

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.
 - 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.

Q1(1) _Solution: **False**

According to Central Limit theorem a sample size of $n \geq 30$ is more than enough.

Q1(2) _Solution: **False**

As we know that sample is a representation of population, sometimes sampling frame may not have all the items where there is a chance of bias towards only some items.

Q1(3) _Solution: **True**

More no on variable/features the better the prediction

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

Q2(A) _Solution: all the PC magazine readers

Population=9000

Q2(B) _Solution:

Population size, mean/average, sample size, rating scale.

Q2(C) _Solution: Total Population size of 9000

Q2(D) _Solution: Sample Size, $s=225$

Q2(E)_Solution: a voluntary response because you can't force someone to take a survey.

Q2(F)_Solution: PC magazine readers vs the whole population outside pc magazine readers who has interest in electronic cameras (or) who buys cameras.

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 μ only applies if the sample data are nearly normally distributed.

Q3(1) _Solution: True

Q3(1) _Solution: False

The above information implies only for 30 to 45% of moviegoers at 95% confidence and not to every moviegoer that is in the population.

Q3(1) _Solution: False

The 95% Confidence-Interval for μ applies even if the sample data are not nearly normally distributed. The distribution of the mean will be approximately normal regardless of the shape of the population distribution.

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

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

Q4_Solution: Option B

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?

Q5_Solution:

The solution for the above question is attached in the .ipynb format as mentioned by the assignment team.

The file [Assignment 2_set4Q5.ipynb](#) contains the solution to the above question.

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.
 - 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

Q6_Solution: Option C

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

Q7_Solution: Option A

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

Q9_Solution:

$Z=1.96$ at 95% CI

$$n = (z^2 * p * (1-p)) / \text{Margin of Error}^2.$$

$$n = (1.96^2 * 0.5 * 0.5) / 0.04^2 = 600.25.$$

Therefore, the nearest value is 600.

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

Q9_Solution:

$Z=2.33$ at 98% CI

$$n = (z^2 * p * (1-p)) / \text{Margin of Error}^2.$$

$$n = (2.33^2 * 0.5 * 0.5) / 0.04^2 = 847.56 (\text{humans so integer outcome is expected})$$

Therefore, the nearest value is 848.