**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.

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
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
8. Ans: The population in this context would be all the readers of PC Magazine who participated in the 2004 survey.

B) This parameter represents the true, population-level average satisfaction rating for this specific product. In this case, it is the overall average rating that PC Magazine readers would give to the Kodak compact digital camera, which is reported as 7.5 in the survey results.

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C. The Sampling Frame: The sampling frame is the list or source from which the survey sample was drawn. In this case, the sampling frame would be all PC Magazine readers who received the survey request and had the chance to participate in the survey.

D. The Sample Size: The sample size mentioned in the survey is 225 readers who rated the Kodak compact digital camera.

E. The Sampling Design: The sampling design used in this survey is not explicitly mentioned, but it appears to be a convenience sample or a voluntary response sample.

F. Potential Sources of Bias or Other Problems:

**Voluntary Response Bias**

**Sampling Bias**

**Non-Response Bias**

**Scale and Context**

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.

ans: who were eligible to participate in the survey and could potentially rate their satisfaction with different brands of electronics. It includes the entire readership of PC Magazine M) The Population: The population in this survey consists of all PC Magazine readers.

N.) The Parameter of Interest: It represents the average satisfaction level for this particular product among all eligible readers.

O.) The Sampling Frame: The sampling frame is the list or source from which the survey sample was drawn. In this case, the sampling frame would be all PC Magazine readers who received the survey request and had the opportunity to participate in the survey.

P. )The Sample Size: The sample size mentioned in the survey is 225 readers who rated the Kodak compact digital camera.

Q.) The Sampling Design: The survey design used in this case is not explicitly mentioned, but it appears to be a convenience sample or a voluntary response sample. PC Magazine asked all its readers to participate, and those who chose to respond were included in the sample.

R.) Potential Sources of Bias or Other Problems:

**Voluntary Response Bias**

**Sampling Bias**

**Non-Response Bias**

**Scale and Context**

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

Ans: False. The 95% confidence interval for the population mean (μ) does not require the sample data to be "nearly" normally distributed.

However, for small sample sizes, it is still advisable to have relatively normal data or to use alternative methods if normality assumptions are not met.

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?

Ans: ) In a typical scenario, if you take a random sample from a population and calculate the sample mean (X \bar), it is equally likely to be greater than or less than the population mean (*μ*).

Therefore, the chances that *X*>ˉ​*μ* is 1/2 or 0.5.

So, the correct answer is

(B) 1/2.

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.

Ans: If WebSideStory's claim that the sample includes all daily Internet users is accurate and the sample is truly representative of the entire population of daily Internet users, then Microsoft could conclude that Mozilla has a less than 5% share of the market based on the reported 4.6% share.

However, it's important to note that such a claim of having data from all daily Internet users is very ambitious and difficult to verify in practice. Sampling and survey methods are typically used precisely because it's challenging to collect data from an entire population, especially in the context of a global Internet user base. In most cases, there is some level of sampling error and uncertainty associated with survey results.

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

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. Ans: This interpretation is not correct. The confidence interval (250 ± 45) does not make a claim about all shipments. It provides a range within which we are reasonably confident the population mean (average) falls.

B.) This interpretation is not correct either. The confidence interval doesn't make a statement about the proportion of shipments; it's about the range in which the population mean is likely to fall.

C.) This interpretation is correct. A 95% confidence interval means that if we were to take many random samples and calculate confidence intervals in the same way, approximately 95% of those intervals would contain the true population mean. So, this statement accurately describes the nature of confidence intervals.

D.) This interpretation is not quite accurate. The 95% confidence interval doesn't make a statement about a specific sample's mean; it's about the range in which the population mean is likely to fall. If you were to take another random sample and calculate a confidence interval, there is a 95% probability that it would contain the population mean, but you can't make a direct statement about the specific sample mean being in that range.

E.) This interpretation is not correct. The confidence interval you provided is 250 ± 45, so the correct range for the population mean is 205 to 295, not 160 to 340.

So, the correct answer is “C”

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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: ) (A) The z-interval is shorter then t-interval

When the population standard deviation (*σ*) is equal to the sample standard deviation (*s*), you can use a z-interval or a t-interval for estimating the population mean (*μ*. However, the z-interval will be shorter (narrower) than the t-interval for the same level of confidence (e.g., 95%) because the z-distribution has smaller critical values compared to the t-distribution. This means the margin of error for the z-interval is smaller, resulting in a shorter interval. The z-interval is more precise in this scenario.

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. 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: A. 600

sample size calculation:

* *n*=*E*2(*Z*2⋅*p*⋅(1−*p*))​  
  *n* is the required sample size.
* *Z* is the Z-score associated with the desired level of confidence. For 95% confidence, the Z-score is approximately 1.96.
* *p* is the estimated proportion of businesses planning to hire (you can use 0.5 to get the most conservative estimate as it maximizes the sample size).
* *E* is the desired margin of error, which is 4% or 0.04.

*n=0.00163.8416⋅0.25​/0.00160*

*=9604​/0.00160 = 600.2*