LESSON 10-3 Practice A
Data Distributions

Find the mean, median, mode, and range of each set of data.

1. 3, 6, 8, 8, 10

mean: 7
median: 8
mode: 8
range: 7

2. 200, 250, 300, 450

mean: 300
median: 275
mode: none
range: 250

3. 2, 6, 5, 9, 2, 5, 6, 4, 6, 5

mean: 5
median: 5
mode: 5 and 6
range: 7

4. 20, 25, 40, 35, 40

mean: 32
median: 35
mode: 40
range: 20

5. Marianna's quiz scores for this term are 83, 86, 51, 95, and 95. Use the mean, median, and mode of her scores to answer each question.

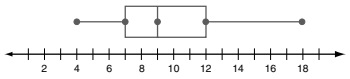
mean = 82 median = 86 mode = 95

a. Which value represents Marianna's quiz average? mean: 82

b. Which value best describes Marianna's quiz scores? Explain.

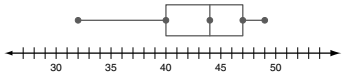
median; the score of 51 makes the mean lower than most of her scores. The mode is her highest score.

6. Make a box-and-whisker plot for data with the following values.
Minimum: 4, Q1: 7, Median: 9, Q3: 12, Maximum: 18



7. The number of grapes on each of the 15 bunches on a grape vine is given. Use the data to make a box-and-whisker plot.

38, 49, 32, 45, 44, 46, 37, 44, 42, 48, 46, 41, 47, 40, 48



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LESSON 10-3 Practice B
Data Distributions

Find the mean, median, mode, and range of each set of data.

1. 12, 15, 19, 18, 21

mean: 17, median: 18
no mode, range: 9

2. 12, 5, 16, 21, 82, 11, 7, 5, 30

mean: 21, median: 12
mode: 5, range: 77

3. 13, 15, 12, 18, 18, 12, 13, 16, 18, 18, 14, 13

mean: 15, median: 14.5
mode: 18, range: 6

4. 135, 70, 155, 140, 135, 140, 145, 80

mean: 125, median: 137.5
mode: 135 and 140, range: 85

5. Henri's times for running one lap around a track, in seconds, are 59, 63, 62, 63, 77, and 60. Use the mean, median, and mode to answer the following questions.

mean = 64 median = 62.5 mode = 63

a. Which value gives Henri's average lap time? mean: 64

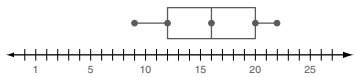
b. Which values describes the lap time recorded most often? mode: 63

c. Which value best describes Henri's lap times? Explain.

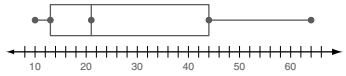
median; the time of 77 s raises the mean. The mean is greater than all but one time. The mode is the second slowest time.

6. Find the interquartile range of the data set: 13, 19, 25, 17, 54, 32, 19, 26, 14, 44, and 50. 27

7. The number of points scored per game by a basketball player is given. Use the data to make a box-and-whisker plot.
21, 18, 20, 16, 9, 16, 12, 22, 15, 17, 11



8. The ages of the first fourteen people to enter a museum are 10, 38, 44, 12, 12, 18, 24, 30, 13, 16, 50, 19, 64, and 44. Use the data to make a box-and-whisker plot.



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LESSON 10-3 Practice C
Data Distributions

Find the mean, median, mode, and range of each set of data.

1. 25, 35, 18, 26, 25, 27

mean: 26, median: 25.5
mode: 25, range: 17

2. 4.6, 6.3, 5.1, 5.3, 4.8, 4.2, 4.4, 5.3

mean: 5; median: 4.95
mode: 5.3; range: 2.1

3. Write a data set with five numbers so that there are two modes, and the mean and median are the same value. Possible answer: 2, 2, 4, 6, 6

4. The heights of children who visited a pediatrician's office in one day were $48\frac{3}{4}$ in., 34 in., $42\frac{1}{2}$ in., 66 in., 38 in., $32\frac{1}{2}$ in., and $32\frac{1}{4}$ in.

a. Find the mean, median, and mode of the data. mean: 42 in., median: 38 in., no mode

b. Which value represents the middle of the data? median: 38

c. Which value best describes the data set? Explain.

median; the value of 66 raised the mean. There are more values in the thirties than forties and there is no mode.

Find the interquartile range of each data set.

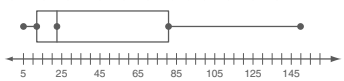
5. 22, 15, 63, 24, 18, 55, 33

37

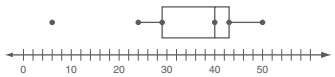
6. 33.5, 50, 16.2, 84, 17.6, 29.1, 40, 88.3

43.65

7. The numbers of vehicles that traveled on a toll road during different times of day are given. Use the data to make a box-and-whisker plot.
67, 159, 46, 100, 95, 23, 21, 8, 5, 14, 62, 10, 16



8. The weights of all the pets, in lbs, in a shelter are: 36, 40, 42, 34, 42, 6, 50, 44, and 24. Use the data to make a box-and-whisker plot. Check for outliers.



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LESSON 10-3 Reteach
Data Distributions

A **measure of central tendency** describes how data cluster around a value.

Mean	Sum all values and divide by the number of values.
Median	Put values in order and choose middle value.
Mode	Choose the value (or values) that occurs the most.
Range	Subtract the least value from the greatest value.

In a data set, a value very different from the others is an **outlier**. An outlier makes the mean greater or lesser than most of the other data values. Therefore, the mean should not be used to describe sets with outliers.

The number of books checked out from a library by six different students is: 14, 2, 3, 2, 5, and 4. Find the mean, median, mode, and range of this data set.

Mean: $\frac{14+2+3+2+5+4}{6} = \frac{30}{6} = 5$
The mean is 5.

Median: 2 2 (3 4) 5 14
The median is $\frac{3+4}{2} = \frac{7}{2} = 3.5$.

If two numbers are in the middle, find the mean of the two numbers.

Mode: 14, (2), 3, (2), 5, 4
The mode is 2.

Range: $14 - 2 = 12$
The range is 12.

Which measure of central tendency is best for describing this data set?
The mean is greater than four of the six values, and the mode is the least value, so the median gives the best description of this data set.

Find each value. Then answer the question.

1. The number of phone calls received by an operator is: 2, 6, 3, 10, 3, 8, and 3.

mean: 5 median: 3 mode: 3 range: 8

Which measure best describes the data set? Explain.

mean; there are no outliers.

2. The number of passengers in each subway car is: 33, 25, 30, 28, 4, and 27.

mean: 24.5 median: 27.5 mode: none range: 29

Which measure best describes the data set? Explain.

median; the mean is less than all but one value.

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LESSON 10-3

Reteach

Data Distributions (continued)

Quartiles divide data into 4 equal parts. Each quartile contains one-fourth of the values in the set.

Find the quartiles for the data set: 1, 1, 2, 3, 3, 4, 5, 6, 7, 7, 9, 9, 10, 10, 10.

Divide the data in half by finding the median.

1, 1, 2, 3, 3, 4, 5, (6), 7, 7, 9, 9, 10, 10, 10

Next, find the median of the lower half and the upper half. This will be the first quartile (Q1) and the third quartile (Q3).

1, 1, 2, [3], 3, 4, 5, (6), 6, 7, 7, [8], 9, 9, 10

Q1 median (Q2) Q3

When finding Q1 and Q3:
- odd number of values: do not include the median
- even number of values: include the middle two values

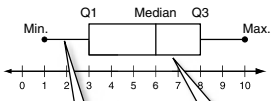
A **box-and-whisker plot** can be used to show how the data is distributed.

Use the data above to make a box-and-whisker plot.

Step 1: List the minimum, Q1, median (Q2), Q3, and the maximum.

minimum = 1, Q1 = 3, median = 6, Q3 = 8, maximum = 10

Step 2: Draw a number line which includes the numbers in step 1. Draw a box from Q1 to Q3. Draw a vertical line at the median. Draw a line from the minimum to Q1 and from Q3 to the maximum.



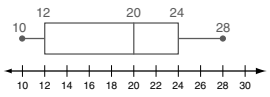
Note: An outlier can be excluded from the data and represented by a point on the plot.

Each whisker represents one-fourth of the data.

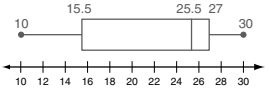
The box represents the middle half of the data.

Use the data to make a box-and-whisker plot.

3. 10, 12, 15, 20, 22, 24, 28



4. 10, 15, 16, 25, 26, 27, 27, 30



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LESSON 10-3

Challenge

Standard Deviation

Mean, median, and mode are *measures of central tendency*; they describe how a set of data clusters around a value.
Range and interquartile range are *measures of dispersion*; they describe how the data spread out from the central value.

Another popular measure of dispersion is **standard deviation**. It measures the "typical" amount that each data value *deviates* (or varies) from the mean. The formula may look intimidating, but it is easy to calculate if you stay organized.

The capital Greek letter sigma, Σ, means to sum values together.

Standard Deviation: $S = \sqrt{\dfrac{\Sigma(x - \bar{x})^2}{n - 1}}$

x represents any data value, and x-bar represents the mean of the data values. You subtract the mean from each data value to find the *deviation* of that value from the mean.

n represents the number of data values. When you divide the sum of the *squared deviations* by one less than the number of data values, you get a statistic called variance.

Josh scored 75, 75, 81, 84, and 85 on five tests. Use this table and follow the steps to calculate the standard deviation.

x	$\bar{x}$	$x - \bar{x}$	$(x - \bar{x})^2$
75	80	−5	25
75	80	−5	25
81	80	1	1
84	80	4	16
85	80	5	25

1. Enter the data values in the first column.

2. Calculate the mean and enter it in each cell of the second column.

3. In the third column, subtract the mean from each data value to find the deviations.

4. In the fourth column, square each deviation.

5. Find the sum of the squared deviations. $\Sigma(x - \bar{x})^2 =$ 92

6. Divide by $n - 1$ to find the variance. $\frac{\Sigma(x - \bar{x})^2}{n - 1} =$ 23

7. Use a calculator to find the square root of the variance. This is the standard deviation. $\sqrt{\frac{\Sigma(x - \bar{x})^2}{n - 1}} \approx$ 4.80

8. Use a graphing calculator to check your work. Press **STAT**, select **Edit...**, and enter the data values into List 1 (**L1**). Quit (**2nd MODE**) the list, then press **STAT**, select **1-Var Stats** from the **CALC** menu, select **L1** (above 1), and press **ENTER**. Look for **Sx**. **Sx** ≈ 4.80

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LESSON 10-3

Problem Solving

Data Distributions

The weights in pounds of the 2005 NBA Western Conference All-Stars are given below.

Player's Weights (lb)											
205	220	260	220	210	215	228	210	180	245	245	310

1. Find these statistics.

a. mean: 229
b. median: 220
c. mode: 210, 220, and 245
d. minimum: 180
e. maximum: 310
f. range: 130
g. first quartile: 210
h. third quartile: 245
i. interquartile range: 35

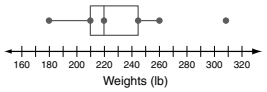
2. Based on the interquartile range, are there any outliers in the data set? Justify your answer.

Yes, 310 is an outlier; Q3 + 1.5(IQR) = 297.5 and 310 > 297.5.

3. Which measure of central tendency best describes the player's weights? Explain.

Median; the mean is affected by the outlier and too great, and there are too many modes.

4. Make a box-and-whisker plot of the data. If there are any outliers, don't forget to leave them disconnected.



Select the best answer.

5. The weights in pounds of the 2005 NBA Eastern Conference All-Stars are given below. Which statistic for the Eastern Conference is *less than* the same statistic for the Western Conference?

Player's Weights (lb)					
191	220	225	260	165	240
230	230	325	230	212	240

(A) interquartile range
B mean
C median
D range

6. The box-and-whisker plot below shows the distribution of scores on a mathematics test. Based on the plot, which statement is certainly true?



F One student scored 80.
G Only five students took the test.
(H) If only five students took the test, then one student scored 80.
J None of the above.

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LESSON 10-3

Reading Strategies

Following Procedures

The procedures for finding several statistical measures are given below.

Mean	Add all data values. Divide by the number of values.
Median	Put the data values in order. Find the middle number. If there are two middle numbers, find the mean of those numbers.
Mode	Find the number that shows up most often.
Minimum	Find the least value.
Maximum	Find the greatest value.
Range	Subtract the minimum from the maximum.
Quartile 1 (Q1)	Find the median of the lower half of the numbers.
Quartile 2 (Q2)	Find the median.
Quartile 3 (Q3)	Find the median of the upper half of the numbers
Interquartile Range (IQR)	Subtract Q3 – Q1.

Complete the following.

1. What is the first step in finding the median?
put the data values in order

2. What is another term for *median*? Quartile 2

3. What values are used in finding the IQR? quartiles 1 and 3

4. Find the mean, median, mode, and range of 6, 9, 4, 2, 5, 10.
mean: 6, median: 5.5, mode: none, range: 8

5. Find the mean, median, mode, and range of 10, 5, 5, 10, 10.
mean: 8, median: 10, mode: 10, range: 5

For 6–9, use the following data set: 8, 9, 9, 10, 13, 15, 15, 16, 17, 18, 18, 18, 19, 19, 21

6. Find the minimum and maximum. 8 and 21

7. Find the quartiles: Q1 10 Q2 16 Q3 18

8. Find the range. 13

9. Find the interquartile range. 8

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