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.

1) i) False → Sample size of 30 is considered large enough but the sample size percentage often varies based on the size of the sample.

ii) False → Sampling frame is a list of all the items in target population

iii) True.

Larger surveys convey more accurate impression because of the large amount of data available to analyse the data.

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

a) The population → Readers of the magazine - 9000

b) The parameter of interest → rating of the product (7.5)

c) Sample frame - readers who took part in survey.

d) Sample size → 225

e) voluntary response

f) we can say that only the readers who felt the user is bad, left most of the reveiws than the users who really liked the product. So we can say that the reveiw of 7.5 rating might be unreliable.

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.

3 i) True. as 100 falls under the range of 50 to 110, we can say that 100 falls under the plausible range of 95%.

ii) False → we can't 100% say that, as we should also consider the values out of the 95% range

iii) For a fairly large data of more the 30 samples, the central limit theorm states that the sampling distribution is normally distributed. , regardless of the data.

4. What are the chances that $\bar{x} > \mu$?

A. ¼
B. ½
C. ¾
D. 1

B) 50% that sample mean ($\bar{x}$) can be greater than population mean (μ).

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. 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?

i) given that

$\bar{x} = 4.6\%$ or 0.046, $n = 2000$, $Z_{95} = 1.96$

$p = 4.6\%$ $\therefore$ $q = 95.4\%$ or 0.954

s not given

$\therefore$ confidence interval formula $\therefore$ $\bar{x} \pm z\sqrt{\frac{\bar{x} \times q}{n}}$

$= 0.046 \pm 1.96 \sqrt{\frac{0.046 * 0.954}{2500}} = 0.046 \pm 0.00918$

$= 0.0368 - 0.0551$

ii) We have the entire population's data; and the sample value reflects that. So, the share is less than 5%.

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. sample is between 205 and 295.

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

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A. False ⇒ The interval is for 95%, not 100%.

B. False ⇒ 95% shows the size of the shipment, not individual shipments.

C. True ⇒ 95% confidence interval holds the population mean

D. False ⇒ One interval cannot determine the mean of another sample

E. False ⇒ This range doesn't fall under the 95% confidence interval.

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

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

A ⇒ 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.

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

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

8) Margin of error $\Rightarrow$ 0.04

n = number of employees.

$\hat{p} = 0.5$, $\hat{q} = 0.5$, $z_{95} = 1.96$

$$M.E = z \times \sqrt{\frac{\hat{p}\hat{q}}{n}}$$

$$0.04 = 1.96 \times \sqrt{\frac{0.5 \times 0.5}{n}}$$

$$n = \frac{1.96^2 \times 0.5 \times 0.5}{(0.04)^2} = 600$$

Ans A

9) $z_{98\%} = 2.326$

using the same values from question 8.

$$0.04 = 2.326\sqrt{\frac{0.5 \times 0.5}{n}}$$

$$n = \frac{2.326^2 \times 0.5 \times 0.5}{0.04^2} = 845.35$$

Ans = C