**Topics: Confidence Intervals**

1. For each of the following statements, indicate whether it is True/False. If false, explain why.
2. The sample size of the survey should at least be a fixed percentage of the population size in order to produce representative results.
3. The sampling frame is a list of every item that appears in a survey sample, including those that did not respond to questions.
4. Larger surveys convey a more accurate impression of the population than smaller surveys.

Ans: 1.  True: The representation of the survey results should have a sample size. The sample size must be a fixed percentage of the total population size of the survey.

2. False: The sampling frame refers to a list of an item which responds to the question and not the ones which do not respond to the questions.

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

1. *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:
2. The population

Ans: all the readers

1. The parameter of interest

Ans: survey of satisfaction - rating of products from 1 to 10.

1. The sampling frames

Ans: readers participated in survey -9000+

1. The sample sizes

Ans: 225 answered for kodak hence 225.

1. The sampling designs

Ans: convenience sampling or purposive sampling

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

Asking all the readers to respond to a survey means that it let members of the population choose whether or not they would be in the sample. This is a voluntary response sample, which almost always produces biased results.

**The direction of bias is more likely** 89% which is probably an overestimate of the percentage of all readers that rate the product.

1. For each of the following statements, indicate whether it is True/False. If false, explain why.
2. 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. A 95% confidence interval is a range of values that you can be 95% certain contains the true mean of the population

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.

Ans : True. Since 30 to 40% moviegoers only purchases concessions.

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

Ans: False. The Central Limit Theorem tells us that regardless of the shape of our population, the sampling distribution of the sample mean will be normal as the sample size increases.  if we were to take 100 different samples and compute a 95% confidence interval for each sample, then approximately 95 of the 100 confidence intervals will contain the true mean value (**μ**)

1. What are the chances that ?
2. ¼
3. ½
4. ¾
5. 1

Ans: A > µ is rarely happens. As per CLT will be mostly close the population mean µ.

1. 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.
2. If the sample were based on 2,000 users, could Microsoft conclude that Mozilla has a less than 5% share of the market?
3. 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) Mozilla has more than 5 percent or has equal to 5% share in the market based on 2000 users sample data.

(II) Yes, Mozilla has a less than 5% share of the market.

**Step-by-step explanation:**

It is given in the question that in the month of January 2005, WebSideStory, an organization which checks internet traffic had reported its sampling revealed which Mozilla Firefox browser had launched in the year 2004 has grabbed a share of 4.6% share of the global market.

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

Then, Null Hypothesis is :     **H0 is p≥5%** {meaning Mozilla has more than 5 percent or equal to 5 percent share of the market}

Alternate Hypothesis, :   **Ha is p<5%**  {meaning Mozilla has a less than five percent share of the market}

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

TS = ~ N(0,1)

where,    = 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  =   0.046-0.05/

                                       = -0.821

Therefore, z-test statistics is -0.821.

As per question it is not mentioned properly or stated the degree of significance, assume degree of significance is 5%. Now, the level of significance at 5 percent, 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) Now it is claimed by WebSideStory that their sample contains all the internet users using daily. Thus, it means 4.6 percent share of market shows the entire population.

So, we conclude that the Mozilla has a share in the, market of less than 5 percent.

1. 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?
2. All shipments are between 205 and 295 books. – False: We cannot confirm all shipments are in between these sizes. 95% possible as per CLT
3. 95% of shipments are between 205 and 295 books. – True as per CLT
4. The procedure that produced this interval generates ranges that hold the population mean for 95% of samples. - : True. CLT and sampling distribution states the same.
5. If we get another sample, then we can be 95% sure that the mean of this second sample is between 205 and 295. : - True , mean of all samples under this normally distributed population will have 95% of this mean range.
6. We can be 95% confident that the range 160 to 340 holds the population mean. – True: this range is the 2σ i.e. 2\*standard deviation range. So population mean will be same in this range also.
7. Which is shorter: a 95% *z*-interval or a 95% *t*-interval for *μ* if we know that σ =s?
8. The z-interval is shorter
9. The t-interval is shorter
10. Both are equal
11. We cannot say

Ans: A , t score will give a slightly larger value than z score.

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.

1. 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)?
2. 600
3. 400
4. 550
5. 1000

## Ans: According to Cochran’s Sample Size Formula,

## The sample size n0 = z2pq/e2

Margin of error, e =4% = 0.04

C= 95% = 0.95

p= 0.5 (assuming 50% probability)

q=1-p = 0.5

Z95% = Z0.975 = 1.96

The sample size is then,

n = 1.962 \* 0.25/0.042 = 600

1. Suppose we want the above margin of error to be based on a 98% confidence level. What sample size (minimum) must we now use?
2. 1000
3. 757
4. 848
5. 543

## Ans: According to Cochran’s Sample Size Formula,

## The sample size n0 = z2pq/e2

Margin of error, e =4% = 0.04

C= 98% = 0.98

p= 0.5 (assuming 50% probability)

q=1-p = 0.5

Z98% = Z0.99= 2.33

The sample size is then,

n = 2.332\* 0.25/0.042 = 848

n =848.