**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 representative results.in order to produce.**

**Ans: False**. The results depend on the size(n) of the sample. The sample size should have at least 30 observations.

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

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

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

**Ans: 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:**

1. **The population**

**Ans:** All readers of PC magazine

1. **The parameter of interest**

**Ans:** Ratings of camera (7.5)

1. **The sampling frame**

**Ans:** All Readers :- 9000

1. **The sample size**

**Ans**: 225

1. **The sampling design**

**Ans:** Voluntary response.

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

**Ans**:   It is possible that the readers who particularly like or dislike the product are participated in survey which can make result unreliable.

1. **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.**

**Ans: 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**.

**Ans: False.**

Since the proportion of moviegoers, who do not like to purchase from the concession is more than 50%, the stated claim is found to be false

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

**Ans: False.**

With the large enough sample, the central limit theorem implies a normal sampling distribution regardless of the distribution of the data.

1. **What are the chances that ?**

1. **¼**
2. **½**
3. **¾**
4. **1**

**Ans:**

There are **50% chances** that our sample **mean is greater than population mean.**

1. **In January 2005, a company that monitors Internet traffic (Web Side Story) 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?**

1. **Web Side Story 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:**

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

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

Then, Null Hypothesis is H0 is p >= 5%

Alternate Hypothesis is, H1 is p < 5%

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

**TS = (p^ - p)/((p(1-p)/n))0.5 ~ N(0,1)**

where, p^ = is the sample proportion of share of the market that is grabbed by the Mozilla in year 2004 = 4.6% = 0.046

**n = sample of users = 2,000**

So, the test statistics is = 0.046 - 0.05/ ((0.05(1-0.05)/2000))0.5    **= -0.821**

**Therefore, z-test statistics is -0.821.** 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.

1. **Web Side Story 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?**

 Now it is claimed by Web Side Story 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?**

1. **All shipments are between 205 and 295 books.**

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

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

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

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

**Ans:**

We have given that, the 95% confidence interval for the size of the shipment was 250 + 45 and 250 - 45

From given,

the **95% confidence interval for the size of the shipment was 250 + 45 and 250 – 45 books.**

**= 295 and 205**

**Option A is Incorrect**

**Option B is Incorrect**

**Option C is Correct**

**Option D is Incorrect**

**Option E is Incorrect**

1. **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**

**Ans:**

95% confidence interval for mean is shorter for z-interval because t-critical is greater than z-critical value. Z-interval is always shorter t-critical value cannot be smaller than z-critical value. **So 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.**

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)?**

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

**Ans:**

Here, n= number of employees,

P=0.5, q= 0.5

Margin of error is 4% i.e. 0.04

For 95% confidence interval z-value is 1.96

Therefore,

Margin of error = z \* ((p\*q)/n)0.5

n = 1.962 \* 0.5 \* 0.5 / 0.042

n= 0.9604/0.0016

n= 600.25

**So, answer A 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?**

1. **1000**
2. **757**
3. **848**
4. **543**

**Ans:**

For 98% confidence interval z-value is 2.326

Here, n= number of employees,

P=0.5, q= 0.5

Margin of error is 4% i.e. 0.04

Therefore,

Margin of error = z \* ((p\*q)/n)0.5

n = 2.3262 \* 0.5 \* 0.5 / 0.042

n= 1.3525/0.0016

n= 845.35

**So, answer C is correct.**