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.

1) **False**
   The survey should have a specific sample size, a fixed percentage of population that helps to analyse the data well to give more accurate results/model and also provided showerity of model.
2) **FALSE**
   The sampling frame is a list of every item which respond to the question and Not the ones which do not responds to the question.
3) **TRUE**
   Larger surveys convey a more accurate impression to the population than smallar survey involves 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:

    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

X = 225
n = 9000

A) Readers of Magazine = 9000
B) The parameters of interest
   Rating of the camera 7.5

C) The sampling frame is 90000
D) The sample size is 225
E) Random Variable
F) Possible only two population of selecting ,mode of rating.

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.

$\Longrightarrow$

1) **TRUE**.
These shows large sample mean much precision of 95% confidence interval is range of values and content true mean of population.
2) **FALSE.**
These shows that beneficial to moviegoers to purchase movie tickets.
3) **FALSE**.
The 95% confidence interval for population mean can be applied to distribution that are not normal but they are easy to understand in symmetric Distribution.

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

    A. ¼
    B. ½
    C. ¾
    D. 1

$\Longrightarrow$

There is 50% chances that the sample mean is greater 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?

⟹

(I) Let **p** = *population proportion share of the market by Mozilla*

So, **Null Hypothesis**, H_0 : p $\geq$ 5% {means that Mozilla has more than or equal to 5%share of the market}

Alternate Hypothesis, H_A : p < 5% {means that Mozilla has a less than 5% share ofthe market}

The test statistics that will be used here is **One-sample z-test for proportions**;

$$\text{T.S.} = \frac{\hat{p}-p}{\sqrt{\frac{p(1-p)}{n}}} \sim N(0,1)$$

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

n = sample of users = 2,000

So, the test statistics = $\frac{0.046-0.05}{\sqrt{\frac{0.05(1-0.05)}{2,000}}}$

= -0.821

The value of z-test statistics is -0.821.

Since in the question we are not given with the level of significance so we assume it to be 5%. **Now, at 5% level of significance the z table gives a critical value of -1.96 for left-tailed test.**

Since the value of our test statistics is more than the critical value of z, so we have *insufficient evidence to reject our null hypothesi*s as it will not fall in the rejectionregion.

Therefore, we conclude that Mozilla has more than or equal to 5% share of themarket.

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:

(II) We are given that WebSideStory claims that its sample includes all the dailyInternet users. This means that the 4.6% share of the market represents the whole population.

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?

   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.

A) **FALSE**
B) **FALSE**
C) **TRUE**
D) **FALSE**
E) **FALSE**

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

A) THE Z_INTERVAL IS SHORTER
A Z-value for 95% confidence interval = 1.96 and a
T_value for 95% confidence interval = 2.262
Therefore 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

Here margin of error is o.o4
We assume p and q equal to 0.5
For 95% confidence interval the critical value z = 1.96,
Margin of error = (Z * (p*q)^1/2)/n

0.04 = (1.96(0.05 % 0.05) ^1/2)/n

n = 600.96

⇨ 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

⟹

Here margin of error is 0.04

We take value of p and q is 0.5

For 98% confidence interval the critical value z =2.33

Margin of error = (Z * (p*q)^1/2)/n

0.04 = (2.33(0.05 *0.05)^1/2)/n

n = 848

⇨ n = 848.