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Purpose: **Assignment 2 – Set 3**

Topics: Confidence Intervals

1. For each of the following statements, indicate whether it is True/False. If false, explain why.

    I. The sample size of the survey should at least be a fixed percentage of the population size in order to produce representative results.

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

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

Ans.

- FALSE because the result is depends on the sample size, and that sample contains at least 30 observation or items.

- FALSE because the sampling frame is list of that items which are respond to the questions and only responded questions are the items of survey sample.

- TRUE If we conduct large survey then there is also a large sample size that is it reduces the occurrence of error and we can say that the large sample size has less standard deviation. In other word we can say that larger surveys or larger sample are accurate.

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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
    B. The parameter of interest
    C. The sampling frame
    D. The sample size
    E. The sampling design
    F. Any potential sources of bias or other problems with the survey or sample

Ans.

- Here population is 9000
- Parameter of interest is 7.5

- All readers
- 225
- Response
- Those who are participated in the survey which makes the results untrustworthy.

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3. For each of the following statements, indicate whether it is True/False. If false, explain why.

    I. 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.

    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.

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

Ans.

- TRUE Because the values for the population parameter are identifies the confidence interval
- FALSE Here we have to consider the values that more than 95% confidence interval. And we can't confirm that the total 100% based on this data
- FALSE Usually we should have sample data grater than 30 and from the central limit theorem if mean 0f sample data is approximately equal to population mean that is it is normally distributed

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4. What are the chances that $\overline{X} > \mu$?

    A. ¼
    B. ½
    C. ¾
    D. 1

Ans. Option **D** is correct because 0.5 is the probability that the sample mean is greater than population mean.

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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.

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

    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.

- Given that n = 2000, p = 0.046, q = 1-p = 1- 0.046 = 0.954
  And Z score for 95% confidence interval is 1.96
  Here x = p = 0.046 and σ = xp = 0.043884
  There-fore the 95% confidence interval for Mozilla users is,
  = x± z* σ / (√n) = 0.046±1.96*0.043884/44.721359
  = 0.046±0.00192
  = (0.04408 - 0.04792)

Hence, We can say that the sample data represent the whole population so we say that Mozilla has a less than 5% share of market.

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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?

    A. All shipments are between 205 and 295 books.

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

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

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

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

Ans.

- INCORRECT because the given interval (205,295) is not for 100% is only for 95% C.I.
- INCORRECT because the interval doesn't specify individuals.
- CORRECT because the 95% of interval contains the population mean.

- INCORRECT because the interval doesn't describe the mean of another sample.
- INCORRECT because the given interval doesn't belongs to 95% C.I.

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7. Which is shorter: a 95% *z*-interval or a 95% *t*-interval for μ if we know that σ =s?

    A. The z-interval is shorter
    B. The t-interval is shorter
    C. Both are equal
    D. We cannot say

Ans. A is correct that is 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.

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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)?

    A. 600
    B. 400
    C. 550
    D. 1000

Ans. Given that,
Number of employee = n, and assume that p = 0.5 and q = 0.5 margin of error = 0.04 and for 95% C.I. the Z value is 1.96

Margin of error = Z*√pq/n

0.04 = 1.96*√0.5*0.5/n

n = 1.96^2*0.5*0.5/0.04^2
n = 0.9604/0.0016 = 600.25
n = 600

Hence, the option A is correct

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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?

   A. 1000
   B. 757
   C. 848
   D. 543

Ans. Given that,
Number of employee = n and assume that p = 0.0 & q = 0.5 margin of error = 0.04, Z score for 98% C.I. is 2.33

Margin of error = Z*√pq/n

0.04 = 2.33 √0.5*0.5/n
n = 2.33^2*0.5*0.5/0.04^2
n = 1.357225/0.0016
n = 848.26

Hence, the option C is correct.
