7.1 Section Exercises

Properties of Sampling Distributions

Decide if each statement is true or false. Explain why.

1. A sampling distribution refers to individuals rather than groups.
2. The shape of a sampling distribution of sample means that follows the requirements of the Central Limit Theorem will be approximately bell-shaped.
3. A sampling distribution of sample means has a standard deviation equal to $\frac{\sigma}{\sqrt{n}}$.
4. A sampling distribution of sample means has a mean equal to $\frac{\mu}{\sqrt{n}}$.

Means and Standard Deviations of Sampling Distributions

Find the mean and standard deviation of the sampling distribution of sample means using the given information.

5. $\mu = 35$ and $\sigma = 9$; $n = 64$
6. $\mu = 28$ and $\sigma = 6$; $n = 81$
7. $\mu = 12.0$ and $\sigma = 2.3$; $n = 36$
8. $\mu = 52$ and $\sigma = 7$; $n = 100$
9. $\mu = 9.5$ and $\sigma = 10.0$; $n = 39$
10. $\mu = 582.0$ and $\sigma = 23.6$; $n = 1201$

Applications for Sampling Distributions of Sample Means

Answer each question for the given scenario.

11. According to the Bangor Daily News, heating fuel prices in Maine averaged $2.88 per gallon in October 2014, an increase of 14 cents from the previous month. If samples of 50 heating oil prices are collected, what would be the mean of the sampling distribution of sample means?

    Source: Bangor Daily News. November 2014. https://www.bangordailynews.com (12 Aug. 2019).

12. According to a local school district, middle school students are assigned a mean of 2.5 hours of homework per night. If 144 samples of 50 students from this school district are collected and the amount of time spent per night on homework is recorded for each student, what would be the mean of the sampling distribution of the sample means?
13. Some health reports claim that the mean duration of a cold is seven days. If 120 samples of 100 people with colds are taken from across the United States and the duration of each person's cold is recorded, what would be the mean of the sampling distribution of the sample means?
14. Suppose that an Internet source shows that the mean fare for one-way flights for business travel is $217, the lowest in five years. If 215 samples of 45 one-way fares for business travel are collected from across the United States, what would be the mean of the sampling distribution of the sample means?
15. For a large internet retailer, their average customer spent $51.28 during the Black Friday sale with a standard deviation of $9.53. If a sampling distribution is created for samples of 75 customers, what would be the standard deviation of the sampling distribution of sample means?
16. Suppose that a study of elementary school students reports that the mean age at which children begin reading is 5.7 years with a standard deviation of 1.1 years. If a sampling distribution is created using samples of the ages at which 55 children began reading, what would be the standard deviation of the sampling distribution of the sample means?
17. A study on the latest fad diet claimed that the amounts of weight lost by all people on this diet had a standard deviation of 5.8 pounds. If a sampling distribution is created using samples of the amounts of weight lost by 100 people on this diet, what would be the standard deviation of the sampling distribution of the sample means?

18. According to aamc.org, the average tuition for students attending a public medical school without resident status for that state is \$60,802 per year. If a sampling distribution that has a standard error of the mean equal to \$100 is desired, how many medical school tuitions must be in each sample? Assume a population standard deviation of \$3150.

Source: Tuition and Student Fees. Association of American Medical Colleges. 2019.https://www.aamc.org/data/tuitionandstudentfees/ (12 Aug. 2019).

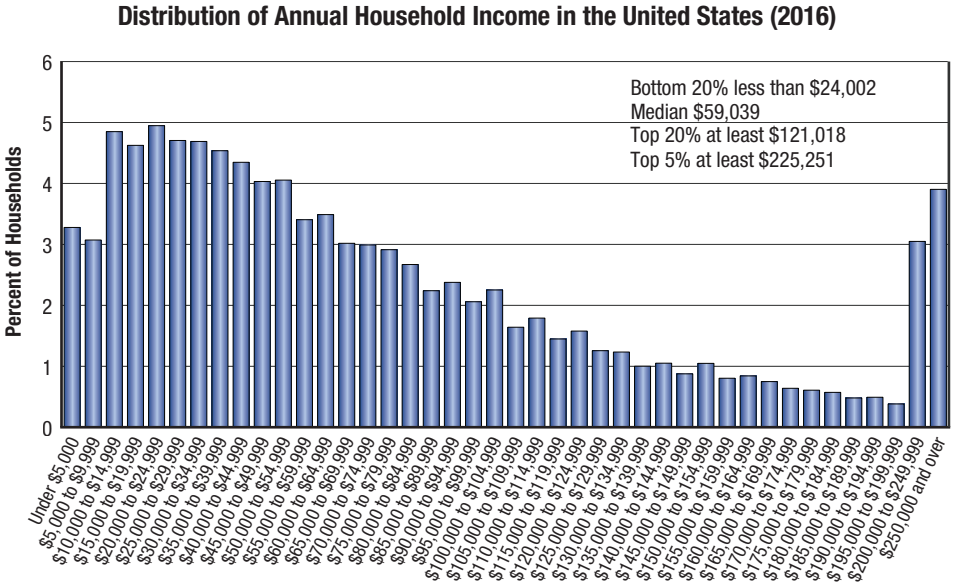
19. Shipping costs for a large national distributor have a mean of \$7.94 per item with a standard deviation of \$2.29. The population distribution is bell-shaped. Consider the sampling distribution created for samples of size 25. Can a normal approximation be used for this sampling distribution? Explain your answer.

20. Shipping weights for a large national distributor have a mean of 12.2 pounds per package and a standard deviation of 3.8 pounds. The graph of the population is skewed right. If a sampling distribution using samples of 20 packages each is created, can a normal approximation be applied? Explain your answer.

21. A television streaming service has found that its customers have on average 65.5 hours of programming recorded to their DVR systems with a standard deviation of 20.4 hours. The population distribution is found to have a multimodal shape. Consider a sampling distribution created from this population using a sample size of 25 customers. Can a normal approximation be used for the sampling distribution? Explain your answer.

22. An airline company recorded the delay times for all 5592 flights completed one week. They found that the delay times had a mean of 16.5 minutes and standard deviation of 4.7 minutes. The frequency distribution created from the population of delay times was found to be skewed right. If a sampling distribution is created using samples of 50 flights each, can a normal approximation be applied? Explain your answer.

23. Consider the following frequency histogram depicting US household incomes for 2016.



Source: U.S. Census Bureau, Current Population Survey, 2017 Annual Social and Economic Supplement
https://commons.wikimedia.org/wiki/File:Distribution_of_ Annual_Household_Income_in_the_United_States_2016.svg (28 July 2019).

a. How would you describe the general shape of this distribution?

b. Consider the sampling distribution of sample means created for samples of 15 household incomes each. Could a normal approximation be used for this sampling distribution? Explain your answer.

c. Consider the sampling distribution of sample means created for samples of 80 household incomes each. Could a normal approximation be used for this sampling distribution? Explain your answer.