**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.

**Answer.**

**1.  True:**

**The representation of the survey results should have a sample size. The sample size must be a fixed percentage of the total population size of the survey II. The sampling frame is a list of every item the survey.**

**2. False:**

**The sampling frame refers to a list of an item which responds to the question and not the ones which do not respond to the questions.**

**3. True:**

**The larger conveys a more accurate impression of the population as larger surveys involve large sample size which reduces the chances of error.**

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 =>

**Answer.**

**Random sample = 225**

**Sample mean = 7.5**

1. **Population proportion (p) = x/n**

**= 225/9000 => 0.025**

**Population is more than 9000 people**

1. **The parameter of interest is sample size, average and scale.**

**Rating of the camera=7.5**

1. **Sampling frame is all the readers included in the survey, 9000**
2. **Sample size is 225**
3. **Sampling design is Random sampling**
4. **There is a possibility that the people who participated in the survey are those who have already used the product. They might be the people who only like or dislike the product.**
5. For each of the following statements, indicate whether it is True/False. If false, explain why.
6. 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.
7. 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.
8. The 95% Confidence-Interval for *μ* only applies if the sample data are nearly normally distributed.

**Answer.**

**A) TRUE:**

**The 95% confidence interval for the average purchase of customers at a**

**department store is $50 to $110. Which means that there is a 95% chance that the**

**population mean will fall between $50 and $110. Hence, as $100 falls between $50 and $110, it is a plausible value for the population mean at this confidence level.**

**B) TRUE:**

**The 95% confidence interval for the number of moviegoers who purchase**

**concessions is 30% to 45%, this means that there is a 95% chance that only 30 to 45 % of moviegoers purchase concessions, which is less than 50%. Hence, we can infer that fewer than half of all the moviegoers purchase concessions.**

**c) False:**

**We should have a moderately large sample(usually at least larger than 30 for many cases), the central limit theorem implies that the sampling distribution is normal regardless of the data itself.**

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

**Answer: B**

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?

**Answer:**

**I ) sample = 2000**

**Null hypothesis, H0 is p> =0.05, has more than or equal to 5% share in the market**

**Alternate hypothesis, H1 is p < 0.05, has less than 5% share in the market**

**Taking test statistics, one sample z test for proportion,**

**p-po/ (square root of(po (1- po)/n))**

* **0.046 – 0.05 / (square root of(0.05(1-0.05)/2000))**
* **-0.821**

**Z statistics for 5% is -1.96. so, test statistic value is greater than z critical value. So, null hypothesis is true.**

**II) This indicates that the 4.6% share in the market shows the entire population. Thus, Mozilla has less than 5% of the market share.**

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.

**Answer:**

**At 95% confidence interval, 250 ± 45 books**

**B) True. Its clearly stated that the confidence interval is 95%. So, we are sure that 95% of the shipment is between 205 and 295.**

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

**Answer:**

**Z critical value for 95% is x ± Z(σ/√ n), where z = 1.96**

**For t statistic, we also need to know the degree of freedom.**

**x ± T (s/√ n) , t = 2.262**

1. **The z-interval is shorter because, the T critical value is greater than the z critical value at 95% confidence interval**

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

**Answer:**

**To Construct a 95% CI for p with margin of error equal to 4%: (we are assuming that population proportion is 0.5, since its unknown from question) :**

**Z critical value at 95% CI is 1.96**

**N >= (zalpha/2 /m)2 \* p(1-p)**

**N >= (1.96/0.04)2 (0.5)(1-0.5)**

**N >= (49)2 \* 0.5(0.5)**

**N >= 600.25**

**Option 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

**Answer:**

**Z critical value at 98% CI is 2.326**

**N >= (zalpha/2 /m)2 \* p(1-p)**

**N >= (2.326/0.04) 2 (0.5)(1-0.5)**

**N >= (58.15)2 \*0.5(0.5)**

**N >= 845.35**

**Option C**