**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.

**ANS**:- **FALSE**. A sample size of 30 is considered large enough, but

that may or may not be adequate.

The appropriate sample size needs to be determined based on

statistical methods and considerations specific to the study and

design goals.

II.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**

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

**ANS**:- **TRUE.**

This is because larger sample sizes tend to reduce sampling error and increase the reliability of estimates derived from the data. With a larger sample size, there's a greater likelihood of capturing

the diversity and variability present within the population.

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**  
 **ANS**:- The population in this scenario would be **all readers of PC  
 magazine** who were asked to participate in the survey regarding

their satisfaction with different brands of electronics.

**B. the parameter of interest**  
 **ANS**:- The parameter of interest in this scenario would be **the**

**population mean satisfaction rating for the Kodak compact**

**digital camera among all readers of PC Magazine**  who

participated in the survey regarding their satisfaction with

different brands of electronics.

**C**. **The sampling frame**

**ANS**:-The sampling frame in this scenario would be **all readers of**

**PC magazine** who were asked to participate in the survey

regarding their satisfaction with different brands of electronics.

**D. The sample size**

**ANS**:- The sample size for the Kodak compact digital camera in

this scenario is **225 readers**.

**E**. **The sampling design**

**ANS**:- PC Magazine asked all of its readers to participate in the

survey, which means that **readers who chose to participate did so**

**voluntarily.** This type of sampling design relies on individuals who

are readily available or accessible to the researcher, rather than

employing a random or systematic method of selection.

Therefore, it's a form of **non-probability sampling**.

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

**or sample**.

**ANS**:- Participants who voluntarily respond to the survey may have

**different opinions** than those who chose not to participate.

Readers of PC Magazine may not represent the general population,

leading to results that are not generalizable beyond this specific

demographic.

3. 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**

In a 95% confidence interval**,** there's a 95% probability that the

true population parameter (in this case, the population mean) falls

within the interval. Since $100 falls within the confidence interval

of $50 to $110, it is indeed a plausible value for the population

mean at the 95% confidence level.

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.

**ANS**:- **False**.

The statement is false because a 95% confidence interval of 30%

to 45% means that we are 95% confident that the true proportion

of moviegoers who purchase concessions falls within this range.

It does not necessarily imply that fewer than half of all movie

goers purchase concessions. The true proportion could be any

where within the interval, including being greater than 50%.

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

**ANS**:- **True**.

The 95% confidence interval for the population mean assumes that the sample data are approximately normally distributed. This

ensures the validity of the confidence interval calculation. If the data are not nearly normally distributed, the confidence interval

may not be accurate, and alternative methods might be needed.

4. What are the chances that ?

1. ¼
2. **½**
3. ¾
4. 1

**ANS**:- if we consider the options provided : **B. ½ (Half)**

This suggests that there's an equal chance (50%) of the sample mean

being greater than the population mean, which is a simplification. In

reality, the likelihood depends on the specific circumstances of the

sampling and the characteristics of the population.

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.

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

**ANS**:- **NO**

Z-score: -0.820782681668124

p-value: 0.20588503245107104

Fail to reject the null hypothesis: Mozilla does not necessarily have

less than a 5% market share.

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**:- **YES**

If WebSideStory's claim is accurate and their sample truly

represents all daily Internet users, then Microsoft can

conclude that Mozilla has less than a 5% share of the market

because the observed sample proportion (4.6%) is less than

the assumed population proportion (5%) under the null

hypothesis.

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?

1. All shipments are between 205 and 295 books.

**ANS**:- **Option A is incorrect** because it suggests all shipments

definitively fall within the stated range, which is not what a

confidence interval represents. It gives a range within which

we estimate the true population mean to lie.

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

**ANS**:- **This interpretation is incorrect**.

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

**ANS**:- **This interpretation is correct.** The confidence interval is constructed in a way that, if the procedure were repeated many times, 95% of the resulting intervals would contain the true population mean.

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

**ANS**:- **This interpretation is incorrect**. The confidence interval pertains to the population mean, not to individual sample means.

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

**ANS**:- **This interpretation is incorrect.**

7. 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**:- **The z-interval is shorter.**

A 95% z-interval is shorter becauseit uses the standard normal

distribution, which has a narrower distribution compared to the

t-distribution used in a t-interval when the sample size is small. So,

the correct answer is A.

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)?

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

**ANS**:- To ensure a margin of error of no more than 4% at a 95%

confidence level, we use the formula

**n = ( Z x σ / E)2**

where Z is the Z-score for 95% confidence (approximately 1.96)

σ is the standard deviation (approximated as 0.5 for a binary

outcome)

E is the margin of error (0.04)

**n = ( 1.96 x 0.5 / 0.04)2 = 600.25**

Rounded up to the nearest whole number, the minimum number of

employers we must contact is 601. **So, the closest option is A. 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?

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

**ANS**:-

**n = ( Z x σ / E)2**

where,

Z is the Z-score corresponding to the desired confidence level (for

98% confidence, it's approximately 2.33)

σ is the standard deviation (approximated as 0.5 for a binaryoutcome)

E is the margin of error (0.04)

**n = (2.33 x 0.5 / 0.04)2 = 848.015**

Rounding up to the nearest whole number, the minimum sample size

required is approximately 849. **Therefore, the closest option is**

**C. 848**