8.9: Practice

Use the following information to answer the next five exercises: The standard deviation of the weights of elephants is known to be approximately 15 pounds. We wish to construct a 95% confidence interval for the mean weight of newborn elephant calves. Fifty newborn elephants are weighed. The sample mean is 244 pounds. The sample standard deviation is 11 pounds.

1.

Identify the following:

1. x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$ = _____
2. σ = _____
3. n = _____

2.

In words, define the random variables X and X¯X¯" role="presentation" style="position: relative;">$\overline{X}\,\overline{X}$.

3.

Which distribution should you use for this problem?

4.

Construct a 95% confidence interval for the population mean weight of newborn elephants. State the confidence interval, sketch the graph, and calculate the error bound.

5.

What will happen to the confidence interval obtained, if 500 newborn elephants are weighed instead of 50? Why?

Use the following information to answer the next seven exercises: The U.S. Census Bureau conducts a study to determine the time needed to complete the short form. The Bureau surveys 200 people. The sample mean is 8.2 minutes. There is a known standard deviation of 2.2 minutes. The population distribution is assumed to be normal.

6.

Identify the following:

1. x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$ = _____
2. σ = _____
3. n = _____

7.

In words, define the random variables X and X¯X¯" role="presentation" style="position: relative;">$\overline{X}\,\overline{X}$.

8.

Which distribution should you use for this problem?

9.

Construct a 90% confidence interval for the population mean time to complete the forms. State the confidence interval, sketch the graph, and calculate the error bound.

10.

If the Census wants to increase its level of confidence and keep the error bound the same by taking another survey, what changes should it make?

11.

If the Census did another survey, kept the error bound the same, and surveyed only 50 people instead of 200, what would happen to the level of confidence? Why?

12.

Suppose the Census needed to be 98% confident of the population mean length of time. Would the Census have to survey more people? Why or why not?

Use the following information to answer the next ten exercises: A sample of 20 heads of lettuce was selected. Assume that the population distribution of head weight is normal. The weight of each head of lettuce was then recorded. The mean weight was 2.2 pounds with a standard deviation of 0.1 pounds. The population standard deviation is known to be 0.2 pounds.

13.

Identify the following:

1. x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$ = _____
2. σ = _____
3. n = _____

14.

In words, define the random variable X.

15.

In words, define the random variable X¯X¯" role="presentation" style="position: relative;">$\overline{X}\,\overline{X}$.

16.

Which distribution should you use for this problem?

17.

Construct a 90% confidence interval for the population mean weight of the heads of lettuce. State the confidence interval, sketch the graph, and calculate the error bound.

18.

Construct a 95% confidence interval for the population mean weight of the heads of lettuce. State the confidence interval, sketch the graph, and calculate the error bound.

19.

In complete sentences, explain why the confidence interval in Exercise 8.18 is wider than in Exercise 8.17.

20.

In complete sentences, give an interpretation of what the interval in Exercise 8.18 means.

21.

What would happen if 40 heads of lettuce were sampled instead of 20, and the error bound remained the same?

22.

What would happen if 40 heads of lettuce were sampled instead of 20, and the confidence level remained the same?

Use the following information to answer the next 14 exercises: The mean age for all Foothill College students for a recent Fall term was 33.2. The population standard deviation has been pretty consistent at 15. Suppose that twenty-five Winter students were randomly selected. The mean age for the sample was 30.4. We are interested in the true mean age for Winter Foothill College students. Let X = the age of a Winter Foothill College student.

23.

x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$ = _____

24.

n = _____

25.

_____ = 15

26.

In words, define the random variable X¯X¯" role="presentation" style="position: relative;">$\overline{X}\,\overline{X}$.

27.

What is x¯x¯" role="presentation" style="position: relative;">$\bar{x}\,\bar{x}$ estimating?

28.

Is σxσx" role="presentation" style="position: relative;">$\sigma_x\sigma_x$ known?

29.

As a result of your answer to Exercise 8.26, state the exact distribution to use when calculating the confidence interval.

Construct a 95% Confidence Interval for the true mean age of Winter Foothill College students by working out then answering the next seven exercises.

30.

How much area is in both tails (combined)? α =_____

31.

How much area is in each tail? α2α2" role="presentation" style="position: relative;">$\frac{\alpha}{2}\,\frac{\alpha}{2}$ =_____

32.

Identify the following specifications:

1. lower limit
2. upper limit
3. error bound

33.

The 95% confidence interval is:_____.

34.

Fill in the blanks on the graph with the areas, upper and lower limits of the confidence interval, and the sample mean.

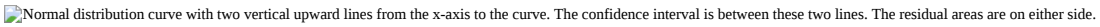

Figure 8.8

35.

In one complete sentence, explain what the interval means.

36.

Using the same mean, standard deviation, and level of confidence, suppose that *n* were 69 instead of 25. Would the error bound become larger or smaller? How do you know?

37.

Using the same mean, standard deviation, and sample size, how would the error bound change if the confidence level were reduced to 90%? Why?

Use the following information to answer the next five exercises. A hospital is trying to cut down on emergency room wait times. It is interested in the amount of time patients must wait before being called back to be examined. An investigation committee randomly surveyed 70 patients. The sample mean was 1.5 hours with a sample standard deviation of 0.5 hours.

38.

Identify the following:

1. x¯x¯" role="presentation" style="position: relative;">$\bar{x}\,\bar{x}$ =_____
2. sxsx" role="presentation" style="position: relative;">$s_x\,s_x$ =_____
3. *n* =_____
4. *n* – 1 =_____

39.

Define the random variables *X* and X¯X¯" role="presentation" style="position: relative;">$\overline{X}\,\overline{X}$ in words.

40.

Which distribution should you use for this problem?

41.

Construct a 95% confidence interval for the population mean time spent waiting. State the confidence interval, sketch the graph, and calculate the error bound.

42.

Explain in complete sentences what the confidence interval means.

Use the following information to answer the next six exercises: One hundred eight Americans were surveyed to determine the number of hours they spend watching television each month. It was revealed that they watched an average of 151 hours each month with a standard deviation of 32 hours. Assume that the underlying population distribution is normal.

43.

Identify the following:

1. x¯x¯" role="presentation" style="position: relative;">$\bar{x}\,\bar{x}$ =_____
2. sxsx" role="presentation" style="position: relative;">$s_x\,s_x$ =_____
3. *n* =_____
4. *n* – 1 =_____

44.

Define the random variable *X* in words.

45.

Define the random variable X¯X¯" role="presentation" style="position: relative;">$\overline{X}\,\overline{X}$ in words.

46.

Which distribution should you use for this problem?

47.

Construct a 99% confidence interval for the population mean hours spent watching television per month. (a) State the confidence interval, (b) sketch the graph, and (c) calculate the error bound.

48.

Why would the error bound change if the confidence level were lowered to 95%?

Use the following information to answer the next 13 exercises: The data in Table 8.10 are the result of a random survey of 39 national flags (with replacement between picks) from various countries. We are interested in finding a confidence interval for the true mean number of colors on a national flag. Let *X* = the number of colors on a national flag.

X	Freq.
1	1
2	7
3	18
4	7
5	6

Table 8.10

49.

Calculate the following:

1. x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$ =_____
2. sxsx" role="presentation" style="position: relative;">$s_x s_x$ =_____
3. n =_____

50.

Define the random variable X¯X¯" role="presentation" style="position: relative;">$\overline{X}\,\overline{X}$ in words.

51.

What is x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$ estimating?

52.

Is σxσx" role="presentation" style="position: relative;">$\sigma_x\sigma_x$ known?

53.

As a result of your answer to Exercise 8.52, state the exact distribution to use when calculating the confidence interval.

Construct a 95% confidence interval for the true mean number of colors on national flags.

54.

How much area is in both tails (combined)?

55.

How much area is in each tail?

56.

Calculate the following:

1. lower limit
2. upper limit
3. error bound

57.

The 95% confidence interval is_____.

58.

Fill in the blanks on the graph with the areas, the upper and lower limits of the Confidence Interval and the sample mean.

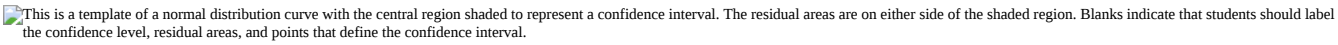
This is a template of a normal distribution curve with the central region shaded to represent a confidence interval. The residual areas are on either side of the shaded region. Blanks indicate that students should label the confidence level, residual areas, and points that define the confidence interval.

Figure 8.9

59.

In one complete sentence, explain what the interval means.

60.

Using the same x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$, sxsx" role="presentation" style="position: relative;">$s_x s_x$, and level of confidence, suppose that n were 69 instead of 39. Would the error bound become larger or smaller? How do you know?

61.

Using the same x¯x¯" role="presentation" style="position: relative;">$\bar{x}\bar{x}$, sxsx" role="presentation" style="position: relative;">$s_x s_x$, and n = 39, how would the error bound change if the confidence level were reduced to 90%? Why?

Use the following information to answer the next two exercises: Marketing companies are interested in knowing the population percent of women who make the majority of household purchasing decisions.

62.

When designing a study to determine this population proportion, what is the minimum number you would need to survey to be 90% confident that the population proportion is estimated to within 0.05?

63.

If it were later determined that it was important to be more than 90% confident and a new survey were commissioned, how would it affect the minimum number you need to survey? Why?

Use the following information to answer the next five exercises: Suppose the marketing company did do a survey. They randomly surveyed 200 households and found that in 120 of them, the woman made the majority of the purchasing decisions. We are interested in the population proportion of households where women make the majority of the purchasing decisions.

64.

Identify the following:

1. x = _____
2. n = _____
3. p' = _____

65.

Define the random variables X and P' in words.

66.

Which distribution should you use for this problem?

67.

Construct a 95% confidence interval for the population proportion of households where the women make the majority of the purchasing decisions. State the confidence interval, sketch the graph, and calculate the error bound.

68.

List two difficulties the company might have in obtaining random results, if this survey were done by email.

Use the following information to answer the next five exercises: Of 1,050 randomly selected adults, 360 identified themselves as manual laborers, 280 identified themselves as non-manual wage earners, 250 identified themselves as mid-level managers, and 160 identified themselves as executives. In the survey, 82% of manual laborers preferred trucks, 62% of non-manual wage earners preferred trucks, 54% of mid-level managers preferred trucks, and 26% of executives preferred trucks.

69.

We are interested in finding the 95% confidence interval for the percent of executives who prefer trucks. Define random variables X and P' in words.

70.

Which distribution should you use for this problem?

71.

Construct a 95% confidence interval. State the confidence interval, sketch the graph, and calculate the error bound.

72.

Suppose we want to lower the sampling error. What is one way to accomplish that?

73.

The sampling error given in the survey is ±2%. Explain what the ±2% means.

Use the following information to answer the next five exercises: A poll of 1,200 voters asked what the most significant issue was in the upcoming election. Sixty-five percent answered the economy. We are interested in the population proportion of voters who feel the economy is the most important.

74.

Define the random variable X in words.

75.

Define the random variable P' in words.

76.

Which distribution should you use for this problem?

77.

Construct a 90% confidence interval, and state the confidence interval and the error bound.

78.

What would happen to the confidence interval if the level of confidence were 95%?

Use the following information to answer the next 16 exercises: The Ice Chalet offers dozens of different beginning ice-skating classes. All of the class names are put into a bucket. The 5 P.M., Monday night, ages 8 to 12, beginning ice-skating class was picked. In that class were 64 girls and 16 boys. Suppose that we are interested in the true proportion of girls, ages 8 to 12, in all beginning ice-skating classes at the Ice Chalet. Assume that the children in the selected class are a random sample of the population.

79.

What is being counted?

80.

In words, define the random variable X.

81.

Calculate the following:

1. x = _____
2. n = _____
3. p' = _____

82.

State the estimated distribution of X. X~_____

83.

Define a new random variable P'. What is p' estimating?

84.

In words, define the random variable P'.

85.

State the estimated distribution of P'. Construct a 92% Confidence Interval for the true proportion of girls in the ages 8 to 12 beginning ice-skating classes at the Ice Chalet.

86.

How much area is in both tails (combined)?

87.

How much area is in each tail?

88.

Calculate the following:

1. lower limit
2. upper limit
3. error bound

89.

The 92% confidence interval is _____.

90.

Fill in the blanks on the graph with the areas, upper and lower limits of the confidence interval, and the sample proportion.

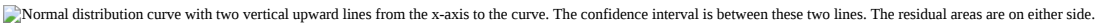

Figure 8.10

91.

In one complete sentence, explain what the interval means.

92.

Using the same p' and level of confidence, suppose that n were increased to 100. Would the error bound become larger or smaller? How do you know?

93.

Using the same p' and $n = 80$, how would the error bound change if the confidence level were increased to 98%? Why?

94.

If you decreased the allowable error bound, why would the minimum sample size increase (keeping the same level of confidence)?
