

Exam 2- STA 2023H - Fall 2015

Directions: For the multiple choice part make sure you clearly label your answer. If you need extra space please use the extra blank sheet with appropriate labeling.

1. If SAT scores are normally distributed with a mean of 500 and a standard deviation of 100, what minimum score is needed to ensure that you are in the top 7%?

(A) 640 (B) 500 (C) ~~445~~ (D) 650 (E) ~~445~~

2. USA Today reported that swimmer Michael Phelps had "won the USA's heart," according to a USA Today/CNN/Gallup poll conducted at the 2012 Summer Olympics in London. When asked who the hero of the Olympics was, 65 percent of the respondents chose Phelps, who won four gold and two silver medals. The poll of 615 adults, done by telephone, had a margin of error of 4 percent. Which of the following statements best describes what is meant by the 4 percent margin of error?

A) About 4 percent of adults were expected to change their minds between the time of the poll and its publication in USA Today.
B) About 4 percent of adults did not have telephones.
C) About 4 percent of the 615 adults polled refused to answer.
D) Not all of the 615 adults knew anything about the Olympics.
E) The difference between the sample percentage and the population percentage is likely to be less than 4 percent.

3. A binomial random variable X counts the number of successes in n trials. What are the mean and standard deviation of X if the probability of success is .71 and is repeated 145 times?

(A) $\mu = 42.05, \sigma = 5.46$
(D) $\mu = 102.95, \sigma = 5.46$
(C) $\mu = 42.05, \sigma = 29.86$
(D) $\mu = 102.95, \sigma = 29.86$

4. A binomial random variable X counts the number of successes in 50 trials. If $\mu = E(x) = 20$, what is the probability of success?

(A) 0.4 (B) 0.84 (C) 0.6 (D) 0.16 (E) not enough information

5. A random variable X counts the number of successes in 15 independent trials. There is the same probability of success for each trial. If $P(X = 1) = \binom{15}{1} .3^1 .7^{14}$, what is $\mu = E(X)$?

(A) 4.5 (B) 10.5 (C) 3.15 (D) 1.77 (E) 1.35

6. In the standard normal distribution, what is the probability that $z \geq 0.86$?
- (A) 0.1949 (B) 0.5000 (C) 0.8400 (D) 0.1056 (E) 0.8051
7. A quality control inspector must verify whether a machine that packages snack foods is working correctly. The inspector will randomly select a sample of packages and weigh the amount of snack food in each. Assume that the weights of food in packages filled by this machine have a mean of 4.05 oz. and a standard deviation of 0.30 oz. An estimate of the mean amount of snack food in each package must be reported with 99.6 percent confidence and a margin of error of no more than 0.12 oz. What would be the minimum sample size for the number of packages the inspector must select?
- (A) 8 (B) 15 (C) 25 (D) 52 (E) 60
8. By what factor (approximately) will the margin of error for the value of a population proportion increase if we increase the confidence level from 95% to 98%?
- (A) 0.43 (B) 0.98 (C) 1.19 (D) 1.68 (E) 2.33
9. Which of the following describes a correct effect on the width of a confidence interval?
- I. As sample size increases, the width of the confidence interval decreases.
II. As the confidence level increases, the width of the confidence interval increases.
III. As the standard error of the estimate increases, the width of the confidence interval increases.
- (A) I. only (B) II. only (C) I. and III. (D) II. and III. (E) I., II., and III.
10. It is known that 80% of the items in a population have a given property. If all possible samples of size 60 are taken from this population, which of the following would describe the sampling distribution \hat{p} , the sample proportion of items with the given property?
- (A) The sampling distribution is skewed right with a mean of 0.8 and a standard deviation of 0.31.
(B) The sampling distribution is skewed left with a mean of 0.1 and a standard deviation of 0.05.
(C) The sampling distribution is approximately normal with a mean of 0.8 and a standard deviation of 0.05.
(D) The sampling distribution is approximately normal with a mean of 0.1 and a standard deviation of 0.31.
11. Suppose that X is a random variable for a binomial experiment that counts the number of success in 12 trials. Find $P(X \leq 3)$ if the probability of success for a single trial is 0.29.
- (A) 0.1807 (B) 0.2460 (C) 0.2775 (D) 0.4765 (E) 0.5235

12. A random sample of 33 households was selected as part of a study on electricity usage, and the number of kilowatt-hours (kWh) was recorded for each household in the sample for the March quarter of 2011. The average usage was found to be 450 kWh. In a very large study in the March quarter of the previous year it was found that the standard deviation of the usage was 81 kWh. Assuming the standard deviation is unchanged and that the usage is normally distributed, which of the following expresses a 99% confidence interval for the mean usage in the March quarter of 2011.

- (A) $450 \pm 2.756 \times \frac{81}{\sqrt{33}}$
 (B) $450 \pm 2.575 \times \frac{81}{\sqrt{33}}$
 (C) $450 \pm 2.33 \times \frac{81}{\sqrt{33}}$
 (D) $450 \pm 2.575 \times \frac{81}{\sqrt{33}}$
 (E) none of the above

13. What is the critical value of a 99% confidence interval for a known standard deviation?

- (A) 1.645 (B) 2.33 (C) 2.575 (D) 1.96 (E) 2.75

14. In a recent survey of 262 college graduates it was revealed that 89% were satisfied that they went to college. With what degree of confidence can you say that $89\% \pm 3\%$ of college graduates were satisfied that they went to college?

- (A) 73% (B) 88% (C) 95% (D) 97.2% (E) 98.6%

15. A confidence interval estimate is determined from the SAT scores of a simple random sample of n students. All other things being equal, which of the following will result in a small margin of error?

- I. Smaller standard deviation
 II. Smaller sample size
 III Smaller confidence interval.

- (A) I. and II. only (B) I. and III. only (C) II. and III. only
 (D) I., II, and III. (E) None of the above.

16. A score at or above the 70th percentile is how many standard deviations (s.d.) away from the mean?

- (A) 0.52 or more standard deviations above the mean
 (B) 1.04 or more standard deviations above the mean
 (C) 1.64 or more standard deviations above the mean
 (D) 0.52 or more standard deviations below the mean
 (E) 1.04 or more standard deviations below the mean

17. Which of the following is true about the margin of error in a sample?

- I. The margin of error depends on the level of confidence desired in the sample results.
- II. The margin of error depends on the sample mean that is found in the sample data.
- III. The margin of error decreases as sample size increases.

(A) I only (B) I and II (C) I and III (D) III only (E) I, II, and III

18. An analyst, using a random sample of $n = 500$ families, obtained a 90% confidence interval for mean monthly family income for a large population: $\$600 \leq \mu \leq \800 . If the analyst had used a 99% confidence coefficient instead, the confidence interval would be:

- (A) narrower and would involve a larger risk of being incorrect.
- (B) wider and would involve a smaller risk of being incorrect.
- (C) narrower and would involve a smaller risk of being incorrect.
- (D) wider and would involve a larger risk of being incorrect.
- (E) wider but it cannot be determined whether the risk of being incorrect would be larger or smaller.

19. Complete the following with increases, decreases, remains the same.

- a) as sample n increases, the confidence interval _____
- b) as the margin of error increases, the standard deviation _____
- c) as confidence increases, the sample size _____ in order to maintain the same margin of error.
- d) if the standard error increases, the confidence interval _____
- e) as confidence increases, the standard deviation _____
- f) as confidence level increases, the margin of error _____

20. Dr. McGovern takes note of the gas mileage of his 12 year old car every time he fills up. Here is the data for the number of miles per gallon taken over the last year. Compute a 90% confidence interval.

19.8 21.8 20.9 18.0 18.9 18.1 17.4 20.5 19.3 19.5 18.3 19.0 19.6 18.5 18.7 20.3

19.6 21.1 21.1 20.2 20.3 19.6 20.3 20.7 20.5 18.6 20.3 19.1 18.1 18.3 20.9 18.2