9.2 Estimating a Population Mean MATH 241 THOMPSON

Table of t-distribution areas

USE TABLE OR STATCRUNCH:

Table VI

t-Distribution
Area in Right Tail

df	0.25	0.20	0.15	0.10	0.05	0.025	0.02	0.01	0.005	0.0025	0.001
1	1.000	1.376	1.963	3.078	6.314	12.706	15.894	31.821	63.657	127.321	318.309
2	0.816	1.061	1.386	1.886	2.920	4.303	4.849	6.965	9.925	14.089	22.327

STATS-CALCULATORS-T

DF: 18

P(X ≥ 1.3303909) = .1

1) Determine the t-value in each of the cases. TABLE OR STATS-CALCULATORS-T

Click the icon to view the table of areas under the t-distribution.

0.01

(a) Find the t-value such that the area in the right tail is 0.10 with 18 degrees of freedom.

1.33 (Round to three decimal pla

17	0.689	0.863	1.069	1.333	1.740	2.110	2.224	2.567

(b) Find the t-value such that the area in the right tail is 0.20 with 30 degrees of freedom.

.854 (Round to three decimal places as needed.)

CALCULATORS - T

DF: 21

(c) Find the t-value such that the area left of the t-value is 0.02 with 21 degrees of freedom.

P(X ≤ -2.1894273) = .02

−2.189 (Round to three decimal places as needed.)

From table, we put a negative because left

(d) Find the critical t-value that corresponds to 99% confidence. Assume 21 degrees of freedom.

2.831 (Round to three decimal places as needed.)

$$\frac{1-.99}{2} = .005$$

DF: 21

P(X ≥ 2.8313596) = .005

2) Determine the t-value in each of the cases.

Click the icon to view the table of areas under the t-distribution.

USE TABLE OR STATCRUNCH

(a) Find the t-value such that the area in the right tail is 0.005 with 5 degrees of freedom.

4.032 (Round to three decimal places as needed.)

(b) Find the t-value such that the area in the right tail is 0.05 with 11 degrees of freedom.

1.796 (Round to three decimal places as needed.)

(c) Find the t-value such that the area left of the t-value is 0.10 with 10 degrees of freedom. [Hint: Use symmetry.]

−1.372 (Round to three decimal places as needed.)

(d) Find the critical t-value that corresponds to 50% confidence. Assume 18 degrees of freedom.

.688 (Round to three decimal places as needed.)

$$\frac{1-.5}{2} = .25$$

3) A researcher believes a new diet should improve weight gain in laboratory mice, so she runs an experiment over a 3-week period. Ten control mice staying with their standard diet gain an average of 4 ounces with a standard deviation of 0.3 ounces. Ten mice are given the new diet, and their average weight gain is 4.8 ounces with a standard deviation of 0.2 ounces. To test the researcher's theory, should a z-test or a t-test be used?

Choose the best answer from those given below.

- A. The z-test should be used because the standard deviation of the population is known.
- B. The z-test should be used because the standard deviation of the population is not known.
- ✔ C. The t-test should be used because the standard deviation of the population is not known.

4) A simple random sample of size n is drawn from a population that is normally distributed. The sample mean, $\bar{x}$, is found to be 111, and the sample standard deviation, s, is found to be 10.
(a) Construct a 90% confidence interval about μ if the sample size, n, is 17.
(b) Construct a 90% confidence interval about μ if the sample size, n, is 25.
(c) Construct a 98% confidence interval about μ if the sample size, n, is 17.
(d) Could we have computed the confidence intervals in parts (a)-(c) if the population had not been normally distributed?

Click the icon to view the table of areas under the t-distribution.

STAT-T-STATS-ONE SAMPLE - SUMMARY

One Sample T Summary

Sample mean: 111
Sample std. dev.: 10
Sample size: 17

Perform:
○ Hypothesis test for μ
H_0: μ = 0
H_A: μ ≠ 0
◉ Confidence interval for μ
Level: 0.90

Output:
☐ Store in data table

(a) Construct a 90% confidence interval about μ if the sample size, n, is 17.

(106.8 , 115.2)
(Use ascending order. Round to one decimal place as needed.)

90% confidence interval results:
μ : Mean of population

Mean	Sample Mean	Std. Err.	DF	L. Limit	U. Limit
μ	111	2.4253563	16	106.76561	115.23439

(b) Construct a 90% confidence interval about μ if the sample size, n, is 25.

(107.6 , 114.4)
(Use ascending order. Round to one decimal place as needed.)

90% confidence interval results:
μ : Mean of population

Mean	Sample Mean	Std. Err.	DF	L. Limit	U. Limit
μ	111	2	24	107.57824	114.42176

How does increasing the sample size affect the margin of error, E?

- A. As the sample size increases, the margin of error stays the same.
- ✔ B. As the sample size increases, the margin of error decreases.
- C. As the sample size increases, the margin of error increases.

(c) Construct a 98% confidence interval about μ if the sample size, n, is 17.

(104.7 , 117.3)
(Use ascending order. Round to one decimal place as needed.)

98% confidence interval results:
μ : Mean of population

Mean	Sample Mean	Std. Err.	DF	L. Limit	U. Limit
μ	111	2.4253563	16	104.73412	117.26588

Compare the results to those obtained in part (a). How does increasing the level of confidence affect the size of the margin of error, E?

- A. As the percent confidence increases, the size of the interval decreases.
- ✔ B. As the percent confidence increases, the size of the interval increases.
- C. As the percent confidence increases, the size of the interval stays the same.

(d) Could we have computed the confidence intervals in parts (a)-(c) if the population had not been normally distributed?

- A. Yes, the population needs to be normally distributed.
- ✔ B. No, the population needs to be normally distributed.
- C. No, the population does not need to be normally distributed.
- D. Yes, the population does not need to be normally distributed.

5) The accompanying data represent the total travel tax (in dollars) for a 3-day business trip in 8 randomly selected cities. A normal probability plot suggests the data could come from a populati that is normally distributed. A boxplot indicates there are no outliers. Complete parts (a) through (c) below.

67.74 78.48 69.44 83.98 80.29 86.46 100.31 97.72

Click the icon to view the table of critical t-values.

(a) Determine a point estimate for the population mean travel tax.

STATS – SUMMARY STATS – MEAN

A point estimate for the population mean travel tax is $ 83.05 .
(Round to two decimal places as needed.)

(b) Construct and interpret a 95% confidence interval for the mean tax paid for a three-day business trip.

STATS – T-STATS – ONE SAMPLE – WITH DATA

Select the correct choice below and fill in the answer boxes to complete your choice.
(Round to two decimal places as needed.)

A. One can be 95 % confident that the mean travel tax for all cities is between $ 73.19 and $ 92.91 .

(c) What would you recommend to a researcher who wants to increase the precision of the interval, but does not have access to additional data?

A. The researcher could increase the level of confidence.
B. The researcher could increase the sample mean.
C. The researcher could decrease the level of confidence.

6) A simple random sample of size n is drawn. The sample mean, $\bar{x}$, is found to be 18.4, and the samp standard deviation, s, is found to be 4.3.

Click the icon to view the table of areas under the t-distribution.

One Sample T Summary

Sample mean: 18.4
Sample std. dev.: 4.3
Sample size: 35

Perform:
Hypothesis test for μ
H_0: μ = 0
H_A: μ ≠ 0
Confidence interval for μ
Level: 0.95

(a) Construct a 95% confidence interval about μ if the sample size, n, is 35.

The confidence interval is (16.92 , 19.88).
(Use ascending order. Round to two decimal places as needed.)

(b) Construct a 95% confidence interval about μ if the sample size, n, is 51.

The confidence interval is (17.19 , 19.61).
(Use ascending order. Round to two decimal places as needed.)

How does increasing the sample size affect the margin of error, E?

*COMPARE THE CONFIDENCE INTERVALS, may increase

A. The margin of error does not change.
B. The margin of error decreases.
C. The margin of error increases.

(c) Construct a 99% confidence interval about μ if the sample size, n, is 35.

The confidence interval is (16.42 , 20.38).
(Use ascending order. Round to two decimal places as needed.)

Compare the results to those obtained in part (a). How does increasing the level of confidence affect the size of the margin of error, E?

*COMPARE THE CONFIDENCE INTERVALS, may decrease

A. The margin of error increases.
B. The margin of error does not change.
C. The margin of error decreases.

(d) If the sample size is 13, what conditions must be satisfied to compute the confidence interval?

C. The sample data must come from a population that is normally distributed with no outliers.

7) The following data represent the pH of rain for a random sample of 12 rain dates. A normal probability plot suggests the data could come from a population that is normally distributed. A boxplot indicates there are no outliers. Complete parts a) through d) below.

5.30	5.72	4.38	4.80
5.02	4.60	4.74	5.19
4.87	4.76	4.56	5.71

Click the icon to view the table of critical t-values. ENTER DATA INTO STATCRUNCH

(a) Determine a point estimate for the population mean. STATS – SUMMARY STATS- mean & Std Dev

A point estimate for the population mean is 4.97.
(Round to two decimal places as needed.)

Mean, then use Std Dev for T-stats

(b) Construct and interpret a 95% confidence interval for the mean pH of rainwater. Select the correct choice below and fill in the answer boxes to complete your choice.

STATS – T-STATS – ONE SAMPLE – WITH SUMMARY

A. There is 95% confidence that the population mean pH of rain water is between 4.70 and 5.25.

(c) Construct and interpret a 99% confidence interval for the mean pH of rainwater. Select the correct choice below and fill in the answer boxes to complete your choice.
(Use ascending order. Round to two decimal places as needed.)

A. There is a 99% probability that the true mean pH of rain water is between ___ and ___.

B. There is 99% confidence that the population mean pH of rain water is between 4.58 and 5.36.

(d) What happens to the interval as the level of confidence is changed? Explain why this is a logical result.

As the level of confidence increases, the width of the interval increases. This makes sense since the margin of error increases as well.

8) Determine the t-value in each of the cases. USE TABLE OR STATCRUNCH

Click the icon to view the table of areas under the t-distribution.

STATS – CALCULATORS - T

(a) Find the t-value such that the area in the right tail is 0.025 with 12 degrees of freedom.

2.179 (Round to three decimal places as needed.)

						0.025
12	0.695	0.873	1.083	1.356	1.782	2.179

(b) Find the t-value such that the area in the right tail is 0.15 with 27 degrees of freedom.

1.057 (Round to three decimal places as needed.)

			0.15
27	0.684	0.855	1.057

(c) Find the t-value such that the area left of the t-value is 0.25 with 14 degrees of freedom. [Hint: Use symmetry.]

– .692 (Round to three decimal places as needed.)

	0.25
14	0.692

(d) Find the critical t-value that corresponds to 96% confidence. Assume 11 degrees of freedom.

2.328 (Round to three decimal places as needed.)

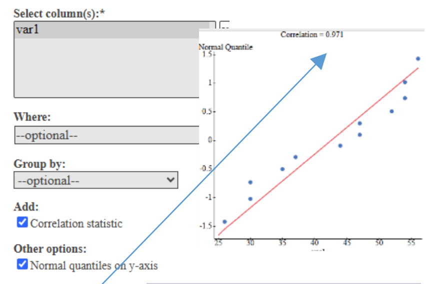
(1-.96)÷2 = 0.02

							0.02
11	0.697	0.876	1.088	1.363	1.796	2.201	2.328

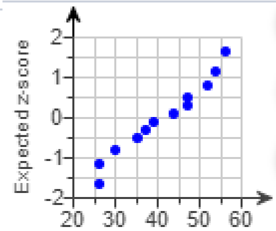
9) The data shown to the right represent the age (in weeks) at which babies first crawl, of 12 mothers. Complete parts (a) through (c) below.

52	30	44	35
47	37	56	26
39	54	47	26

GRAPH – QQ PLOT



(a) Draw a normal probability plot to determine if it is reasonable to conclude the data come from population that is normally distributed. Choose the correct answer below.



Since the correlation between the expected z-scores and the observed data, .971 , exceeds the critical value .928 , it is reasonable to conclude that the data come from a population that is normally distributed.
(Round to three decimal places as needed.)

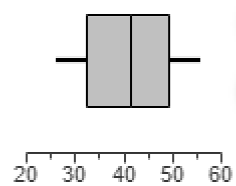
(b) Draw a boxplot to check for outliers. Choose the correct answer below.

GRAPH-BOX PLOT

☑ **Draw boxes horizontally**

Plot groups for each column

Other options:
☑ Use fences to identify outliers
☑ Draw boxes horizontally



Does the boxplot suggest that there are outliers?

- A. Yes, there is at least one point that is greater than the third quartile or less than the first quartile.
- ✔ B. No, there are no points that are outside of the 1.5(IQR) boundary.

(c) Construct and interpret a 95% confidence interval for the mean age at which a baby first crawls. Select the correct choice and fill in the answer boxes to complete your choice.
(Round to one decimal place as needed.)

STAT-T-STATS-ONE SAMPLE - SUMMARY

✔ A. The lower bound is 34.4 weeks and the upper bound is 47.8 weeks. We are 95% confident that the mean age at which a baby first crawls is within the confidence interval.

◉ Confidence interval for μ
Level: 0.95

> As the sample size n increases, the density curve of t gets closer to the standard normal density curve. The variability introduced into the t-statistic becomes less.

10) A survey was conducted that asked 1016 people how many books they had read in the past year. Results indicated that $\bar{x} = 10.1$ books and s = 16.6 books. Construct a 99% confidence interval for the mean number of books people read. Interpret the interval.

Click the icon to view the table of critical t-values.

STATS – T-STATS-ONE SAMPLE-WITH SUMMARY

Construct a 99% confidence interval for the mean number of books people read and interpret the result. Select the correct choice below and fill in the answer boxes to complete your choice.
(Use ascending order. Round to two decimal places as needed.)

✔ A. There is 99% confidence that the population mean number of books read is between 8.76 and 11.44 .

11) A researcher wishes to estimate the average blood alcohol concentration (BAC) for drivers involved in fatal accidents who are found to have positive BAC values. He randomly selects records from 75 such drivers in 2009 and determine the sample mean BAC to be 0.17 g/dL with a standard deviation of 0.060 g/dL. Complete parts (a) through (d) below.

(a) A histogram of blood alcohol concentrations in fatal accidents shows that BACs are highly skewed right. Explain why a large sample size is needed to construct a confidence interval for the mean BAC of fatal crashes with a positive BAC.

(b) Recently there were approximately 25,000 fatal crashes in which the driver had a positive BAC. Explain why this, along with the fact that the data were obtained using a simple random sample, satisfies the requirements for constructing a confidence interval.

- A. The sample size is likely less than 10% of the population.
- ✔ B. The sample size is likely less than 5% of the population.

(c) Determine and interpret a 90% confidence interval for the mean BAC in fatal crashes in which the driver had a positive BAC.
(Use ascending order. Round to three decimal places as needed.)

- ✔ A. The lower bound is .158 and the upper bound is .182. The researcher is 90% confident that the population mean BAC is in the confidence interval for drivers involved in fatal accidents who have a positive BAC value.

(d) All areas of the country use a BAC of 0.11 g/dL as the legal intoxication level. Is it possible that the mean BAC of all drivers involved in fatal accidents who are found to have positive BAC values is less than the legal intoxication level? Explain.

- ✔ A. Yes, it is possible that the mean BAC is less than 0.11 g/dL, because it is possible that the true mean is not captured in the confidence interval, but it is not likely.

12) A doctor wants to estimate the mean HDL cholesterol of all 20- to 29-year-old females. How many subjects are needed to estimate the mean HDL cholesterol within 4 points with 99% confidence assuming s = 19.6 based on earlier studies? Suppose the doctor would be content with 95% confidence. How does the decrease in confidence affect the sample size required?

A 99% confidence level requires 160 subjects. (Round up to the nearest subject.)

A 95% confidence level requires 93 subjects. (Round up to the nearest subject.)

How does the decrease in confidence affect the sample size required?

- A. The sample size is the same for all levels of confidence.
- B. Decreasing the confidence level increases the sample size needed.
- ✔ C. Decreasing the confidence level decreases the sample size needed.

z-score from table 99%	= 2.576
95%	= 1.960
90%	= 1.645

$$\left(\frac{\text{z−score} \cdot \text{\% confidence}}{\text{points}}\right)^2 = \left(\frac{2.576 \cdot 19.6}{4}\right)^2$$

13) Explain why the t-distribution has less spread as the number of degrees of freedom increases.

Choose the correct answer below.

- A. The t-distribution has less spread as the degrees of freedom increase because, as n increases, less information is known about σ by the law of large numbers.
- B. The t-distribution has less spread as the degrees of freedom increase because, for large values of n, $n \geq 30$, the t-distribution and the normal distribution are the same.
- ✔ C. The t-distribution has less spread as the degrees of freedom increase because, as n increases, s becomes closer to σ by the law of large numbers.
- D. The t-distribution has less spread as the degrees of freedom increase because the variability introduced into the t-statistic becomes greater as n increases.

14) The data from a simple random sample with 25 observations was used to construct the plots given below. The normal probability plot that was constructed has a correlation coefficient of 0.937. Judge whether a t-interval could be constructed using the data in the sample.

Click here to view the normal probability plot and the boxplot.
Click here to view the table of critical values of the correlation coefficient.

n=25 on table

The normal probability plot does not suggest the data could come from a normal population because 0.937 < .959 and the boxplot shows outliers, so a t-interval could not be constructed.
(Round to three decimal places as needed.)

15) The data from a simple random sample with 25 observations was used to construct the plots given below. The normal probability plot that was constructed has a correlation coefficient of 0.974. Judge whether a t-interval could be constructed using the data in the sample.

Click here to view the normal probability plot and the boxplot.
Click here to view the table of critical values of the correlation coefficient.

n=25 on table

The normal probability plot suggests the data could come from a normal population because 0.974 > .959 and the boxplot does not show outliers, so a t-interval could be constructed.
(Round to three decimal places as needed.)

16) Put the following in order for the most area in the tails of the distribution.

(a) Standard Normal Distribution
(b) Student's t-Distribution with 15 degrees of freedom.
(c) Student's t-Distribution with 35 degrees of freedom.

(This is a reading assessment question. Be certain of your answer because you only get one attempt on this question.)

- (a), (c), (b)
- (b), (a), (c)
- ✔ (b), (c), (a)

17) Determine the point estimate of the population mean and margin of error for the confidence interval.

Lower bound is 18, upper bound is 26.

$\frac{18+26}{2} = 22$

The point estimate of the population mean is 22.

The margin of error for the confidence interval is 4.

26-22 = 4

18) **(a)** When constructing 95% confidence intervals for the mean when the parent population is right skewed and the sample size is small, the proportion of intervals that include the population mean is (above, below, equal to) 0.95.
(b) When constructing 95% confidence intervals for the mean when the parent population is right skewed and the sample size is small, the proportion of intervals that include the population mean approaches _____ as the sample size, n, increases.

(This is a reading assessment question. Be certain of your answer because you only get one attempt on this question.)

(a) Complete the statement below.

When constructing 95% confidence intervals for the mean when the parent population is right skewed and the sample size is small, the proportion of intervals that include the population mean is below 0.95.

(b) Complete the statement below.

When constructing 95% confidence intervals for the mean when the parent population is right skewed and the sample size is small, the proportion of intervals that include the population mean approaches .95 as the sample size, n, increases.

19) Determine whether the following statement is true or false.

To construct a confidence interval about the mean, the population from which the sample is drawn must be approximately normal.

This statement is false.

Partial Critical Value Table

Level of Confidence, $(1-\alpha)\cdot 100\%$	Area in Each Tail, $\frac{\alpha}{2}$	Critical Value, $z_{\alpha/2}$
90%	0.05	1.645
95%	0.025	1.96
99%	0.005	2.575

People were polled on how many books they read the previous year. Initial survey results indicate that s = 17.2 books. Complete parts **(a)** through **(d)** below.

Click the icon to view a partial table of critical values.

$$\left(\frac{Z\alpha/_2(90\%)\cdot s}{\#\ of\ books}\right)^2 \qquad \left(\frac{1.645\cdot 17.2}{6}\right)^2 = 22.2\ round\ up\ to\ 23$$

(a) How many subjects are needed to estimate the mean number of books read the previous year within six books with 90% confidence?

This 90% confidence level requires 23 subjects. (Round up to the nearest subject.)

(b) How many subjects are needed to estimate the mean number of books read the previous year within three books with 90% confidence?

This 90% confidence level requires 89 subjects. (Round up to the nearest subject.)

$$\left(\frac{1.645\cdot 17.2}{4}\right)^2 = 88.95\ round\ up\ to\ 89$$

(c) What effect does doubling the required accuracy have on the sample size?

- A. Doubling the required accuracy nearly quarters the sample size.
- ★B. Doubling the required accuracy nearly quadruples the sample size.
- C. Doubling the required accuracy nearly doubles the sample size.
- D. Doubling the required accuracy nearly halves the sample size.

$$\left(\frac{2.575\cdot 17.2}{6}\right)^2 = 54.49\ round\ up\ to\ 55$$

(d) How many subjects are needed to estimate the mean number of books read the previous year within six books with 99% confidence?

This 99% confidence level requires 55 subjects. (Round up to the nearest subject.)

Compare this result to part **(a)**. How does increasing the level of confidence in the estimate affect sample size? Why is this reasonable?

- A. Increasing the level of confidence decreases the sample size required. For a fixed margin of error, greater confidence can be achieved with a smaller sample size.
- B. Increasing the level of confidence decreases the sample size required. For a fixed margin of error, greater confidence can be achieved with a larger sample size.
- C. Increasing the level of confidence increases the sample size required. For a fixed margin of error, greater confidence can be achieved with a smaller sample size.
- ★D. Increasing the level of confidence increases the sample size required. For a fixed margin of error, greater confidence can be achieved with a larger sample size.

A trade magazine routinely checks the drive-through service times of fast-food restaurants. A 90% confidence interval that results from examining 623 customers in one fast-food chain's drive-through has a lower bound of 177.0 seconds and an upper bound of 180.8 seconds. What does this mean?

Choose the correct answer below.

- A. The mean drive-through service time of this fast-food chain is 178.9 seconds 90% of the time.
- B. One can be 90% confident that the mean drive-through service time of this fast-food chain is between 177.0 seconds and 180.8 seconds.
- C. There is a 90% probability that the mean drive-through service time of this fast-food chain is between 177.0 seconds and 180.8 seconds.
- D. One can be 90% confident that the mean drive-through service time of this fast-food chain is 178.9 seconds.

A poll was conducted that asked 1018 people how many books they had read in the past year. Results indicated that $\bar{x} = 11.8$ books and $s = 16.6$ books. Construct a 99% confidence interval for the mean number of books people read.

Click the icon to view the table of areas under the t-distribution.

Construct a 99% confidence interval for the mean number of books people read.

(10.46 , 13.14) (Use ascending order. Round to two decimal places as needed.)

T-STATS – WITH DATA

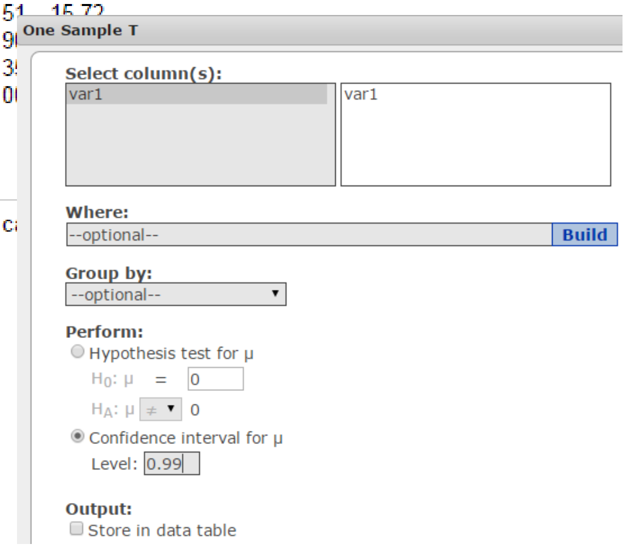
The following data represent the concentration of organic carbon (mg/L) collected from organic soil. Construct a 99% confidence interval for the mean concentration of dissolved organic carbon collected from organic soil. (Note: $\bar{x} = 18.3$ mg/L and $s = 7.13$ mg/L)

20.46	29.80	27.10	16.51	15.72
8.81	16.87	20.46	14.9	[illegible]
30.91	14.86	15.72	15.3	[illegible]
19.80	14.86	8.09	14.0	[illegible]

Click the icon to view the table of areas under the t-distribution.

Construct a 99% confidence interval for the mean concentration of dissolved organic ca collected from organic soil.

(13.74 , 22.86) (Use ascending order. Round to two decimal places as needed.)



An agricultural researcher is interested in estimating the mean length of the growing season in a region. Treating the last 10 years as a simple random sample, he obtains the following data, which represent the number of days of the growing season.

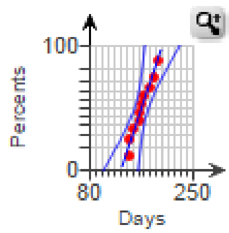
160	163	143	144	168	184	191	177	165	150

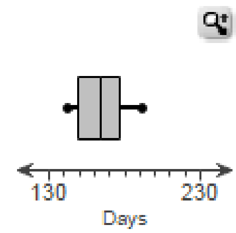
Click the icon to view the table of areas under the t-distribution.

(a) Because the sample size is small, we must verify that the data come from a population that is normally distributed and that the sample size does not contain any outliers. The normal probability plot and boxplot are shown below.

Are the conditions for constructing a confidence interval about the mean satisfied?

- A. Yes, both conditions are met.
- B. No, the population is not normal.
- C. No, there are outliers.
- D. No, neither condition is met.





(b) Construct a 95% confidence interval for the mean length of the growing season in the region.

(152.90 , 176.10)

(Use ascending order. Round to two decimal places as needed.)

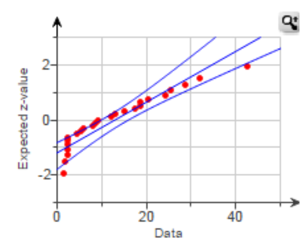
(c) What can be done to decrease the margin of error, assuming the researcher does not have access to more data?

- A. The researcher could increase the level of confidence.
- B. The researcher could increase the sample mean.
- C. The researcher could decrease the level of confidence.

From the normal probability plot and boxplot, judge whether a t-interval should be constructed.

Should a t-interval be constructed?

- A. The normal probability plot is not approximately linear, so a t-interval should not be constructed.
- B. The normal probability plot is approximately linear, so a t-interval should be constructed.
- C. It cannot be determined whether the normal probability plot is approximately linear.



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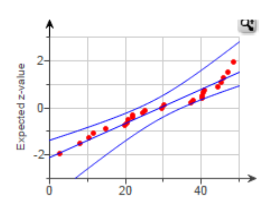
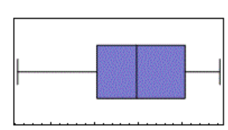
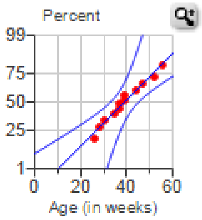
- B. The normal probability plot is approximately linear, so a t-interval should be constructed.
- C. It cannot be determined whether the normal probability plot is approximately linear.

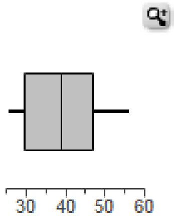




The following data represent the age (in weeks) at which babies first crawl based on a survey of 12 mothers.

52	30	44	35
47	37	56	26
39	37	39	28





Mean = 39.17
StDev = 9.25

Click the icon to view the table of areas under the t-distribution.

(a) Because the sample size is small, we must verify that the data come from a population that is normally distributed and that the sample size does not contain any outliers. Are the conditions for constructing a confidence interval about the mean satisfied?

A. No, the population is not normally distributed.
B. No, the sample contains an outlier.
C. Yes, the population is normally distributed and the sample does not contain any outliers.

(b) Construct a 95% confidence interval for the mean age at which a baby first crawls. Select the correct choice below and fill in any answer boxes in your choice.

A. (33.3 , 45.0)
(Use ascending order. Round to one decimal place as needed.)
B. A 95% confidence interval cannot be constructed.

(c) What could be done to increase the accuracy of the interval without changing the level of confidence?

A. Decrease the sample size.
B. Nothing can be done.
C. Increase the sample size.
D. Either increase or decrease the sample size.

The trade volume of a stock is the number of shares traded on a given day. The following data, in millions (so that 2.45 represents 2,450,000 shares traded), represent the volume of a certain stock traded for a random sample of 40 trading days in 2007. Complete parts (a) through (d).

Click the icon to view the data table.

Click the icon to view the table of areas under the t-distribution.

(a) Use the data to compute a point estimate for the population mean number of shares traded per day in 2007.

STATS – SUMMARY STATS –COLUMNS to get mean

The population mean number of shares is 2.334 million.
(Round to three decimal places as needed.)

(b) Construct a 90% confidence interval for the population mean number of shares traded per day in 2007.

The lower bound is 2.012 million.
(Round to three decimal places as needed.)

The upper bound is 2.655 million.
(Round to three decimal places as needed.)

Interpret the confidence interval. Choose the correct answer below.

A. There is 90% confidence that the mean number of shares of the stock traded per day in 2007 was greater than the upper bound of the confidence interval.
B. There is 90% confidence that the mean number of shares of the stock traded per day in 2007 was less than the lower bound of the confidence interval.
C. There is 90% confidence that the mean number of shares of the stock traded per day in 2007 was between the lower and upper bounds of the confidence interval.

(c) A second random sample of 40 days in 2007 resulted in the following data. Construct another 90% confidence interval for the population mean number of shares traded per day in 2007.

1.97	4.96	2.42	3.64	2.26	4.01	5.86	2.32
5.19	2.38	3.32	2.44	2.34	2.74	1.37	1.6
1.71	1.64	2.2	1.43	1.48	2.05	3.75	3.3

3.59	1.79	2.2	1.54	0.84	2.19	1.69	1.77

The lower bound is 2.176 million.
(Round to three decimal places as needed.)

The upper bound is 2.766 million.
(Round to three decimal places as needed.)

Interpret the confidence interval. Choose the correct answer below.

- A. There is 90% confidence that the mean number of shares of the stock traded per day in 2007 was greater than the upper bound of the new confidence interval.
- B. There is 90% confidence that the mean number of shares of the stock traded per day in 2007 was less than the lower bound of the new confidence interval.
- C. There is 90% confidence that the mean number of shares of the stock traded per day in 2007 was between the lower and upper bounds of the new confidence interval.

(d) Explain why the confidence intervals obtained in parts (b) and (c) are different. Choose the correct answer below.

- A. The confidence intervals are different because of variation in sampling. The samples have the same standard deviations but different means that lead to different confidence intervals.
- B. The confidence intervals are different because of variation in sampling. The samples have the same means but different standard deviations that lead to different confidence intervals.
- C. The confidence intervals are different because of variation in sampling. The samples have different means and standard deviations that lead to different confidence intervals.
- D. The confidence intervals are different because the values of $t_{\frac{\alpha}{2}}$ are different for different samples.