Confidence Intervals for AP Statistics

Proportions

Name	Statistic	Parameter	Conditions	Formula	Calculator
One-sample *z*-interval for a proportion	$\hat{p}$	p	• Random sample • $n \leq 10\%N$ • $n\hat{p} \geq 10$ and $n(1-\hat{p}) \geq 10$	$\hat{p} \pm z^* \sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$	1-PropZInt
Two-sample *z*-interval for a difference in proportions	$\hat{p}_1 - \hat{p}_2$	$p_1 - p_2$	• Independent random samples or randomized experiment • $n_1 \leq 10\%N_1$ and $n_2 \leq 10\%N_2$ • $n_1\hat{p}_1 \geq 10$, $n_1(1-\hat{p}_1) \geq 10$ $n_2\hat{p}_2 \geq 10$, $n_2(1-\hat{p}_2) \geq 10$	$(\hat{p}_1 - \hat{p}_2) \pm z^* \sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$	2-PropZInt

Means

Name	Statistic	Parameter	Conditions	Formula	Calculator
One-sample *t*-interval for a mean or paired t-interval	$\bar{x}$	μ	• Random sample or randomized experiment • $n \leq 10\%N$ • Population distribution is ≈ normal (given or sample data show no strong skew or outliers) or $n \geq 30$	$\bar{x} \pm t^* \frac{s}{\sqrt{n}}$ df = n – 1	TInterval
Two-sample *t*-interval for a difference in means	$\bar{x}_1 - \bar{x}_2$	$\mu_1 - \mu_2$	• Independent random samples or randomized experiment • $n_1 \leq 10\%N_1$ and $n_2 \leq 10\%N_2$ • For each sample or group, the population distribution is ≈ normal (given or sample data show no strong skew or outliers) or $n \geq 30$	$(\bar{x}_1 - \bar{x}_2) \pm t^* \sqrt{\frac{(s_1)^2}{n_1} + \frac{(s_2)^2}{n_2}}$ df = smaller of $n_1 - 1$ and $n_2 - 1$ OR df = use technology	2-SampTInt

Slope

Name	Statistic	Parameter	Conditions	Formula	Calculator
t-interval for a slope	b	β	• Relationship between *x* and *y* is fairly linear • $n \leq 10\%N$ • For each *x*, the distribution of *y* is ≈ normal • For each x, *y* has the same standard deviation • Random sample or randomized experiment	$b \pm t^* SE_b$ df = n – 2	LinRegTInt

Significance Tests for AP Statistics

Proportions

Name	Null Hypothesis	Conditions	Formula	Calculator
One-sample *z*-test for a proportion	$H_0: p = p_0$	• Random sample • $n \leq 10\%N$ • $np_0 \geq 10$ and $n(1-p_0) \geq 10$	$z = \frac{\hat{p} - p_0}{\sqrt{\frac{p_0(1-p_0)}{n}}}$	1-PropZTest
Two-sample *z*-test for a difference in proportions	$H_0: p_1 - p_2 = 0$	• Independent random samples or randomized experiment • $n_1 \leq 10\%N_1$ and $n_2 \leq 10\%N_2$ • $n_1\hat{p}_c \geq 10$, $n_1(1-\hat{p}_c) \geq 10$ $\hat{p}_c = \frac{X_1+X_2}{n_1+n_2}$ $n_2\hat{p}_c \geq 10$, $n_2(1-\hat{p}_c) \geq 10$	$z = \frac{(\hat{p}_1 - \hat{p}_2) - 0}{\sqrt{\frac{\hat{p}_c(1-\hat{p}_c)}{n_1} + \frac{\hat{p}_c(1-\hat{p}_c)}{n_2}}}$	2-PropZTest

Means

Name	Null Hypothesis	Conditions	Formula	Calculator
One-sample *t*-test for a mean or paired *t*-test	$H_0: \mu = \mu_0$	• Random sample or randomized experiment • $n \leq 10\%N$ • Population distribution is ≈ normal (given or sample data show no strong skew or outliers) or $n \geq 30$	$t = \frac{\bar{x} - \mu_0}{\frac{s}{\sqrt{n}}}$ df = n – 1	T-Test
Two-sample *t*-test for a difference in means	$H_0: \mu_1 - \mu_2 = 0$	• Independent random samples or randomized experiment • $n_1 \leq 10\%N_1$ and $n_2 \leq 10\%N_2$ • For each sample or group, the population distribution is ≈ normal (given or sample data show no strong skew or outliers) or $n \geq 30$	$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{(s_1)^2}{n_1} + \frac{(s_2)^2}{n_2}}}$ df = smaller of $n_1 - 1$ and $n_2 - 1$ OR df = use technology	2-SampTTest

Slope

Name	Null Hypothesis	Conditions	Formula	Calculator
t-test for a slope	$H_0: \beta = \beta_0$	• Relationship between *x* and *y* is fairly linear • $n \leq 10\%N$ • For each *x*, the distribution of *y* is ≈ normal • For each x, *y* has the same standard deviation • Random sample or randomized experiment	$t = \frac{b - \beta_0}{SE_b}$ df = n – 2	LinRegTTest

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Chi-Square

Name	Hypotheses	Conditions	Formula	Calculator
χ^2 test for goodness-of-fit	H_0: The claimed distribution of (categorical variable) is correct. H_a: The claimed distribution of (categorical variable) is incorrect.	• Random sample or randomized experiment • $n \leq 10\%N$ • All expected counts > 5	$\chi^2 = \sum \frac{(observed - expected)^2}{expected}$ df = # of categories – 1	χ^2GOF-Test
χ^2 test for homogeneity	H_0: There is no difference in the distribution of (categorical variable) across populations or treatments. H_a: There is a difference in the distribution of (categorical variable) across populations or treatments.	• Random samples from each population or randomized experiment • $n \leq 10\%N$ • All expected counts > 5	$\chi^2 = \sum \frac{(observed - expected)^2}{expected}$ df = (# of rows – 1) (# of columns – 1)	χ^2-Test
χ^2 test for independence	H_0: There is no association between two categorical variables in a given population or the two categorical variables are independent. H_a: Two categorical variables in a population are associated or dependent.	• Random sample or randomized experiment • $n \leq 10\%N$ • All expected counts > 5	$\chi^2 = \sum \frac{(observed - expected)^2}{expected}$ df = (# of rows – 1) (# of columns – 1)	χ^2-Test