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
The results depends on the size(n) of the sample. The sample size should min 30 observation

    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, sampling frame is list of respond question but not the non respond question

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

Ans : True
Larger sample means less SD thus we can say larger sample means 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

Ans : 9000

    B. The parameter of interest

Ans : Rating of the camera 7.5

    C. The sampling frame

Ans : All the readers of PC Magazine

    D. The sample size

Ans : 225

    E. The sampling design

Ans : Voluntary response

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

Ans: Selection of bias and problems based on survey

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 : The 95% confidence interval for the average purchase of customers at a department store is $50 to $110. Which means that there is a 95% chance that the population mean will fall between $50 and $110. Hence, as $100 falls between $50 and $110, it is a plausible value for the population mean at this confidence level

    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
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% confidance interval).

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

Ans : False
We should have a moderately large sample(usually at least larger than 30 for many cases), the central limit theorem implies that the sampling distribution is normal regardless of the data itself

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

    A. ¼
    B. ½
    C. ¾
    D. 1

Ans : D 1 , Mean of Sample mean is equal to Population mean

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?

Ans : No

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 : Yes

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

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

Ans: Inorrect
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
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: Inorrect
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
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 σ =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
Because t-critical value cannot be smaller than z-critical value

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 : n=number of employee, Assume P=0.5 ,q=0.5 margin error =4%=0.04
for 95% CI Z= 1.96

$$ME = Z * \sqrt{\frac{(p * q)}{n}}$$

0.04 = 1.96 * sqrt((.5*.5)/n)
n = (1.96^2*.05*.05)/.04^2 = 0.9604/0.0016 = 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

Ans : At 98% CI ,Z=2.326
Using Marin error formula
ME = Z * sqrt((p*q)/n)
0.04= 2.326 * sqrt((0.05*0.05)/n)
n= 1.352/0.0016 = 845.35 = C