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.

ANS: I) False, It depends on the size and design of the population. A large sample does not necessarily produce great results.

II) False, The sampling frame is a list of every member of the population from which the sample was drawn, not just the items that appear in the survey sample

III) True and false, A larger sample size can lead to more accurate results if the sample is selected and designed appropriately. However, a sample that is too large can be wasteful and unnecessary, and a smaller sample size can be more efficient and still provide accurate results if it is well-designed.

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:

The population: The population in this survey is all readers of PC Magazine who have used Kodak compact digital cameras.

The parameter of interest: The parameter of interest is the true average rating of Kodak compact digital cameras given by all readers of PC Magazine who have used them.

The sampling frame: The sampling frame is all readers of PC Magazine who have used Kodak compact digital cameras.

The sample size: The sample size is 225 readers.

The sampling design: The sampling design is not explicitly stated in the problem, but it appears to be a convenience sample, where readers of PC Magazine who were willing to participate in the survey were included in the sample.

The survey is biased as only the readers from PC magazine have participated in the survey and the sample size is too small.

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.

Ans :

I) True, Since the 95% confidence interval for the average purchase of customers at a department store is $50 to $110, it means that if the study were repeated many times, 95% of the confidence intervals generated would contain the true population mean. Therefore, it is plausible that the population mean lies within this interval, including the value of $100.

II) False, A 95% confidence interval for the proportion of moviegoers who purchase concessions between 30% to 45% means that we are 95% confident that the true proportion of all moviegoers who purchase concessions lies within this interval. It is possible that more than half of moviegoers purchase concessions since 45% is below 50%.

III) True, The 95% confidence interval for the population mean is based on the Central Limit Theorem

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

    A. ¼
    B. ½
    C. ¾
    D. 1

Ans : D

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) No we cannot conclude that Mozilla has less than a 5% share of the market since the sample size is only 2000 users.

II) If WebSideStory's claim that their sample includes all daily Internet users is true, then this would imply that their sample is a census of the population of interest, rather than a sample. In this case, there would be no need for statistical inference, as the sample proportion of 4.6% would be an exact estimate of the true proportion of Internet users who use the Mozilla Firefox browser. Microsoft would then be able to conclude with certainty that the true proportion is less than 5%.

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.

ANS : B is correct

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

    A. The z-interval is shorter
    B. The t-interval is shorter
    C. Both are equal

D. We cannot say

ANS: 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

Ans : A

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 : B