

What is a Confidence Interval

What is a Confidence Interval

Question 1 (3 points) ✓ Saved

Choose the answer(s) that is(are) correct.

3 answers

- ☒ Increasing sample size decreases the width of a confidence interval.
- ☐ Decreasing the confidence level increases the width of a confidence interval.
- ☒ A confidence interval with a 100% confidence level can be computed.
- ☒ Increasing the confidence level increases the width of a confidence interval.
- ☐ Decreasing sample size decreases the width of a confidence interval.

Question 2 (3 points) ✓ Saved

With 80% confidence, for sample proportion 0.42 and sample size 29, what is the upper confidence limit with 2 decimal places?

Your Answer:

0.54

0.54

Answer

Margin of Error - Mean

Margin Mean

Question 3 (4 points) ✓ Saved

What is the margin of error for the population mean at 90% confidence level for the information in [DATA](#). (<--- Click the link to access the data for this problem.)

☐ 0.75

☐ 0.72

☐ 0.73

☒ None of the answers match my calculations

☐ 0.74

$$E = t \cdot \frac{s}{\sqrt{n}} = \frac{1.699(2.1354)}{\sqrt{30}} = 0.66$$

Question 4 (3 points) ✓ Saved

With 90% confidence, for sample mean 412.50, sample standard deviation 12.60, and sample size 35, what is the upper confidence limit with 2 decimal places?

Your Answer:

416.10

Answer

$$\bar{x} + t \cdot \frac{s}{\sqrt{n}}$$

416.10

$$= 412.50 + 1.691 \left(\frac{12.60}{\sqrt{35}} \right) \\ = 416.10$$

Question 5 (4 points) ✓ Saved

Bobo's Bad Burgers fast food claims you will be in and out in 5 minutes. To test this claim, time in minutes from entering Bobo's to receiving the order was secretly recorded. The results are documented in [DATA](#). At a 95% confidence level, does the confidence interval support Bobo's claim?

- ☐ None of the answers match my calculations.
- ☒ The confidence limits (1.62,3.21) reject the claim of 5 minutes. 5 is greater than the upper confidence limit. Performance at Bobo's is incredible.
- ☐ The confidence limits (6.79,8.56) reject the claim of 5 minutes. 5 is less than the lower confidence limit. Audit of Bobo's procedures and employees is recommended.
- ☐ The confidence limits (2.77, 4.54) reject the claim of 5 minutes. 5 is greater than the upper confidence limit. Bobo's performance is exemplary.
- ☐ The confidence limits (4.77,6.58) support the claim of 5 minutes. 5 falls inbetween the confidence limits. Bobo's performance meets the expectation.

Question 6 (3 points) ✓ Saved

Match up the following:

- 3 Rejection of H_0 when H_0 is false, or not rejecting H_0 when H_0 is true
- 4 The risk we are willing to take of a type 1 error, or the type 1 error rate
- 2 Failure to reject H_0 when H_0 is false
- 1 Rejection of H_0 when H_0 is true

1. Type 1 error
2. Type 2 error
3. Not an error
4. α

Question 7 (4 points) ✓ Saved

Match up the following:

- 2 The power of a test = $P(\text{rejecting } H_0 | H_0 \text{ false})$
- 1 The probability of a type 2 error
- 6 Test of this hypothesis requires 2-tailed test with lower reject region bounded by negative critical value and upper reject region bounded by positive critical value
- 3 Reject H_0
- 5 Test of this hypothesis requires 1-tailed test with lower reject region bounded by negative critical value
- 4 Test of this hypothesis requires 1-tailed test with upper reject region

1. β ✓
2. $1 - \beta$ ✓
3. $p\text{-value} < \alpha$ ✓
4. $H_0: \mu \leq 0$ ✓
5. $H_0: \mu \geq 0$ ✓
6. $H_0: \mu = 0$ ✓

Question 8 (3 points)

Match the rules for rejecting H_0 at the right to the following tests

3 Two-tail test with lower and upper reject regions

2 One-tail test with lower reject region

1 One-tail test with upper reject region

4 For any test hypothesis, ANOVA, or Chi Squared, this rule for rejecting H_0 always applies

1. test statistic $>$ positive critical value

2. test statistic $<$ negative critical value

3. test statistic outside interval (negative critical value, positive critical value)

4. pvalue $< \alpha$

Question # 9

3 Test size C battery mean life is at least 25 hours.

4 Testing that a gasoline additive increases mileage, we compute mpg with additive minus mpg without additive for each car. If the mean of the differences is positive enough, action will be required to implement the additive.

1 An effective vaccine would reduce the proportion of exposed persons contracting a disease. A pharmaceutical company wants to test the effectiveness of a new vaccine in preventing a certain disease. It is expected that 40% of unvaccinated exposed people will contract the disease. A group of 48 exposed persons volunteered to be vaccinated. Later, two of the volunteers contracted the disease. Test $H_0: \pi \geq 0.40$ (vaccine ineffective) at $\alpha = 0.01$.

5 Run times (msec) of a new phone app developed by GotYourGP and established competitor WeTrackYou.Inc. are logged in a data file. At $\alpha = 0.05$, are the run times of GotYourGP and WeTrackYou.Inc comparable?

2 Given weights of 31, 29, 26, 33, 40, 28, 30, and 25,

1. 1-tailed test of proportion with negative critical value

2. 2-tailed test of mean with both negative and positive critical values

3. 1-tailed test of mean with negative critical values

4. 1-tailed test of paired-data with positive critical value

5. 2-tailed test of means of 2 independent populations

Question 10 (3 points) ✓ Saved

Match problems to procedures.

4 4 Does the data validate the normal probability distribution assumption?

3 3 Do contingency table classification values matter?

2 2 A multinomial probability distribution describes the distribution of counts across multiple levels of a variable. A special case is the binomial discrete probability distribution. For each level of a variable, which is common to multiple populations, equality of distributions can be tested.

1 1 Data were gathered in an experiment comparing the effects of three insecticides in controlling a certain species of parasitic beetle. Each observation represents the number of such insects found dead in a certain fixed area treated with an insecticide.

1. ANOVA
2. Chi-square test of homogeneity
3. Chi-square test of independence
4. Chi-square test of goodness of fit

Test H0 - Proportion

Proportion

Question 11 (4 points)

An Air Quality instrument logs 0 when standards are not met and 1 when standards are met. The log is saved to file [DATA](#). First, compute the proportion meeting standards as the mean of Air Quality values. Second, at alpha = 0.10 (sensitive, exploratory), test the hypothesis that proportion of times that air quality meets standards is at least 90%.

- ☐ The pvalue of 0.062 indicates that the data provide weak evidence against H0: $\pi \geq 0.90$. H0 is rejected at $\alpha = 0.10$.
- ☐ The pvalue of 0.006 indicates that the data provide overwhelming evidence against H0: $\pi \geq 0.90$. H0 is rejected at $\alpha = 0.10$. Send out an air quality alert.
- ☒ The pvalue of 0.966 indicates that the data provide insignificant evidence against H0: $\pi \geq 0.90$. H0 is not rejected at $\alpha = 0.10$. The status quo remains unchanged.
- ☐ None of the answers are correct.
- ☐ The pvalue of 0.022 indicates that the data provide strong evidence against H0: $\pi \geq 0.90$. H0 is rejected at $\alpha = 0.10$. The status quo has changed.

Test H0 - Mean

TestH0 - Mean

Question 12 (4 points)

The Lawnpoke Golf Association (LGA) has established rules that manufacturers of golf equipment must meet for their products to be acceptable for LGA events. BatOutaHell Balls uses a proprietary process to produce balls with a mean distances of 295 yards. BatOutaHell is concerned that if the mean distance falls below 295 yards, the word will get out and sales will sag. Further, if the mean distance exceeds 295 yards, their balls may be rejected by LGA. Measurements of the distances are recorded in [DATA](#). At $\alpha = 0.05$, test the no action hypothesis that the balls have a mean distance of 295 yards.

- ☐ The test statistic is 1.297 and the critical value is 1.734, therefore the test statistics is less than the critical value and the null hypothesis is not rejected. The distance is about 295 yards.
- ☐ The test statistics of 2.238 is greater than the critical value of 1.734, therefore H0 is rejected. It is reasonable to assume that the distance is not 295 yards.
- ☒ The test statistic is 3.003 and the critical value is 1.734, therefore the test statistic is greater than the critical value of 1.734 and the null hypothesis is rejected. The distance is not 295 yards.
- ☐ The test statistic of 1.908 is greater than the critical value of 1.734, therefore H0 is rejected. It is reasonable to assume that the distance is not 295 yards.

$$\alpha = 0.10$$

$$t = \frac{\bar{x} - \mu_0}{s/\sqrt{n}}$$
$$= \frac{287.53 - 295}{10.85/\sqrt{19}}$$
$$= -3$$

Test H0 - Paired Data

Test H0 - Paired

Question 13 (4 points)

The Fast N' Hot food chain wants to test if their "Buy One, Get One Free" program increases customer traffic enough to support the cost of the program. For each of 15 stores, one day is selected at random to record customer traffic with the program in effect, and one day is selected at random to record customer traffic with program not in effect. The results of the experiment are documented in [DATA](#). At $\alpha = 0.05$, test the hypothesis that the mean difference is at most 0 (at best the program makes no difference, or worse it decreases traffic) against the alternative that the mean difference > 0 (the program increases traffic).

- ☐ The pvalue of 0.002 provides overwhelming evidence against H0. H0 is rejected at $\alpha = 0.05$. You decide that the program results in increased customer traffic, overall, and recommend the program be implemented.
- ☐ The pvalue of 0.084 provides weak evidence against H0. H0 is not rejected at $\alpha = 0.05$. You decide the evidence is not strong enough to recommend further evaluation of the program.
- ☐ The pvalue of 0.221 indicates that the data provide insignificant evidence against H0. H0 is not rejected at $\alpha = 0.05$. You decide to conclude the study and not to recommend the program.
- ☒ The pvalue of 0.033 provides strong evidence against H0. H0 is rejected at $\alpha = 0.05$. You decide to recommend further evaluation of the program.
- ☐ The pvalue rejects H0: Mean difference > 0 .

Test H0 - 2 Means

Test H0 2Means

Question 14 (4 points)

BigDeal Real Estate surveyed prices per square foot in the valley and foothills of Hoke-a-mo, Utah. Based on BD's [DATA](#), are prices per square foot equal at $\alpha = 0.01$?

- ☒ The critical value is 2.977 since this is a two-tail scenario. The test statistic is 1.936. Since the test statistic $<$ the critical value, the test statistic does not lie in the area of rejection. Do not reject the null hypothesis. The prices per square foot are equal at $\alpha = .01$
- ☐ The critical value is 2.977 since this is a two-tail scenario. The test statistic is 1.513. Since the test statistic $<$ the critical value, the test statistic does not lie in the area of rejection. Do not reject the null hypothesis. The prices per square foot are equal at $\alpha = .01$
- ☐ The critical value is 2.977 since this is a two-tail scenario. The test statistic is 2.239. Since the test statistic $<$ the critical value, the test statistic does not lie in the area of rejection. Do not reject the null hypothesis. The prices per square foot are equal at $\alpha = .01$
- ☐ The critical value is 2.977 since this is a two-tail scenario. The test statistic is 3.207. Since the test statistic $>$ the critical value, the test statistic does lie in the area of rejection. Reject the null hypothesis. The prices per square foot are not equal at $\alpha = .01$

ANOVA - 1

ANOVA - 1

Question 15 (4 points)

National Bearings manufactures bearings at plants located in Portland Oregon, Houston Texas, and Jacksonville Florida. To measure employee knowledge of Total Quality Management (TQM), six employees were randomly selected at each plant and tested. The test scores for these employees are given in [DATA](#). Managers want to know if, on average, knowledge of TQM is equal across the 3 plants. Test equality of mean scores at $\alpha = 0.05$.

- ☐ The F value of 1.326 is $<$ the F critical value of 3.682, therefore do not reject equality of means. Knowledge of TQM is equal across the 3 plants.
- ☐ The F value of 6.349 is $>$ the F critical value of 3.682, therefore reject the equality of means. Knowledge of TQM is not equal across the 3 plants.
- ☒ The F value of 9 is $>$ the F critical value of 3.682, therefore reject the equality of means. Knowledge of TQM is not equal across the 3 plants.
- ☐ The F value of 3.419 is $<$ the F critical value of 3.682, therefore do not reject equality of means. Knowledge of TQM is equal across the 3 plants.

ANOVA - 2

ANOVA - 2

Question 16 (4 points)

To test whether the mean time to mix a batch of adhesive is the same for machines produced by four manufacturers, TiteBondMax obtained DATA on the time (minutes) needed to mix the materials. Test whether the machines have equal mean mixing time at $\alpha = 0.01$.

- ☐ The data provide strong evidence against H_0 : Equal means at pvalue 0.013. The mixing machines are not all equal.
- ☒ The data provide weak evidence against H_0 : Equal means at pvalue 0.072. Equality of means remains plausible.
- ☐ None of the answers are correct.
- ☐ The data provide extreme evidence against H_0 : Equal means at pvalue 0.001. The mixing machines are not all equal.
- ☐ The data provide insignificant evidence against H_0 : Equal means at pvalue 0.514. The machine are considered equal.
- ☐ The pvalue 0.0001 is extreme evidence that the machines are not all the same.

Pivot Table

Question 17 (4 points)

To balance inventory at Otto's Optometry, customer Gender and Eye Condition were collected in DATA. Make a 2x2 pivot table with Gender in rows and Eye Condition in columns. The pivot table is

- ☒

Count of Eye Condition	Column Labels			
Row Labels	Bifocals	Farsighted	Nearsighted	Grand Total
Female	29	9	17	55
Male	9	9	11	29
Grand Total	38	18	28	84
- ☐

Count of Gender	Column Labels			
Row Labels	Bifocals	Farsighted	Nearsighted	Grand Total
Female	15	9	20	44
Male	10	15	15	40
Grand Total	25	24	35	84
- ☐

Count of Eye Condition	Column Labels			
Row Labels	Bifocals	Farsighted	Nearsighted	Grand Total
Female	22	9	16	47
Male	17	15	5	37
Grand Total	39	24	21	84
- ☐ None of the answers match my table
- ☐

Count of Eye Condition	Column Labels			
Row Labels	Bifocals	Farsighted	Nearsighted	Grand Total
Female	13	27	5	45
Male	8	24	7	39
Grand Total	21	51	12	84

Question 18 (3 points)

Given the following contingency table with category labels A, B, C, X, Y, and Z, what is the expected count with 1 decimal place in the joint category of C and X?

	X	Y	Z
A	17	10	17
B	15	6	2
C	8	1	5

Your Answer:

~~6.9~~ 6.9

Answer

	X	Y	Z	
A	17	10	17	
B	15	6	2	
C	8	1	5	14
	40			81

Expected Count =

$$\frac{(40)(14)}{81} = 6.9$$

ChiSquare - Critical Value

ChiSquare - Critical Value

Question 19 (4 points)

What is the critical value for level of significance and table parameters in DATA?

☐ 11.143

☐ 5.991

☒ 18.475

☐ None of the answers are correct.

☐ 22.307

$$\begin{aligned} df &= k - 1 \\ &= 8 - 1 \\ &= 7 \end{aligned}$$

$$\chi^2_{.01, 7} = 18.475$$

Chi Square - Test of Independence

ChiSquare - Test of Independence

Question 20 (4 points)

DATA contains Part Quality data of three Suppliers. At $\alpha = 0.05$, does Part Quality depend on Supplier, or should the cheapest Supplier be chosen?

- ☐ Pvalue of 0.008 rejects the assumption of independence of Part Quality and Supplier. Further supplier evaluation is recommended.
- ☐ Pvalue of 0.0008 rejects the assumption of independence of Part Quality and Supplier. Further supplier evaluation is recommended.
- ☒ Pvalue of 0.039 rejects the assumption of independence of Part Quality and Supplier. Further supplier evaluation is recommended.
- ☐ The assumption of independence of Part Quality and Supplier cannot be rejected. Choose the cheapest Supplier.
- ☐ None of the answers fit the data.

Question 21 (4 points)

A sales region has been divided into five territories, each of which was believed to have equal sales potential. The actual Sales Volume for several sampled days is logged in **DATA**. At $\alpha = 0.05$, do the territories have equal Sales Volume?

- ☐ H_0 : Territories have equal Sales Volume is not rejected with pvalue 0.334. The counts are consistent with the model of equal proportions.
- ☒ H_0 : Territories have equal Sales Volume is rejected with pvalue 0.012. The counts are not consistent with the model of equal proportions. Territories have unequal Sales Volume.
- ☐ None of the answers are correct
- ☐ H_0 : Territories have equal Sales Volume is not rejected with pvalue 0.074. The counts are consistent with the model of equal proportions.
- ☐ H_0 : Territories have equal Sales Volume is rejected with pvalue 0.041. The counts are not consistent with the model of equal proportions. Territories have unequal Sales Volume.