

## 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 to produce representative results.
  - II. The sampling frame is a list of every item that appears in a survey sample, including those that did not respond to questions.
  - III. Larger surveys convey a more accurate impression of the population than smaller surveys.

Ans:

- i. The following statement represents False.

The representative of the sample depends on various factors, including the sampling method and the nature of the population, In some cases, a small , well-designed sample can provide representative results while in others a larger sample may be necessary.

- ii. The following statement represents False.

The sampling frame is a list of every item that cloud potentially appear in a Survey sample, not necessarily those that did not respond to questions.

- iii. The following statement represents True.

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 parameter of interest
  - C. The sampling frame
  - D. The sample size
  - E. The sampling design
  - F. Any potential sources of bias or other problems with the survey or sample

Ans:

Code file attached

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

Ans:

i. The following statement is true.

ii. The following statement is False.

The statement " the 95% confidence interval for the number of moviegoers, who purchase concession is 30% to 45% does not necessarily mean that fewer than half of all moviegoers purchase concession.

iii. The following statement is false.

The 95% confidence interval for mean population does not strictly require, the sample data to be nearly normally distributed.

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

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

Ans:

The probability that a randomly selected value from a dataset is greater than the Mean depends on the distribution of the data. In perfectly symmetric and Normal distribution, the probability that a random value is greater than the Mean is 0.05(or  $\frac{1}{2}$ )

So, the answer is:

B .1/2

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?
  - 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?

Ans:

i. File attached

ii. Assuming a census with all daily internet users.

In the case, you don't need hypothesis testing or code because you are assuming That the sample includes all daily internet users.

The observed proportion of 4.6% directly represented the entire population.

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  $250 \pm 45$  books. Which, if any, of the following interpretations of this interval are correct?
- A. All shipments are between 205 and 295 books.
  - B. 95% of shipments are between 205 and 295 books.
  - C. The procedure that produced this interval generates ranges that hold the population mean for 95% of samples.
  - D. If we get another sample, then we can be 95% sure that the mean of this second sample is between 205 and 295.
  - E. We can be 95% confident that the range 160 to 340 holds the population mean.

Ans:

- a. Incorrect
- b. Incorrect
- c. Correct
- d. Incorrect
- e. Incorrect

7. Which is shorter: a 95%  $z$ -interval or a 95%  $t$ -interval for  $\mu$  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:

Option: C

We know that  $\sigma = s$

Then the  $t$ -distribution converges to the standard normal ( $z$ ) distribution as the sample size increases, which means that the critical values for the  $z$ -interval and  $t$ -interval will be the same for a given confidence level.

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.

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: Option A

code file attached

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: Option C

code file attached