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.
   There is not a fixed percentage that the sample size must be in relation to the population size. The appropriate sample size depends on factors like the desired level of confidence, margin of error, and variability in the population.

   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**.
   Because the sample is the subset of the sampling frame. The sampling frame consist of the data present in sample and also consists of the data those who did not respond to questions.

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

   ANS: True,
   In general, larger surveys tend to provide a more accurate representation of the population compared to smaller surveys.

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:

A) More than 2000 readers

B) Giving the rate between 1 to 10

C) The readers of PC magazine

D) The sample size is 225.

E) Voluntary response

F) In this case, who participated volunteered cannot represent who do not participate.so we can't generalize.

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**

    we cannot confirm 100% based on this data. We have to consider the values out of this range.

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

ANS: False

    The confidence level has many factors not only μ. The Central Limit Theorem allows the use of the 95% confidence interval for the μ even if the underlying data distribution is not normal, as long as the sample size is sufficiently large.

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

    A. ¼

    B. ½

    C. ¾

    D. 1

ANS: The sample mean is depends on the sample data we took to calculate, so sometimes it can be greater or less than the Mean. The given information inefficient to conclude that. The chance is ¼.

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: We cannot say that Microsoft cannot conclude that Mozilla has a less than 5% share of market Based on 2000 users concluding the result on a that much larger filed will not provide accurate result.

   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, because we are given that WebSideStory claims that its sample includes all the daily internet users.

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: **A)** Incorrect. Not all but 95% of the shipments are between 205 to 295

   B) Correct. Because the confidence interval is between this range.

   C) Correct

   D) Incorrect. Because based on the sample the range can be varies.

   E) Incorrect. Because it is already given that the range of 205 and 295 have the 95%

confidence interval.

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: 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.

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 employers
Margin of error=0.04
For 95% confidence interval, the critical value Z=1.96
By using the formula,
$n = (z^2 \cdot p \cdot (1-p))/E^2$

$n = 1.96^2 * 0.5 * 0.5/(0.04^2)$
   $= 600$

Answer is **option A. 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: For 95% confidence interval, the critical value Z= 2.326

n = 2.326^2*0.5*0.5/(0.04^2)

   =848

Answer is **option C. 848**