Topics: Confidence Intervals

1. For each of the following statements, indicate whether it is True/False. If false, explain why.

1. The sample size of the survey should at least be a fixed percentage of the population size in order to produce representative results.

Answer: False

Reason: A sample size of 30 is considered large enough, but that may or may not be adequate.

1. The sampling frame is a list of every item that appears in a survey sample, including those that did not respond to questions.

Answer: False

Reason: The population is generic and the sampling frame is a specific list of all items in the population. Hence the sampling frame includes those that did not respond to questions.

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

Answer: True

Reason: The larger conveys a more accurate impression of the population as larger surveys involve large sample size which reduces the chances of error.

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:

1. The population

Sol: All the readers of PC Magazine

1. The parameter of interest

Sol: Rating of Camera (7.5)

1. The sampling frame

Sol: Readers that rated the products (around 9000)

1. The sample size

Sol: 225

1. The sampling design

Sol: Voluntary Response

1. Any potential sources of bias or other problems with the survey or sample Sol: Selection of the readers, selection of the issue which will contain the survey.

3. For each of the following statements, indicate whether it is True/False. If false, explain why.

1. 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.

Answer: True

Reason: Confidence Interval identifies the collection of values for the population parameter that are consistent with the observed sample.

1. 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.

Answer: False

Reason: We have evidence in that direction but we cannot confirm 100% based on this data. We have to consider the value out of this range (i.e. more than 95% confidence interval).

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

Answer: False

Reason: 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 *X* ?

1. ¼
2. ½
3. ¾
4. 1

Answer: B. (1/2)

Reason: This is a pure assumption. There is 50% chance that the sample mean(X) is greater than the population mean(µ).

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.

1. If the sample were based on 2,000 users, could Microsoft conclude that Mozilla has a less than 5% share of the market?

Answer: As (p value = 0.2058) > (α = 0.05); Accept Null Hypothesis i.e. Mozilla market share > 5% Thus, Microsoft cannot conclude that Mozilla has a less than 5% share of the market.

Solution in Visual Studio code (Basic Stat (set-3)

1. 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: This means that the 4.6% is the population percentage. Comparing it with Microsoft's claim that Mozilla has a less than 5% share of the whole market is True. Hence, we can conclude that Mozilla has a less than 5% share of the market.

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?

1. All shipments are between 205 and 295 books.

Answer: Incorrect, the interval of (205,295) is for 95% confidence not for 100%

1. 95% of shipments are between 205 and 295 books.

Answer: Incorrect, the interval does not describe individual shipments.

1. The procedure that produced this interval generates ranges that hold the population mean for 95% of samples.

Answer: Correct, 95% of intervals created in this way contain the true population mean.

1. If we get another sample, then we can be 95% sure that the mean of this second sample is between 205 and 295.

Answer: Incorrect, the interval does not describe the mean of another sample

1. We can be 95% confident that the range 160 to 340 holds the population mean. Answer: Incorrect, the interval doesn’t correspond to a 95% confidence interval

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

1. The z-interval is shorter
2. The t-interval is shorter
3. Both are equal
4. 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)?

1. 600
2. 400
3. 550
4. 1000

Answer: (A) Here, n=number of employees, Assume p =0.5, q=0.5, Margin of error=0.04 For confidence interval of 95%, the critical value Z=1.96

ME = Z\*√pq/n

n = 1.962 \* 0.5 \* 0.5/0.042  = 0.9604/0.0016 = 600.25 = 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?

1. 1000
2. 757
3. 848 D. 543

Sol: (C) Here, Z=2.33

0.04 = 2.33\* √0.5\*0.5/n

= 2.332\*0.5\*0.5/0.042

= 1.357/0.0016

=848.26

= 848