

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.  
Ans: True.
  - II. The sampling frame is a list of every item that appears in a survey sample, including those that did not respond to questions.  
Ans: 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.
  - III. Larger surveys convey a more accurate impression of the population than smaller surveys.  
Ans: True
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: product rating
  - 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
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.  
Ans: True
  - 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.  
Ans : True
  - III. The 95% Confidence-Interval for  $\mu$  only applies if the sample data are nearly normally distributed.  
Ans: True

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

- ☒ A.  $\frac{1}{4}$
- B.  $\frac{1}{2}$
- C.  $\frac{3}{4}$
- D. 1

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?  
Ans: No
- 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: Yes

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  $250 \pm 45$  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.

7. Which is shorter: a 95%  $z$ -interval or a 95%  $t$ -interval for  $\mu$  if we know that  $\sigma = s$ ?

- ☒ A. The  $z$ -interval is shorter
- B. The  $t$ -interval is shorter
- C. Both are equal
- D. 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.

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)?

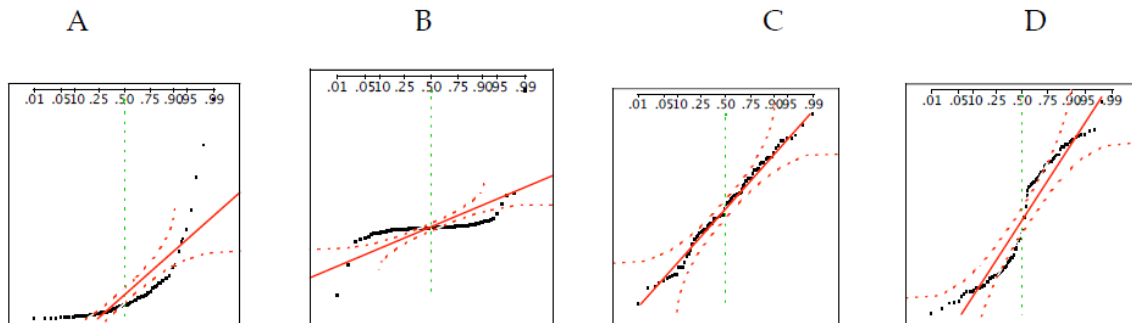
☒ A. 600  
☐ B. 400  
☐ C. 550  
☐ D. 1000

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  
☐ D. 543

10. Examine the following normal Quantile plots carefully. Which of these plots indicates that the data?

1. Are nearly normal? Ans: C
2. Have a bimodal distribution? (One way to recognize a bimodal shape is a “gap” in the spacing of adjacent data values.) Ans: D
3. Are skewed (i.e. not symmetric)? Ans: A
4. Have outliers on both sides of the center? Ans: B



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

The manager of a warehouse monitors the volume of shipments made by the delivery team. The automated tracking system tracks every package as it moves through the facility. A sample of 25 packages is selected and weighed every day.

Based on current contracts with customers, the weights should have  $\mu = 22$  lbs. and  $\sigma = 5$  lbs.

- i) Before using a normal model for the sampling distribution of the average package weights, the manager must confirm that weights of individual packages are normally distributed.  
Ans: False, the individual values do not need to be normally distributed as long as the sample size condition is satisfied
- ii) The standard error of the daily average  $SE(\bar{x}) = 1$ .  
Ans: True. The standard error of the mean is given by the formula  $SE(X) = \sigma / \sqrt{n}$ . For this example, this value is equal to  $SE(X) = 5 / 25 = 1$ .

12. Auditors at a small community bank randomly sample 100 withdrawal transactions made during the week at an ATM machine located near the bank's main branch. Over the past 2 years, the average withdrawal amount has been \$50 with a standard deviation of \$40. Since audit investigations are typically expensive, the auditors decide to not initiate further investigations if the mean transaction amount of the sample is between \$45 and \$55. What is the probability that in any given week, there will be an investigation?

- A. 1.25%  
B. 2.5%  
C. 10.55%  
☒ D. 21.1%  
E. 50%

13. The auditors from the above example would like to maintain the probability of investigation to 5%. Which of the following represents the minimum number transactions that they should sample if they do not want to change the thresholds of 45 and 55? Assume that the sample statistics remain unchanged.

- A. 144  
B. 150  
C. 196  
☒ D. 250  
E. Not enough information

$z = (x - \text{mean}) / \sigma / \sqrt{n}$ ; z-test, because sd is given for the long term  
 $= \pm 5 / 40 / \sqrt{100}$   
 $= \pm 1.25$

The probability of z between those values is 0.7887, so probability of an investigation is  $1 - 0.7887$ , or 0.2113.

For 5%, z has to be  $\pm 1.96$ , so  $1.96 = (5) * \sqrt{n} / 40$   
 $\sqrt{n} = 15.68$   
 $n = 245.86$  or 246

14. An educational startup that helps MBA aspirants write their essays is targeting individuals who have taken GMAT in 2012 and have expressed interest in applying to FT top 20 b-schools. There are 40000 such individuals with an average GMAT score of 720 and a standard deviation of 120. The scores are distributed between 650 and 790 with a very long and thin tail towards the higher end resulting in substantial skewness. Which of the following is likely to be true for randomly chosen samples of aspirants?
- A. The standard deviation of the scores within any sample will be 120.
  - B. The standard deviation of the mean of across several samples will be 120.
  - C. The mean score in any sample will be 720.
  - D. The average of the mean across several samples will be 720.
  - ☒ E. The standard deviation of the mean across several samples will be 0.60

The SEM is  $sd/\sqrt{n}=120/\sqrt{40000}=0.6$

- A. SD will not be 120 of scores in any one sample, especially since we don't know the sample size.
- B. SD of mean across several samples will also not be 120. It will be less; indeed, probably about 0.6
- C. The mean score in any sample will be 720. Maybe, but no reason it couldn't be less or more.
- D. The average of the mean across several samples will be 720. This is certainly possible, but it requires the mean of all samples that sample size, which would be the case
- E. The SEM will be 0.60. This is likely, given the sample size, which even with a lot of skewness will tend towards normality given the sample size. I would use this in calculations. The mean would have an expected value of 720, but in calculations, the SEM is 0.6