sample *t* test for $\mu_1 - \mu_2$ (2-SampTTest) $t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$ df $= \min(n_1 - 1, n_2 - 1)$ or use technology	**Random** Data from random samples or randomized experiment **Normal** Population distributions Normal or large samples ($n_1 \geq 30$ and $n_2 \geq 30$) **Independent** observations and independent samples/groups; *10% condition* if sampling without replacement
Distribution of categorical variables	1	Test	Chi-square test for goodness of fit (χ^2GOF-Test) $\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$ with df $=$ number of categories $- 1$	**Random** Data from a random sample or randomized experiment **Large sample size:** All *expected counts* at least 5 **Independent** observations; *10% condition* if sampling without replacement
	2 or more	Test	Chi-square test for homogeneity (χ^2-Test) $\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$ with df $=$ (no. of rows $- 1$) (no. of columns $- 1$)	**Random** Data from random samples or randomized experiment **Large sample size:** All *expected counts* at least 5 **Independent** observations and independent samples/groups; *10% condition* if sampling without replacement
Relationship between 2 categorical variables	1	Test	Chi-square test of association/ independence (χ^2-Test) $\chi^2 = \sum \frac{(\text{observed} - \text{expected})^2}{\text{expected}}$ with df $=$ (no. of rows $- 1$) (no. of columns $- 1$)	**Random** Data from a random sample or randomized experiment **Large sample size:** All *expected counts* at least 5 **Independent** observations; *10% condition* if sampling without replacement
Relationship between 2 quantitative variables (slope)	1	Estimate	One-sample *t* interval for β (LinRegTInt) $b \pm t^* (\text{SE}_b)$ with df $= n - 2$	**Linear** True relationship between the variables is linear **Independent** observations; *10% condition* if sampling without replacement **Normal** Responses vary Normally around regression line for all *x*-values **Equal variance** around regression line for all *x*-values **Random** Data from a random sample or randomized experimer
		Test	One-sample *t* test for β (LinRegTTest) $t = \frac{b - \beta_0}{\text{SE}_b}$ with df $= n - 2$	