

Topics: Confidence Intervals

1. For each of the following statements, indicate whether it is True/False. If false, explain why.

I. The sample size of the survey should at least be a fixed percentage of the population size in order to produce representative results.

Ans. False

Explanation:-

- The results depend on the size(n) of the sample. The sample size should have atleast 30 observations.

II. The sampling frame is a list of every item that appears in a survey sample, including those that did not respond to questions.

Ans. FALSE

Explanation:-

- The sampling frame is a list of every items in the Target population from which the sample is selected.

III. Larger surveys convey a more accurate impression of the population than smaller surveys.

Ans. TRUE

Explanation:-

Large sample size will result in less standard deviation compared to small size. Thus we can say larger sample is more accurate

2. *PC Magazine* asked all of its readers to participate in a survey of their satisfaction with different brands of electronics. In the 2004 survey, which was included in an issue of the magazine that year, more than 9000 readers rated the products on a scale from 1 to 10. The magazine reported that the average rating assigned by 225 readers to a Kodak compact digital camera was 7.5. For this product, identify the following:

A. The population

B. The population

Ans. All readers = 9000

C. The parameter of interest

Ans. Average, sampling size, scale.

D. The sampling frame

Ans. 9000

E. The sample size

Ans. 225

F. The sampling design

Ans. Voluntary response

G. Any potential sources of bias or other problems with the survey or sample

Ans. It is possible that only those who were particularly pleased or only who are displeased with the product participated in the survey which can make the results unreliable.

3. For each of the following statements, indicate whether it is True/False. If false, explain why.

I. If the 95% confidence interval for the average purchase of customers at a department store is \$50 to \$110, then \$100 is a plausible value for the population mean at this level of confidence.

Ans. TRUE

II. If the 95% confidence interval for the number of moviegoers who purchase concessions is 30% to 45%, this means that fewer than half of all moviegoers purchase concessions.

Ans. FALSE

Explanation:-

- We have evidence in that direction but we cannot confirm 100% based on this data. We have to consider the values out of this range (i.e. more than 95% confidence interval).

III. The 95% Confidence-Interval for μ only applies if the sample data are nearly normally distributed.

Ans. FALSE

Explanation:-

- With a large enough sample, the central limit theorem implies a normal sampling distribution regardless of the distribution of the data.

4. What are the chances that $\bar{X} > \mu$?

- A. $\frac{1}{4}$
- B. $\frac{1}{2}$
- C. $\frac{3}{4}$
- D. 1

Ans. (B) $\frac{1}{2}$.

Explanation:-

- This is pure assumption. There is a 50% chance that the sample mean (\bar{X}) greater than the population mean (μ).

5. In January 2005, a company that monitors Internet traffic (WebSideStory) reported that its sampling revealed that the Mozilla Firefox browser launched in 2004 had grabbed a 4.6% share of the market.

- I. If the sample were based on 2,000 users, could Microsoft conclude that Mozilla has a less than 5% share of the market?

➤ **Refer from Yash Bhosale Assignment-2 Answer.ipynb**

- II. WebSideStory claims that its sample includes all the daily Internet users. If that's the case, then can Microsoft conclude that Mozilla has a less than 5% share of the market?

➤ **Refer from Yash Bhosale Assignment-2 Answer.ipynb**

- III. WebSideStory claims that its sample includes all the daily Internet users. If that's the case, then can Microsoft conclude that Mozilla has a less than 5% share of the market?

6. A book publisher monitors the size of shipments of its textbooks to university bookstores. For a sample of texts used at various schools, the 95% confidence interval for the size of the shipment was 250 ± 45 books. Which, if any, of the following interpretations of this interval are correct?

- A. All shipments are between 205 and 295 books.

Ans. Incorrect

Explanation:-

- The interval of (205,295) is for 95% confidence not for 100%

B. 95% of shipments are between 205 and 295 books.

Ans. Incorrect

Explanation:-

- The interval doesn't describe individual shipments.

C. The procedure that produced this interval generates ranges that hold the population mean for 95% of samples.

Ans. Correct

Explanation:-

- 95% of intervals created in this way contain the true population mean.

D. If we get another sample, then we can be 95% sure that the mean of this second sample is between 205 and 295.

Ans. Incorrect.

Explanation:-

- The interval doesn't describe the mean of another sample.

E. We can be 95% confident that the range 160 to 340 holds the population mean.

Ans. Incorrect.

Explanation:-

- The interval doesn't correspond to a 95% confidence level.

7. Which is shorter: a 95% z -interval or a 95% t -interval for μ if we know that $\sigma = s$?

- A. The z -interval is shorter
- B. The t -interval is shorter
- C. Both are equal
- D. We cannot say

Ans. (A) The z -interval is shorter

Questions 8 and 9 are based on the following: To prepare a report on the economy, analysts need to estimate the percentage of businesses that plan to hire additional employees in the next 60 days.

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8. How many randomly selected employers (minimum number) must we contact in order to guarantee a margin of error of no more than 4% (at 95% confidence)?

- A. 600
- B. 400
- C. 550
- D. 1000

Ans. 600

Explanation:-

- $P=0.50$
- $Z=1.960$ for 95% confidence interval
- $N=(z/M)^2 (p)(1-p)$
- $N=(1.960/0.04)^2 (0.5)(1-0.5)$
600.25

9. Suppose we want the above margin of error to be based on a 98% confidence level. What sample size (minimum) must we now use?

- A. 1000
- B. 757
- C. 848
- D. 543

Ans. 848

Explanation:-

- $Z = 2.576$ for 98% confidence interval
- $0.04 = 2.326 * \sqrt{\frac{0.5*0.5}{n}}$
$$n = \frac{(2.326)^2 * 0.5 * 0.5}{(0.04)^2}$$

➤ $\frac{1.3525}{0.0016}$

➤ $845.35 \approx 848$