**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:-

The statement is generally false. The representativeness of a sample does not solely depend on the sample size being a fixed percentage of the population size. While having a sufficiently large sample size is important for achieving precision and reducing sampling error, the representativeness of the sample depends on how well the sample is selected from the population.

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:-

The statement is false. The sampling frame is a list of all the elements or units in the population from which the sample is drawn, not the sample itself. It is used as a reference to create the sample and ensure that every member of the population has an equal chance of being included.

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:
2. The population

Ans:- 9000 readers

1. The parameter of interest

Ans:- Parameter of interest is 7.5

1. The sampling frame

Ans:- the sampling frame is the list of all readers of PC Magazine who were eligible and invited to participate in the survey about their satisfaction with different brands of electronics.

1. The sample size

Ans:- 225

1. The sampling design

Ans:- simple random sampling

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

Ans:- Without specific details provided about the sampling methodology and survey administration, it's challenging to identify potential sources of bias or other problems with certainty.

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.

Ans:- False. The 95% confidence interval ($50 to $110) indicates that we are 95% confident that the true population mean falls within this range. However, it does not mean that any specific value within that range is more plausible than another. So, while $100 is within the interval

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. The 95% confidence interval (30% to 45%) refers to the range within which we are 95% confident the true proportion of moviegoers who purchase concessions lies. It does not imply that fewer than half of all moviegoers purchase concessions. The interval gives a range for the estimate, but the true proportion could still be greater than 45%.

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

Ans:- False. The Central Limit Theorem suggests that the sampling distribution of the sample mean becomes approximately normal as the sample size increases, regardless of the distribution of the population.

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

Ans:- (B) ½ If the sampling distribution is approximately normal.then the probability that xˉ>μ is 0.5 or 1/2.

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?

Ans:- If WebSideStory surveyed 2,000 users and found that Mozilla's market share is 4.6%, Microsoft might have reason to believe that Mozilla's share is less than 5%, but it depends on the details and statistical analysis.

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?

Ans:- If WebSideStory surveyed all daily Internet users and found a 4.6% market share for Mozilla, then Microsoft can reasonably conclude that Mozilla's market share is less than 5%, assuming the survey is accurate and representative of all users.

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.

Ans:- This is not correct. The confidence interval does not state that all shipments are between 205 and 295 books. It's about the population mean.

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

Ans:- This is not correct. The confidence interval does not mean that 95% of shipments individually fall between 205 and 295 books. It's about the range within which the population mean is likely to fall.

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

Ans:- This is not entirely correct. The confidence interval does provide a range that is likely to contain the population mean for 95% of samples, but it doesn't guarantee it for every sample.

1. 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 is correct. The 95% confidence interval indicates that if we were to take many samples and create confidence intervals from them, 95% of those intervals would contain the true population mean.

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

Ans:- This is not correct. The confidence interval 160 to 340 is not supported by the information given, and it's not accurate to say we are 95% confident that this range holds the population mean based on the provided interval.

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

Ans:- Given that both intervals are constructed at a 95% confidence level:

The t-interval will be wider because the t-distribution has larger critical values compared to the z-distribution.

The z-interval will be 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

Ans:-

n=E2Z2×p×(1−p)

where:

• n is the required sample size.

• Z is the Z-score corresponding to the desired confidence level. For a 95% confidence level, Z is approximately 1.96.

• p is the estimated proportion of businesses planning to hire additional employees (it's common to use 0.5 for maximum variability, which gives the maximum required sample size).

• E is the desired margin of error.

Let's plug in the values:

n=(0.04)2(1.96)2×0.5×(1−0.5)

n=0.00163.8416×0.25

n≈0.00160.9604

n≈600.25

So, the minimum number of randomly selected employers must be 601 to guarantee a margin of error of no more than 4% at a 95% confidence level.

Therefore, the correct answer is:

A. 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

Ans:- To calculate the minimum sample size required for a margin of error of no more than 4% at a 98% confidence level, we'll use the same formula:

n = {Z^2 \times p \times (1-p)}{E^2}

where:

Z is the Z-score corresponding to the desired confidence level. For a 98% confidence level, ( Z ) is approximately 2.33.

p is the estimated proportion of businesses planning to hire additional employees (it's common to use 0.5 for maximum variability).

E is the desired margin of error.

Plug in the values:

[ n = \frac{(2.33)^2 \times 0.5 \times (1-0.5)}{(0.04)^2}

[ n = \frac{5.4289 \times 0.25}{0.0016}

[ n \approx \frac{1.357225}{0.0016}

[ n \approx 848.266

So, the minimum sample size required for a margin of error of no more than 4% at a 98% confidence level is approximately 849.

Therefore, the correct answer is:

C. 848