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.

Answer-:

1) False- The produce representative results it depends on the sample(n) size number of sample size rather than percentage of the population size. A sample of n>=30 is considered a sufficiently large amount.
2) True
3) 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

Answer-:

A. Population= All of the PC Magazine Readers, only if we are interested in the readers of PC magazines, or else the population is all the users of different brands of electronics.

B. The parameter of interest = size, average, scale

C. The sampling frame = 9000

D. The sample size = 225

E. The sampling design= Voluntary Response

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

The key to random selection is that there is no bias involved in the selection of the sample, but surveys conducted by the magazines often suffer from nonresponse bias and also the source of this data is from readers that read PC magazine vs the whole population that do not read PC magazine yet they use these different brands of electronics

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.

Answer-:

1) Yes, True
2) False
3) False

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

   A. ¼
   B. ½
   C. ¾
   D. 1

Answer-:

B (This is only an assumption, because if we consider more than 50% for sample mean to be greater than the probability of getting a lower value gets overshadowed because sample mean has an equal chance to be lesser than 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?

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?

Answer-:

(I) Now suppose the population proportion share of market by the Mozilla is = p

Then,

Null Hypothesis is → H0 is p> or equal to 5%

→{meaning Mozilla has more than 5 percent or equal to 5 percent share of the market}

Alternate Hypothesis is → Ha is p< 5%

→{meaning Mozilla has a less than five percent share of the market}

This test statistic which will be used is One-sample z-test for proportions;

$$TS = \frac{\hat{p}-p}{\sqrt{\frac{p(1-p)}{n}}} \sim N(0,1)$$

where, $\hat{p}$ = is the sample proportion of share of the market that is grabbed by the Mozilla in year 2004 = 4.6%

n = sample of users = 2,000

So, the test statistics is = $= \frac{0.046-0.05}{\sqrt{\frac{0.05(1-0.05)}{2000}}}$

$= -0.821$

Therefore, z-test statistics is -0.821.

Now, the level of significance at 5%, the z table will give the critical value of -1.96 to the left-tailed test.

Now the test statics value is greater than critical value of z, and thus we don't have sufficient evidence to reject the null hypothesis because it will not be placed in the rejection part or region.

So we can conclude that the Mozilla has equal to 5% or more than 5 % share of the market.

(II)

Please check attached notebook.

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.

Answer-:

A) False statement
B) False statement
C) True statement
D) False statement
E) False statement

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

Answer-:

A. 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

Answer-:

for 4 % error, Z value for 95 %
0.04=1.96 xsqrt((0.5x0.5)/n)
Sqrt(n)= (1.96x0.5)/0.04
n =600.25=600

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

Answer-:

for 4 % error, Z value for 98 %
0.04=2.326 xsqrt((0.5x0.5)/n)
Sqrt(n)= (2.326x0.5)/0.04
n =845=848

C. 848