**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.

**Soln. :**

**True**

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

**Soln. :**

**False**, A list of all the elements in the population from which the sample is drawn. Frame is needed so that everyone in the population is identified so they will have annual opportunity for selection as a subject.

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

**Soln. :**

**True**

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

Soln. :

n = 9000

1. The parameter of interest

Soln. :

Rating of Interest.

1. The sampling frame

Soln. :

Readers

1. The sample size

Soln. :

x = 225

1. The sampling design

Soln. :

P = x/n=225/9000=0.025

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

Soln. :

The bias is that we might have selected the population that might have voted too low or too high for the rating of the product that may give significantly different result as compared to the whole population.

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.

Soln. :

**True**

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.

**Soln. :**

**False,**  The confidence interval tells you the probability of the population mean falling with-in the interval, but doesn’t give you any more information on the distribution.

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

**Soln. :**

**True**

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

**Soln. :**

D. 1 (Mean of Sample means is equal to population mean)

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?

**Soln. :**

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

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?

**Soln. :**

We are given that WebSideStory claims that its sample includes all the daily Internet users.

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.

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.

**Soln. :**

**Incorrect**

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

**Soln. :**

**Correct**

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

**Soln. :**

**Incorrect**

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

**Soln. :**

**Correct**

1. We can be 95% confident that the range 160 to 340 holds the population mean.

**Soln. :**

**Incorrect**

1. Which is shorter: a 95% *z*-interval or a 95% *t*-interval for *μ* if we know that σ =s?
2. The z-interval is shorter
3. The t-interval is shorter
4. Both are equal
5. We cannot say

Soln. :

Suppose σ = s and thus sample size are the same. At 95% confidence, z  is approximately 1.96, meanwhile t have higher values which only decreases and will approach to 1.96 as sample size increases as we can see at the t-table;

Thus with t confidence level value is larger than z, this will result to broader confidence interval in t confidence intervals.

Thus the answer is:

A. The z confidence 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.

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

**Soln. :**

**Using the population proportion be p = 0.5, E = 0.04, from standard normal table,**

**z = 1.96 for 95% confidence interval for a sample size :**

**Values are given as,**

**Margin of error = 0.04 , z = 1.96 (critical value of 95%)**

**Using the formula when proportion is not given**

**n =0.25\*(z/E)2 = 0.25\*(1.96/0.04)2 = 600**

**Required Sample Size, n = 600**

**Thus, Option A. 600 is correct.**

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

**Soln. :**

**Using the population proportion be p = 0.5, E = 0.04, from standard normal table,**

**z = 2.33 for 98% confidence interval for a sample size :**

**Based on a 98% confidence level:**

**Z = 2.33 (critical value of 98%)**

**E = 0.04**

**Using the formula when proportion is not given**

**n =0.25\*(z/E)2 = 0.25\*(2.33/0.04)2 = 848**

**Required Sample Size, n = 848**

**Thus, Option C. 848 is correct.**