**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.

**Solution:** False. The sample size should be determined by statistical power analysis, which considers the factors such as the desired level of precision, the variability of the population, and the level of confidence desired. Fixed percentage is not required.

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

**Solution:** False. The sampling frame includes a list of items that are required for the survey, not just those who also responded.

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

**Solution:** 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

**Solution:** The population is 9000

1. The parameter of interest

**Solution:** The parameter of interest is 7.5

1. The sampling frame.

**Solution:** The sampling frame is all readers of the magazine.

1. The sample size.

**Solution:** The sample size is 225

1. The sampling design.

**Solution:** The sample was selected by inviting readers of the magazine to participate in the survey.

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

**Solution:** The survey appears to be biased as the readers of magazine might have a strong opinion on Kodak compact digital camera or they are potential customers of Kodak camera.

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.

**Solution:** 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.

**Solution:** False. We can be 95% confident that the true population lies between 30% to 45%. There is no specific data to prove that fewer than half of all moviegoers purchase concessions.

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

**Solution:** True

1. What are the chances that ?

1. ¼
2. ½
3. ¾
4. 1

**Solution:** Option B (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?

**Solution:**

Given, p=0.046, n=2000, q=0.954

We know Z=1.96

95% confidence interval for the proportion of web users who are using mozilla is X+- Z

=0.046-0.00918

=0.046+0.00918

=0.0368-0.0551

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?

**Solution:**

For the above case, we have data on the entire population and sample value correctly reflects the population number. Therefore, we can conclude that the share of the Mozilla is less than 5%.

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.

**Solution:** Incorrect. The interval (205,295) is for 95% confidence interval not for 100%.

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

**Solution:** Incorrect. This interval does not describe individual shipments.

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

**Solution:** Correct

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

**Solution:** Incorrect. The interval does not describe the mean of another sample.

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

**Solution:** Incorrect. The interval does not correspond to 95% confidence level.

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

**Solution:** 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

**Solution:**

Formula: n=((Z^2)\*p\*q)/(E^2)

Where, n=sample size, Z=Z score, p=pass percentage, q=failure percentage, E= margin of error

Since we do not know the proportion of businesses that plan to hire, we can use a conservative estimate of 0.5 for p (if half of businesses plan to hire, and half do not). This will give us the largest possible sample size, which will ensure that the margin of error is no more than 4%.

Plugging in the values, we get:

n= ((1.96)^2 \*0.5\*0.5)/0.04^2

n=600.25

Therefore, we need to contact at least 600 employees to guarantee a margin of error of no more than 4% at 95% confidence level.

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

**Solution:**

From the above formula that:

n=((Z^2)\*p\*q)/(E^2)

Here, the confidence interval is 98%.

Therefore, the Z-score for that confidence interval is 2.33.

Assuming all other parameters same, we get,

n= ((2.33^2)\*0.5\*0.5)/(0.04^2)

we get,

n= 848.26

Therefore, we need to contact at least 848 employees to guarantee a margin of error of no more than 4% at 98% confidence level.

Therefore, Option C (848)