Test Bank

# Chapter 5: The Distribution of Sample Means and z for a Sample Mean

## Multiple Choice

1. The *mean score* of the 27 students in a history class on the standardized History test was 56. The national mean (i.e., µ) and standard deviation (i.e., σ) for the History test was 52 and 9, respectively. Compute the *z* score for the History test.

A. 0.44

B. 2.31

C. 0.15

D. 0.77

E. 1.65

Ans: B

Learning Objective: Compute a z for a sample mean

2. The *mean score* of the 18 students in a statistics class on the standardized Statistics test was 75. The national mean (i.e., µ) and standard deviation (i.e., σ) for the Statistics test was 69 and 10, respectively. Compute the z score for the Statistics test.

A. .6

B. 2.55

C. 2.357

D. 1.44

E. 1.65

Ans: B

Learning Objective: Compute a z for a sample mean

3. An honors claculus class with 25 students took an exam and their mean exam performance corresponded to a *z* score of 1.8. What is the probability of this classes’ sample mean, or a higher sample mean, occuring due to sampling error?

A. 0.0359

B. 0.9641

C. 0.05

D. 0.3085

Ans: A

Learning Objective: Determine probability of a sample mean

4. Two teachers have a friendly rivalry. They want to know which of their students did better on their respective final exams. The first teacher teaches chemistry and her 49 students had a mean = 68. The national mean and standard deviation for this exam is 65 and 10, respectively. The second teacher teaches history and his 64 students had a mean = 72. The national mean and standard deviation for this exam is 70 and 7, respectively. Which teachers’ students did better on their respective final exams?

A. the chemistry class did better

B. the history class did better

C. the two classes did equally well

Ans: B

Learning Objective: Interpret z for a sample mean results

5. The History test had a national mean of µ = 52 and a standard deviation of σ = 9. Which is more likely to occur?

A. drawing a random sample of 27 students from the national population of high school students that has a mean equal to or greater than 55

B. drawing a random sample of 100 students from the national population of high school students that has a mean equal to or greater than 55

Ans: A

Learning Objective: Law of large numbers

6. The History test had a national mean of µ = 52 and a standard deviation of σ = 9. How much sampling error would you expect for a sample with a size of 27?

A. 1.73

B. 0.33

C. 5.20

D. 1.65

Ans: A

Learning Objective: Compute expected sampling error

7. The History test had a national mean of µ = 52 and a standard deviation of σ = 9. How much sampling error would you expect for a sample with a size of 100?

A. 10

B. 0.9

C. 3.00

D. 0.79

Ans: B

Learning Objective: Compute expected sampling error

8. The incomes of a population of lawyers have a normal distribution with mean US$88,000 and standard deviation US$60,000. Forty-nine lawyers are selected at random from the above population to serve as a sample in a research project. Use the *z* for a sample mean formula and determine the probability that the one sample of 49 lawyers drawn at random will have a mean salary of US$90,000 or greater.

A. .03

B. .23

C. −.03

D. −.23

E. .5120

F. .4880

G. .5910

H. .4090

Ans: H

Learning Objective: Interpret z for a sample mean results

9. Which two of the following are the best descriptions of the standard error of the mean? (Choose 2)

A. The typical distance each sample score is away from each other.

B. The typical distance sample means are from the population mean.

C. The typical distance between the standard deviation and *N*.

D. The typical distance a score is from the sample mean in a distribution of sample means.

E. The typical amount of sampling error expected in the study.

F. The typical amount of error between population scores and sample scores.

Ans: B and E

Learning Objective: Explain what SEM measures

10. You are interested in studying self-esteem among college students and plan to obtain a sample of 36 students from the population. The self-esteem questionnaire you plan to use has a mean of 90 and a standard deviation of 12. Which of the following best describes the distribution of sample means?

A. The collection of all possible random samples of 36 students will have a mean of 90 and a standard deviation of 12.

B. The collection of all possible random samples from the population will have a mean of 90 and a standard deviation of 12.

C. The collection of all possible random samples from the population will have a mean of 90 and a standard deviation of 2.

D. The collection of all possible random samples of 36 students will have a mean of 90 and a standard deviation of 2.

Ans: D

Learning Objective: Explain the SEM

11. Which of the following is the best description of a distribution of sample means?

A. a frequency distribution of all possible scores in a population

B. a frequency distribution of the sample mean from the study

C. a frequency distribution of all possible sample means of a given size from a population

D. a frequency distribution of the population mean

E. a frequency distribution of the standard error of the mean

Ans: C

Learning Objective: Explain the SEM

12. The standard error of the mean is a measure of

A. population error

B. sampling error

Ans: B

Learning Objective: Explain the SEM

13. The standard error of the mean is a measure of the typical distance (or deviation) between sample \_\_\_\_\_\_ and \_\_\_\_\_\_.

A. statistics

B. population parameters

C. scores

D. population scores

Ans: A and B

Learning Objective: Explain the SEM

14. The standard error is the typical distance (or deviation) of:

A. scores from a population mean

B. scores from a sample mean

C. sample means from the population mean

D. sample means from the scores in the population

Ans: C

Learning Objective: Explain the SEM

15. The incomes of a population of statisticians have a normal distribution with mean US$65,000 and standard deviation US$15,000. Sixty-four statisticians are selected at random from the above population to serve as a sample in a research project. Use the *z* for a sample mean formula and determine *the probability* that the one sample of 64 statisticians drawn at random will have a mean salary of US$68,000 or greater?

A. −0.2

B. 0.2

C. −1.6

D. 1.6

E. 0.0548

F. 0.9452

G. 0.4207

H. 0.5793

Ans: E

Learning Objective: Compute z for a sample mean

16. Suppose a population has a mean happiness score of 75 and a standard deviation of 15. Researcher A takes a random sample of 100 participants. Researcher B takes a random sample of 25 participants. Which researcher is more likely to get a sample mean of *80* or higher?

A. Researcher A

B. Researcher B

Ans: B

Learning Objective: sampling error

17. Which two of the following responses are good explanations of the law of large numbers?

A. The law of large numbers states as the sample size increases, the sample mean will be more likely to be close to the population mean.

B. When using a larger sample size it decreases the critical region, making it more difficult to get a mean equal to the population mean.

C. The larger sample size will result in less sampling error.

D. As the sample size increases, the variability and error also increase.

Ans: A and C

Learning Objective: Law of Large Numbers

18. A group of researchers want to determine if an online textbook helps students learn statistics better than a standard textbook. They plan to take a sample of 49 students from a population of statistics students at Midwestern University. The researchers know that this population has a mean of µ = 92 and a standard deviation of σ = 13 on a nationwide statistics test. The researchers ask you to compute the standard error of the mean they should expect in this situation.

A. 1.65

B. 1.86

C. 1.50

D. 3.77

E. 0.265

Ans: B

Learning Objective: Sampling error

19. Suppose the researchers told you that they need to have a standard error that is smaller. What could they do to make it smaller?

A. increase the size of the treatment effect

B. increase the sample size

C. increase the variability in the population

D. increase the population size

Ans: B

Learning Objective: Sampling error

20. If you draw a random sample of 100 scores from a large population of test scores and compute the sample mean (*M*), which is more likely to be true?

A. The sample mean (*M*) has a *z* value of 1.00 or higher

B. The sample mean (*M*) has a *z* value of 3.00 or higher

C. *z* values of 3 or higher and 1 or higher are equally likely

Ans: A

Learning Objective: Sampling error

21. How is this standard error influenced by sample size?

A. As sample size increases, the standard error increases

B. As sample size increases, the standard error decreases

C. There is no consistent relationship between sample size and the standard error

Ans: B

Learning Objective: Sampling error

22. Suppose a population has a mean happiness score of 50 and a standard deviation of 10. Researcher A takes a random sample of 25 participants. Researcher B takes a random sample of 100 participants. Which researcher is more likely to get a sample mean of *60* or more?

A. Researcher A

B. Researcher B

Ans: A

Learning Objective: Sampling error

23. A group of researchers want to determine if an online textbook helps students learn statistics better than a standard textbook. They plan to take a sample of 36 students from a population of statistics students at Midwestern University. The researchers know that the population of statistics students at Midwestern University produces a mean of µ = 72 and a standard deviation of σ = 9 on a nationwide statistics test. The researchers ask you to compute the standard error of the mean they should expect in this situation.

A. 0.25

B. 0.75

C. 1.5

D. 3

Ans: C

Learning Objective: Sampling error

24. The central limit theorem describes three important properties of all distributions of sample means of any given sample size. What are the three properties it describes? Select all that apply.

A. Population size

B. Shape

C. Central Tendency

D. Variability

Ans: B, C, and D

Learning Objective: Central limit theorem

25. According to the central limit theorem what shape do distributions of sample means tend to take?

A. Distributions of sample means tend to be similar in shape to the original population of scores.

B. Distributions of sample means tend to be normally distributed (bell shaped).

C. Distributions of sample means tend to be positively or negatively skewed.

Ans: B

Learning Objective: Central limit theorem

26. A statistics professor has kept track of the scores for all students who have ever taken a particular exam. This exam is *negatively* skewed. The mean score on this exam was µ = 102 with a standard deviation of σ = 22. Which of the following graphs looks like the original distribution of scores in the population? In other words, which is negatively skewed?



Ans: C

Learning Objective: Central limit theorem

27. A professor wants to try a new review technique to improve test scores and he chooses 36 students at random from his class of 100 to try this new technique. After trying this new review technique, the average score on the test for this sample of 36 students is 104. Which of the following graphs looks most like the distribution of sample means for samples based on a sample size of 36 taken from this population of scores that is negatively skewed?



A. Graph A

B. Graph B

C. Graph C

Ans: C

Learning Objective: Central limit theorem

28. A statistics professor has keep track of the scores for all students who have ever taken a particular exam. This exam is *positively* skewed. The mean score on this exam was µ = 82 with a standard deviation of σ = 16. Which of the following graphs looks like the original distribution of scores in the population? In other words, which is positively skewed?



A. Graph A

B. Graph B

C. Graph C

Ans: A

Learning Objective: Central limit theorem

29. A professor wants to try a new review technique to improve test scores and he chooses 30 students at random from his class of 250 to try this new technique. After trying this new review technique, the average score on the test for this sample of 30 students is 84. Which of the following graphs looks most like the distribution of sample means for samples of a size of 30 taken from this population of scores that is positively skewed with exam is µ = 82 and σ = 16?



A. Graph A

B. Graph B

C. Graph C

Ans: C

Learning Objective: Central limit theorem

30. The standard deviation of the *distribution of sample means* would be equal to:

A. the mean of the population.

B. the mean of the sample.

C. the standard deviation of the population.

D. the standard deviation of the sample.

E. the standard error of the mean.

Ans: E

Learning Objective: Central Limit Theorem

31. The mean of the *distribution of sample means* would be equal to:

A. the mean of the population.

B. the mean of the sample.

C. the standard deviation of the population.

D. the standard deviation of the sample.

E. the standard error of the mean.

Ans: A

Learning Objective: Central limit theorem.

32. According to the central limit theorem what is the mean of all distributions of sample means going to equal?

A. α

B. 0

C. σ

D. µ

Ans: D

Learning Objective: Central limit theorem

33. According to the central limit theorem what is the standard deviation of all distributions of sample means going to equal? Select all that apply.

A. the standard error of the mean

B. the standard deviation of the population

C. 

D. 

Ans: A and C

Learning Objective: Central limit theorem

34. A psychologist records the reaction times of 48 college students and finds that the reaction times are positively skewed. It is impossible to compute the entire distribution of sample means. However, knowing only that the sample size was 48 and the distribution of raw scores is positively skewed, you can use the central limit theorem to predict specific characteristics of the distribution of sample means. Use this information to answer the following four questions.  
Which of the following is the best description of a distribution of the sample means for this study?

A. a frequency distribution of all possible reaction times in a population

B. a frequency distribution of the sample mean reaction times from the study

C. a frequency distribution of all possible sample mean reaction times with *n* = 48

D. a frequency distribution of the population means reaction times

Ans: C

Learning Objective: Distribution of sample means

35. The shape of the distribution of sample means would be:

A. negatively skewed

B. positively skewed

C. normal

Ans: C

Learning Objective: Distribution of sample means

36. The center of the distribution of sample means would be equal to:

A. the mean of the population.

B. the mean of the sample.

C. the standard deviation of the population.

D. the standard deviation of the sample.

E. the average distance of all sample means from the population mean.

Ans: A

Learning Objective: Distribution of sample means

37. The standard deviation of the distribution of sample means would be equal to:

A. the standard deviation of the population.

B. the standard deviation of the sample.

C. the standard error of the mean.

Ans: C

Learning Objective: Distribution of sample means

38. In general, the \_\_\_\_\_\_ sample size, the closer the shape of the distribution of sample means is to a normal distribution.

A. larger

B. smaller

Ans:A

Learning Objective: Sampling error

39. A population distribution of scores has a mean = 100 and a standard deviation of 10. Researchers plan to take a sample size of *N* = 25. Based on the central limit theorem, 68.26% of all possible sample means are between the sample means of \_\_\_\_\_\_.

A. 90 and 100

B. 95 and 105

C. 98 and 102

D. 97 and 103

Ans: C

Learning Objective: Distribution of sample means

40. A population distribution of scores has a mean = 50 and a standard deviation of 4. Researchers plan to take a sample size of *N* = 64. Based on the central limit theorem, 68.26% of all possible sample means are between the sample means of \_\_\_\_\_\_.

A. 46 and 54

B. 42 and 58

C. 49.5 and 50.5

D. 47 and 53

Ans: C

Learning Objective: Distribution of sample means

41. A company that makes baseball caps for babies is designing a new type of hat for toddlers. The new hat design must be adjustable to fit the middle 90% of the toddler population. If the mean toddler head size is µ = 22.8 inches and standard deviation σ =0 .9 inches. Which statistic would you use to determine the minimum and maximum head sizes that the new hat must fit?

A. *z* for a single score

B. *z* for a sample mean

Ans: A

Learning Objective: Choose correct statistic

42. A survey indicates that the average employee at a local company spends μ = US$57 on coffee each week. The distribution of spending amounts is approximately normal with a standard deviation of σ = US$11. What statistic would you use to determine, what proportion of the population spends more than US$70 a week on coffee?

A. *z* for a single score

B. *z* for a sample mean

Ans: A

Learning Objective: Choose correct statistic

43. A reporter wanted to determine if “rookie” officers issue more parking tickets than average. She took a sample of 25 officers and recorded the number of tickets they issued across one week. She compared the mean of the number of tickets issued by these officers to the mean for all of the officers in the city. Which statistic would you use to determine if “rookies” issue more tickets than the average officer?

A. *z* for a single score

B. *z* for a sample mean

Ans: B

Learning Objective: Choose correct statistic

44. Boeing is considering designing a new seat for passengers on its new airliner. The seat must be able to accommodate the middle 95% of the adult population. If the mean adult “behind” size is µ = 15.8 inches and standard deviation σ = 0 .7inches. Which statistic would you use to determine the minimum and maximum “behind” sizes that the new airliner seat must fit?

A. *z* for a single score

B. *z* for a sample mean

Ans: A

Learning Objective: Choose correct statistic

45. A consumer survey indicates that the average household spends μ = US$155 on groceries each week. The distribution of spending amounts is approximately normal with a standard deviation of σ = US$25. What statistic would you use to determine, what proportion of the population spends more than US$150 a week on groceries?

A. *z* for a single score

B. *z* for a sample mean

Ans: A

Learning Objective: Choose correct statistic

46. A researcher theorizes that first-born children are more intelligent than other children. A sample of 50 first-born children is found to have an average IQ of 105. The average IQ in the general population is 100 with a standard deviation of 15. Which statistic would you use to determine if first-born children significantly more intelligent than the general population?

A. *z* for a single score

B. *z* for a sample mean

Ans: B

Learning Objective: Choose correct statistic

47. The average IQ in the general population is 100 with a standard deviation of 15. Billy has an IQ of 105. Which statistic would you use to determine the proportion of people in the population who have an IQ score less than Billy’s 105?

A. *z* for a single score

B. *z* for a sample mean

Ans: A

Learning Objective: Choose correct statistic

48. The national average on a political ideology scale is 15 with a standard deviation of 3.5. A researcher wants to know how local activists compare to the national average. She takes a sample of 50 local activists and gives them the political ideology scale. Which statistic would you use to determine if this sample represents the national political ideology well or not well?

A. *z* for a single score

B. *z* for a sample mean

Ans: B

Learning Objective: Choose correct statistic

49. The national average on a political ideology scale is 15 with a standard deviation of 3.5. A researcher wants to know how a prominent local activists compares to the national average. She asks this local activist to complete the political ideology scale and finds her score to be 18. Which statistic would you use to determine if what proportion of the nation has a higher score than the local activists score of 18?

A. *z* for a single score

B. *z* for a sample mean

Ans: B

Learning Objective: Choose correct statistic

50. The average employee at a company produces an average of 16 chairs each week with a standard deviation of 3. What is the probability of randomly selecting 25 employees and having their mean number of chairs produced in a week be 20 or more?

A. *z* for a single score

B. *z* for a sample mean

Ans: B

Learning Objective: Choose correct statistic