**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.**

* (I) False. The sample size of a survey does not need to be a fixed percentage of the population size in order to produce representative results. The key factor in determining the sample size is the desired level of precision and confidence in the survey results.

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

(III) True. Large sample size will result in less standard deviation compared to small sample size. Thus we can say a larger sample is more accurate.

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**
3. **The parameter of interest**
4. **The sampling frame**
5. **The sample size**
6. **The sampling design**
7. **Any potential sources of bias or other problems with the survey or sample**

* (A) The population for this survey would be all readers of PC Magazine who participated in the survey

(B) The parameter of interest for this product is the average rating assigned by all readers of PC Magazine to the Kodak compact digital camera in the 2004 survey.

(C) The sampling frame for this survey would be all readers of PC Magazine who participated in the survey.

(D) The sample size refers to the number of participants or respondents in a survey or study. In this case, the sample size is the number of readers who rated the Kodak compact digital camera.

According to the information provided, 225 readers rated the camera. Therefore, the sample size for this product is 225.

(E) The sampling design for the survey conducted by PC Magazine in 2004 can be described as a voluntary response sampling. This means that all readers of the magazine were invited to participate in the survey, and it was up to them to decide whether or not to take part.

(F) Limited sample size, Lack of comparison with other brands.

Readers who had extremely positive or negative experiences with the Kodak compact digital camera might have been more motivated to participate in the survey, leading to a biased representation of satisfaction levels.

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.**
3. **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.**
4. **The 95% Confidence-Interval for *μ* only applies if the sample data are nearly normally distributed.**

* (I) True

(II) False. The statement is false because a 95% confidence interval does not provide information about the exact proportion of moviegoers who purchase concessions. It only provides a range within which the true proportion is likely to lie. In this case, the confidence interval suggests that the proportion of moviegoers who purchase concessions could be anywhere between 30% and 45%, but it does not indicate whether it is less than or greater than half of all moviegoers.

(III) False. The 95% Confidence-Interval for μ does not rely on the assumption that the sample data are nearly normally distributed. The Central Limit Theorem states that as the sample size increases, the sampling distribution of the sample mean approaches a normal distribution, regardless of the shape of the population distribution. Therefore, even if the sample data are not normally distributed, the 95% Confidence-Interval for μ can still be calculated and provide a reliable estimate of the population mean

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



1. **¼**
2. **½**
3. **¾**
4. **1**

* ﻿Option B.

This is pure assumption. There is a 50% chance that the sample mean(X) is greater than 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?**

* (I) 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

(II) We are given that WebSideStory claims that its sample includes all the daily

Internet users.

This means that 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.**
3. **95% of shipments are between 205 and 295 books.**
4. **The procedure that produced this interval generates ranges that hold the population mean for 95% of samples.**
5. **If we get another sample, then we can be 95% sure that the mean of this second sample is between 205 and 295.**
6. **We can be 95% confident that the range 160 to 340 holds the population mean.**

* (A.) This interpretation is incorrect. The 95% confidence interval means that we are 95% confident that the true size of the shipment falls within the interval of 205 to 295 books. It does not guarantee that all shipments will fall within this range.

(B.) This interpretation is incorrect. The 95% confidence interval does not refer to the percentage of shipments within that range. It means that if we were to take multiple samples and calculate confidence intervals for each, 95% of those intervals would contain the true population mean.

(C.) Yes, it is correct to interpret that the procedure that produced this interval generates ranges that hold the population mean for 95% of samples. This means that if we were to take multiple samples from the population and calculate 95% confidence intervals for each sample, approximately 95% of those intervals would contain the true population mean size of the shipment of textbooks to university bookstores.

(D.) Yes, if we obtain another sample, we can be 95% confident that the mean of this second sample will fall between 205 and 295 books.

(E. ) Yes, we can conclude with 95% confidence that the population mean of textbook shipments falls within the range of 160 to 340 books, based on the provided confidence interval of 250 ± 45 books.

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**

* Option 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.**

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**

* here, n=number of employers, Assume P=0.5,q=0.5, Margin of Error=0.04

For 95% confidence interval, the critical value Z= 1.96

ME = Z \* (√pq/n)

0.04 = 1.96 \* (√0.5∗0.5/n)

n = (1.962∗0.5∗0.50/0.42\*0.42)

= 0.9604/0.0016

= 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**

* Z= 2.5760

0.04 = (2.326 \* √(0.5∗0.5)/n)

n= (2.326\*2.326∗0.5∗0.50)/.042

= 1.3525/0.0016

= 845.35

= We must use minimum sample size of 848