Lesson 6
Understanding Data

Outline

Part A
Data Calculations

- Measures of Center
- Measures of Spread
- Box Plots
- Dot Plots and Bar Graphs
- Histograms

Part B
Interpreting Data

- The Shape of Data Sets
- Standard Deviation
- Outliers
- Comparing Data Sets

Targeted Review

Vocabulary

- data
- quantitative data
- categorical data
- mean
- median
- mode
- range
- spread
- interquartile range (IQR)
- standard deviation (σ)
- five-number summary
- dot plot
- bar graph
- histogram
- box plot
- skewed data
- right-skewed
- left-skewed
- normal distribution
- bell curve
- deviation
- 68-95-99.7 Rule
- outliers

Check out **More to Explore** in the Digital Pack to see if there are additional activities for this part of the lesson.

Warm Up

Your student should spend no more than 5 minutes on the Warm Up. This should be a quick review to activate prior knowledge.

3) This number repeats twice.

Part A: Data Calculations

Objectives

In this part of the lesson, you will learn about data calculations.

By the end of this lesson you will be able to do the following:

- Match a data set to a graph, including dot plots, histograms, and box plots.
- Calculate measures of spread, including range, interquartile range, and the five-number summary.
- Calculate the measures of center: mean, median, and mode.

Why?

From figuring out which store has the best discount on your favorite sneakers to the average age of people that purchase your company's product, being able to understand and calculate data will impact your world, personally and professionally, throughout your life.

Warm Up

Use the table below to answer the following questions.

Last Week's High Temperatures (°F)

S	M	T	W	Th	F	Sa
85	80	60	75	55	45	55

1) What was the median temperature last week?

45, 55, 55, 60, 75, 80, 85

60°F

2) What was the mean temperature last week?

$\frac{(45 + 55 + 55 + 60 + 75 + 80 + 85)}{7} = 65°\text{F}$

3) What was the mode temperature last week?

55°F

4) What was the range of temperatures last week?

$85 - 45 = 40°\text{F}$

EXPLORE 6A

Measures of Center

- **Data** is a collection, or set, of information that can be quantitative or categorical.
  - **Quantitative** data is numerical.
  - **Categorical** data is data that is divided into categories or groups.

Measures of Center:

- **Mean** is the average.
- **Median** is the middle element of the data set when the data set is ordered.
- **Mode** is the most frequently occurring element in a data set.
- When an element *larger* than the mean is added to a data set, the mean **increases**.
- When an element *smaller* than the mean is added to a data set, the mean **decreases**.
- When an element that is the **same** as the mean is added to the data set, the mean remains the same.

Example 1

Find the average when elements are added to the data set.

After taking five tests, Jill had a mean test score of 85. What would her average be if she scored 75 on the next test? Round to the nearest unit.

$85 \cdot 5 = 425$ Total points earned on 5 tests

$425 + 75 = 500$ New point total

$\frac{500}{6} = 83.\overline{3}$ New average of 6 tests

Setup with calculator:

$\bar{x} = \frac{(85 \cdot 5) + 75}{6}$

Remember to enter the entire problem into the calculator at one time.

The new average is about **83**.

Example 1

The original test scores are not needed because the number of tests and the average is given. When these are multiplied together, the average total points can be calculated.

6A EXPLORE

Example 2

Find the element that will result in the desired average for the data set.

The basketball team had an average score of 90 points between their first four games. They wanted their average score after five games to be 95 points. What would the final score in the next game need to be to achieve this average?

n: needed score for new average

$4 \cdot 90 = 360$ ◀ Total points in four games

$5 \cdot 95 = 475$ ◀ New average with 95-point average in five games

$n + 360 = 475$ ◀ Equation to find the next game's score

$-360 \quad -360$ ◀ Addition Property of Equality

$n = 115$

To reach a final average of 95 after five games, the team must score 115 points.

This problem can also be solved using an equation:

$$\frac{(4 \cdot 90) + n}{5} = 95$$

$$\frac{360 + n}{5} = \frac{95}{1}$$ ◀ Write 95 as a ratio

$$(360 + n)(1) = (5)(95)$$ ◀ Cross product, simplify terms

$$360 + n = 475$$ ◀ Addition Property of Equality

$$n = 115$$

Either method to solve is correct. You should determine the strategy that makes the most sense to you.

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Choice B is the correct equation because Bo is looking for a specific grade and already has the average (mean). Choice A would be used if Bo was trying to calculate his new average after scoring 90 on the fifth test.

Checkpoint

Bo has a class average of 88 after taking four tests. Bo was hoping for an average of 90 for the grading period. What score does Bo need to earn on the next test to have a 90% average?

Pick the correct equation and use it to solve.

A) $\bar{x} = \frac{(88 \cdot 4) + 90}{5}$

B) $90 = \frac{(88 \cdot 4) + n}{5}$

$$\frac{(88 \cdot 4) + n}{5} = \frac{90}{1}$$

$$352 + n = 450$$

$$n = 98$$

Bo need to earn a 98 on his next test.

EXPLORE 6A

Measures of Spread

- The **spread** of a data set represents how far apart the elements of the data set are from one another.

Measures of Spread:

- Range is found by subtracting the **minimum** value from the **maximum** value.
- A quartile is a **quarter**, or 25% of the data.
  - The lower quartile, **Q1**, represents the bottom 25% of the data set.
  - The upper quartile, **Q3**, represents the top 25% of the data set.
- Interquartile range (IQR) represents the spread of the middle **fifty percent (50%)** of a data set and measures the spread based on the **median** value.
- IQR = **Q3** − **Q1**
- **Standard deviation** is the average distance of elements in the data set from the mean.
- The parts of the five-number summary are:
  - **minimum (min) (Q0)**
  - **first quartile (Q1)**
  - **median (med) (Q2)**
  - **third quartile (Q3)**
  - **maximum (max) (Q4)**

Example 3

Find the interquartile range for: $\{2, 3, 4, 4, 5, 5, 5, 7, 7, 8, 10, 11, 11, 11, 12\}$

Plan Write the data set in order
Calculate the median, Q1, Q3
Calculate the IQR

Implement

$\{2, 3, 4, (4), 5, 5, [7, 7,] 8, 10, (11), 11, 11, 12\}$

Q1 Q3

$\frac{7+7}{2} = 7$

med = 7

IQR = Q3 − Q1

$11 - 4 = 7$

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

The five-number summary is listed in the order in which it is solved for. Q1 and Q3 can only be found after the median is known, since Q1 and Q3 are based on the median.

6A EXPLORE

Example 4

Find the interquartile range for: {19, 19, 20, 21, 21, 22, 23, 23, 24, 25, 28, 28, 29}

Plan Write the data set in order
Calculate the median, Q1, Q3
Calculate the IQR

Implement

{19, 19, [20, 21,] 21, 22, (23), 23, 24, [25, 28,] 28, 29}

Q1 — med — Q3

IQR = Q3 − Q1

$\frac{20+21}{2} = 20.5$ $\frac{25+28}{2} = 26.5$ $26.5 - 20.5 = 6$

Checkpoint

Calculate the five-number summary, interquartile range, and range.
{28, 37, 39, 43, 46, 47, 22, 34, 38}

Order the data set: {22, 28, 34, 37, 38, 39, 43, 46, 47}

Min: 22

Med (Q2): 38

Max: 47

Q1: $\frac{28+34}{2} = 31$

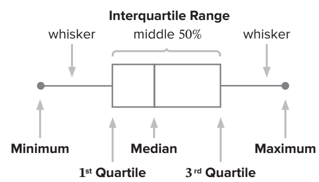
Q3: $\frac{43+46}{2} = 44.5$

IQR: $44.5 - 31 = 13.5$

Range: $47 - 22 = 25$

Box Plots

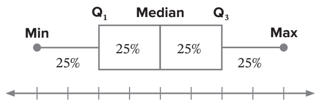
- **Box plots** divide data sets into four parts, each with the **same number** of elements.
- The **five-number summary** is calculated to determine the construction of the box plot.
- In a box plot, the box represents the **middle 50%** of the data elements.



- In a box plot, **whiskers** are drawn from the minimum to the first quartile and from the third quartile to the maximum.

EXPLORE 6A

- The median is the middle number in the data set but is **not always** in the middle of the box when graphed.
- Box plots are useful in showing the **spread** of the data.
- **Range** and **IQR** are measures of spread that can be calculated from a box plot.
- There are **four** sections in a box plot.
- Each section represents **25%** of the data set and has the same number of elements in each part.

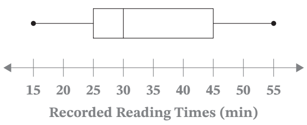


- If the **total number** of elements in the data set is known, it can be divided into **four** parts, or quarters, to determine the number of elements in each section of the box plot.

The mean cannot be calculated from a box plot because the value of each element of the data set cannot be determined.

Example 5

Mrs. Madigan asked 24 of her students to record the time they spent reading for homework last night.



Use the box plot to answer the questions.

A) What is the median reading time? **30 minutes**

B) What is the interquartile range? **$45 - 25 = 20$**

C) What percentage of students read between 25 and 45 minutes? **50%**

D) What percentage of students read for more than 25 minutes? **75%**

E) What quartile contains elements from $15 - 25$ minutes? **Q1, the lower quartile**

F) How many students are in the upper quartile? **$\frac{24}{4} = 8$ students**

G) What is the average?

The average cannot be determined from a box plot without the original data set.

H) How many students read for less than 30 minutes?

50% of 24 students = 12 students

I) Does the box plot represent measures of center or spread better? Explain.

Box plots represent measures of spread better. Only the median can be determined from a box plot. The mean and mode are unknown without the original data set.

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Q: What is the five-number summary for the box plot?

A: min = 2, Q1 = 6, med = 7, Q3 = 8, max = 12

Q: What percentage of the data is represented by the box?

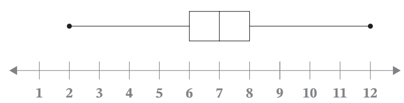
A: *50%*

Q: What percentage of the data is represented by 1 whisker?

A: *25%*

Checkpoint

Use the box plot to find the range and interquartile range (IQR). Determine the average or explain why it cannot be calculated.



Range: 12 − 2 = 10
IQR: 8 − 6 = 2

It is not possible to determine the average (mean) because the individual elements of the data set are unknown.

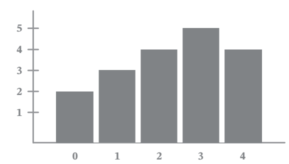
Dot Plots and Bar Graphs

Dot Plots

- Determining which ___**graph**___ to use is just as important as calculating measures of center and spread.
- Graphing data incorrectly can lead to ___**misunderstandings**___.
- ___**Dot plots**___ use basic shapes to represent each element in a data set.
- Dot plots are useful for representing ___**small**___ data sets with ___**countable**___ elements.

Bar Graphs

- ___**Bar graphs**___ are used to compare categories of data and usually have a vertical axis number line.



- Unlike dot plots, bar graphs can represent ___**large**___ counted values.

EXPLORE 6A

Example 6

Find the measures of center from the bar graph.
The bar graph recorded customer reviews at Harvey's Restaurant.

Plan List the elements
Determine the mean, median, mode

Implement

Elements of the bar graph: $\{1, 3, 3, 4, 4, 4, 5, 5\}$

Mode: **4**
The tallest bar and the number that repeats the most is the mode.

Median: **4**

Find the middle number when the data set is listed in order:

$\{1, 3, 3, 4, 4, 4, 5, 5\}$

$$\frac{(4+4)}{2} = 4$$

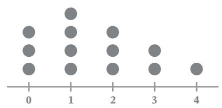
Mean: **3.625**

Add all of the values and divide by the total number of elements.

$$\frac{(1 \cdot 1) + (3 \cdot 2) + (4 \cdot 3) + (5 \cdot 2)}{8} = \frac{29}{8} = 3.625$$

Checkpoint

Use the dot plot to determine the measures of center. Round to the nearest tenth where needed.



mean: $\frac{((0 \cdot 3) + (1 \cdot 4) + (2 \cdot 3) + (3 \cdot 2) + (1 \cdot 4))}{13}$

$$\frac{(0+4+6+6+4)}{13} = 1.5$$

OR

$$\frac{(0+0+0+1+1+1+1+2+2+2+3+3+4)}{13} = 1.5$$

median: 1
mode: 1

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

The process for finding the measures of center is the same used in Example 4 with a bar graph.

The measures of center are mean, median, and mode. Have your student refer to their notes if they forget which values are measures of center.

Your student can calculate the mean by adding each number in the data set or by multiplying the number of each element by the value of the element.

Encourage your student to find this on the graph rather than listing out all of the elements in the data set.

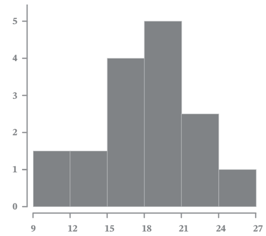
The mode should stand out the most in a dot plot because it is represented by the tallest column of dots.

Q: What is the tallest column of dots?
A: *1*

Q: What measure of center is this?
A: *mode*

6A EXPLORE

Histograms

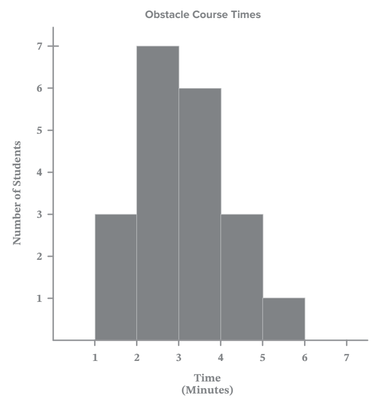


- In a **histogram**, the horizontal axis has equal intervals of data instead of categories.
- **Intervals** on a histogram meet but never overlap.
- In a histogram, each element of the **data set**, will fit into only one interval.
- The **vertical** axis of a histogram identifies the number of elements in each interval.
- Histograms can be used to **compare** the intervals created for the data set, but cannot be used to find the exact **mean** or **median** for the data set.
- Without being given the actual data set, values calculated from a histogram will be an **estimate** only.

Example 7

Use the histogram to determine the estimated medan and range.

On field day, the students recorded their times in minutes to complete the obstacle course. They used the data to create a histogram.



Estimated range: **5**

largest value − smallest value

$6 - 1 = 5$

Estimated median: **2.5**

total number of elements: 20

middle elements: 10th and 11th (2 intervals from left and 3 intervals from right)

$\frac{(2+3)}{2} = 2.5$

estimated element values:

$\{1, 1, 1, 2, 2, 2, 2, 2, 2, 2, 3, 3, 3, 3, 3, 3, 4, 4, 4, 5\}$

EXPLORE 6A

Checkpoint

Use Example 7 to find the estimated mean from the histogram. Explain why the mean is an estimate.

Estimated mean: $\frac{(1 \cdot 3) + (2 \cdot 7) + (3 \cdot 6) + (4 \cdot 3) + (5 \cdot 1)}{20} = 2.6$

The mean is an estimate because the data set is not given with the histogram.

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Practice 1

Worked solutions for these problems are located in the Digital Pack.

2) The median does not need to be calculated if your student reads it from the graph correctly.

3) Recall the line inside the box represents the middle of the data. Since the median is aligned with a score of 75% (passing), half of the students passed. Fifty percent of 8 student test scores equals four passing students.

4–5)

Your student can use an equation rather than follow the step-by-step procedure.

4) The mean will stay the same because the new element is equal to the given mean.

Mean with new element: 52

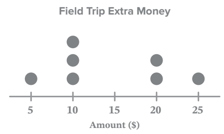
5) The mean will decrease because the new elements much smaller than the given mean.

Mean with new element: 26.53

Practice 1

Complete the problems on a separate sheet of paper. Round to the nearest hundredth where needed.

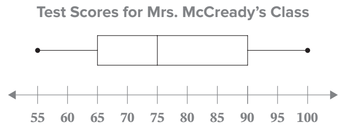
1) Seven students went on a field trip. Their teacher suggested they take extra money to spend in the gift shop. The set below represents how much extra money each student brought.



Using only the dot plot determine mean, median, and mode.
Mean: 14.29 **Median: 10** **Mode: 10**

Mrs. McCready analyzed the test she had given her students using a box plot. The scores for the test were:

{60, 90, 80, 90, 70, 65, 100, 55}.



2) Determine the average and the median. **Average (mean): 76.25** **Median: 75**

3) Mrs. McCready considers a passing score to be 75%. What percentage of her class passed based on this determination? How many students passed the test? **Fifty percent of the class passed. This represents four students.**

Determine how the value of the new element will affect the mean (increase, decrease, remain the same). Then find the new average of the data set after adding the new elements.

4) Original data set

Number of elements: 3
Mean: 52
New element: 52

5) Original data set

Number of elements: 24
Mean: 28.3
New elements: 6.4, 4.3

Find the value of the element necessary to arrive at the desired mean.

6) Original data set

Number of elements: 8
Original Average: 27.5
Desired Average: 30

Necessary element: 50

7) Original data set

Number of elements: 12
Original Average: 90
Desired Average: 90

Necessary element: 90

Determine the graph that best matches the given situation.

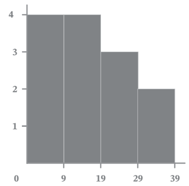
8) Benjamin is applying for a scholarship. To qualify, he needs to score in the top 50% of applicants on a specific test. Which type of graph is the best for Benjamin to see the top 50% of scores for the test? **box plot**

9) Danielle was researching the cyclists that traveled down the hill in front of her home. She found that cyclists traveled down the hill at various speeds ranging from 3.2 miles per hour (mph) to 25.7 mph. Which type of graph would best represent the number of cyclists traveling down the hill at speeds within 5 mph intervals? **histogram**

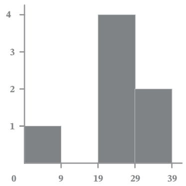
PRACTICE 1 6A

Match the data set to a graph.

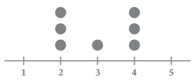
A)



B)



C)



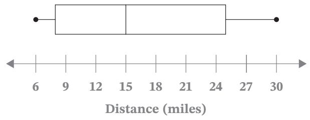
B **10)** {20, 32, 25, 35, 9, 22, 25}

A **11)** {15, 21, 26, 25, 7, 6, 10, 17, 10, 30, 8, 35, 3}

C **12)** {2, 3, 4, 2, 2, 4, 4}

Use the box plot to answer problems 13-16. It represents the commutes of 13 people at a local office.

Morning Commute Distances



13) What percentage of people have a commute with a distance greater than 15 miles? **50%**

14) What percentage of people commute between 8 and 25 miles to work? **50%**

15) How many people are represented in the first quartile? **3**

16) What is the IQR? **IQR = 17**

17) Mary-Anne listed her age and the age of her four siblings: {4, 7, 7, 13, 15}
In six years, will the following measures increase, decrease, or remain the same?

mean **increases**
median **increases**
mode **increases**
range **remains the same**
IQR **remains the same**

Name the measure of center or spread that best matches the scenario.

18) Anderson said on his farm that most cows have one calf each time. **mode**

19) Elizabeth found the difference between the highest and lowest temperature in March was 30 degrees. **range**

20) Dodge has an overall grade in Algebra of 92% **mean (average)**

21) What are the *similarities and differences* between the mean and median of a data set?

14) Q: What do the numbers 8 and 25 represent?
A: *Q1 and Q3*

15) There are six numbers on each side of the median. Dividing this in half shows there are three people represented in each quarter. Or $\frac{13}{4} = 3.25$ which will round down to 3.

17) Q: What will the ages be in 6 years?
A: *10, 13, 13, 19, 21*

Your student may need to complete the calculations with the current and new ages to answer these questions. Have them say what they expect to happen first, and then use calculations to confirm their response.

Q: What do you notice about the numbers that remain the same?
A: *Both are a type of range (measure of spread).*

Q: What do you notice about the numbers that change?
A: *All of the measures that increase are measures of center.*

Q: Why do all of the measures of center increase?
A: *Because all of the ages increase.*

18–20)
Have your student look for keywords:
a) most = mode,
b) difference, highest, lowest = range,
c) grade percent is an average

21) Similarities Sample:
Both the mean and the median represent the center of the data set.

Differences Sample:
The median is the middle number of an ordered data set. The amount of numbers on each side of the median is balanced. The value of each element is not considered when finding the median. The mean is the center value of the elements. The mean represents what number all the elements would be if all the elements were equal. The mean is the balancing point of the data set.

Mastery Check

Show What You Know

B) Students can choose to use Desmos® to create their graph but will still need to transfer the graph back to paper.

Q: How many scores are represented in each quartile?

A: *3*

$\frac{\text{12 scores}}{\text{4 quartiles}}$ = 3 *scores in each quarter of the data*

Q: If the same number of scores are in each quartile, why are they different lengths?

A: *A box plot shows the spread of the data. If a quarter is longer, it means the data is more spread out.*

C) Your student can set up a proportion to solve or they may know that 75% of 25 points is 18.75 points. Since 19 = Q1, they will need to approximate what percent of the class passed.

D) This ties the idea of a midpoint from absolute value inequalities from Lesson 4 to the median.

Have your student look at the graph and ask them what is the distance from the median to the minimum? (5) What is the distance from the median to the maximum? (5)

Say What You Know

Your student should be able to restate the objectives of the lesson in their own words. If your student is unable to restate the lesson objectives, have them go back and reread the objectives and then explain them.

- You will be able to match a data set to a graph, including dot plots, histograms, and box plots.
- You will be able to calculate measures of spread, including range, interquartile range, and the five-number summary.
- You will be able to calculate the measures of center: mean, median, and mode.

Mastery Check

Show What You Know

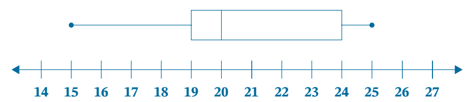
Mr. Stephens recorded the scores of the last math quiz for his class. A total of 25 points could be earned for the quiz.

Class quiz scores: {15, 18, 19, 19, 19, 19, 21, 24, 24, 24, 25, 25}

A) Calculate the five-number summary for the data set.

Five-number summary:
min = 15
Q1 = 19
med = 20
Q3 = 24
max = 25

B) Create a box plot for the class quiz scores.



C) What percent of the class earned grades higher than 75%? Explain.

$\frac{75}{100} = \frac{x}{25}$

$\frac{3}{4} = \frac{x}{25}$

$4x = 75$

$x = \frac{75}{4} = 18.75$

A score of 75% is the same as 18.75 points out of 25. Approximately three-quarters, or 75%, of the class earned grades higher than 75%.

D) Write an absolute value inequality that will represent all of the class quiz scores. Explain what the numbers in your inequality represent.

c: class quiz scores

$|c - 20| \leq 5$

Twenty represents the midpoint (the median score).
Five represents the distance from the median to the minimum or maximum number.

Say What You Know

In your own words, talk about what you have learned using the objectives for this part of the lesson and your work on this page.

Practice 2

Complete the problems on a separate sheet of paper. Round to the nearest hundredth where needed.

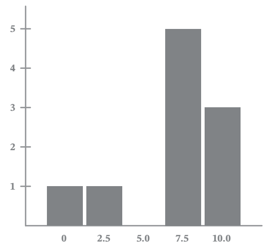
1) How can you determine the mean and median from a bar graph or dot plot?

2) Determine the measures of center for the bar graph.

mode = 7.5, median = 7.5, mean = 7

3) Can you determine the interquartile range from the given bar graph? Explain.

Yes, since each element of the data set can be determined and the median was already determined, the IQR can also be determined.



Determine how the value of the new element will affect the mean (increase, decrease, remain the same). Then find the new average of the data set after adding the new elements.

4) Original data set

Number of elements: 8
Mean: 25
New elements: 48 and 22

5) Original data set

Number of elements: 10
Mean 12.5
New elements: 15, 22, 12, 16, 20

Find the value of the element necessary to arrive at the desired mean.

6) Original data set

Number of elements: 4
Original Average: 89
Desired Average: 90

Necessary Element: 94

7) Original data set

Number of elements: 20
Original Average: 89
Desired Average: 90

Necessary Element: 110

Determine the graph that will best represent the given situation.

8) Mrs.Collins wants to compare the data she collected from forty-five third graders on their favorite colors. The categories are blue, red, green, yellow. **bar graph**

9) Dr. Jones collected data about the heights of old-growth trees. He needs to analyze the data once it is broken into quarters. **box plot**

Practice 2

Worked solutions for these problems are located in the Digital Pack.

1) Sample:
Using a bar graph or dot plot, the mean can be determined by multiplying the value of each category by the total number of elements in that category, adding these values together, and then dividing by the total number of elements. The median can be found by finding the middle element when listed in order.

3) Remind your student that you do not have to have a box plot to find the IQR.

Q: Can you list all of the elements of this data set?

A: *Yes*

Q: If you have all of the elements can you find the five-number summary?

A: *Yes*

4) The mean will increase since 48 is much larger than the given mean.

New average (mean): 27

5) The mean will increase because most of the new elements are larger than the given mean.

New average (mean): 14

8) Categories by color is the key that determines a bar graph.

9) Quarters is the keyword that determines a box plot.

13) 1 ≤ goals scored ≤ 4

14) 25%

16) In order to calculate the average, you need the elements of the data set. You cannot calculate the average using a box plot, which is used to show the spread of the data.

17) Q: In general, did the rainfall total increase or decrease?

A: *Decrease*

Q: How would you expect this to affect the measures listed?

A: *They would decrease.*

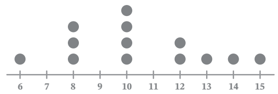
21) Sample:
Adding an element that is the same as the mean will leave the mean unchanged. When an element that is the same as the mean is added to the data set, the mean remains the same because it is already the same as the equal value created by the mean.

If needed, have your student go back to the Mastery Check and reapply what they have learned to say and show what they know.

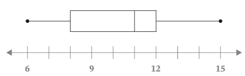
6A PRACTICE 2

Match the graph to its data set.

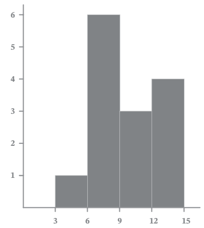
__C__ **10)**



__A__ **11)**



__B__ **12)**



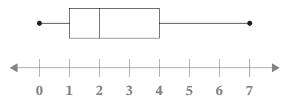
A) {6, 8, 11, 12, 13, 14, 15, 12, 11, 11, 8, 8, 11}

B) {6, 8, 9, 12, 13, 14, 15, 12, 9, 14, 8, 8, 10, 8}

C) {6, 8, 10, 12, 13, 14, 15, 12, 10, 10, 8, 8, 10}

Mr. Cotes's ice hockey team has currently played 48 games. The box plot represents the numbers of goals scored at each of the 48 games.

Goals Scored Per Game



13) What is the range in goals that represents the IQR?

14) What percentage of games had between 0 and 1 goals scored?

15) How many games had goals over 4 goals scored? **12 games**

16) Mr. Cotes told the team he used the box plot to calculate the average goals per game. Explain why this is not the correct way to calculate the average.

17) Centimeters of rainfall were recorded for the same five weeks in 2012 and 2019.

2012: {1, 1.5, 2, 0, 0.5}   2019: {0, 0.5, 0, 1, 1.5}

In 2019, did the following measures increase, decrease, or remain the same?

mean **decreased**   range **decreased**
median **decreased**   IQR **remains the same**

Name the measure of center or spread that best describes the scenario.

18) The middle half of the class's scores had a range of 5. **IQR**

19) The most common grade in the class was 88%. **mode**

20) The middle score for the class was 87%. **median**

21) What added value(s) will leave the mean unchanged? Explain.

EXPLORE 6B

Part B: Interpreting Data

Objectives

In this part of the lesson, you will learn about interpreting data.

By the end of this lesson, you will be able to do the following:

- Use the 68-95-99.7 Rule and bell curves to analyze standard deviations.
- Use the outlier formula to determine if a data set contains outliers.
- Compare center and spread for multiple data sets, including their outliers.

Why?

Understanding concepts like outliers and standard deviation will allow you to better understand and use the data you encounter in algebra and your everyday life.

Warm Up

Answer the following questions using the data set: {28, 37, 39, 43, 46, 47}.

mean = 40 median = 41 range = 19

1) If 40 was added to the set, would the mean increase, decrease, or stay the same?

Stay the same.

2) If 40 were added to the set, would the median increase, decrease, or stay the same?

Decrease

3) If 68 was added to the original set, compared to the original mean, would the mean increase, decrease, or stay the same?

Increase

4) If 68 were added to the original set, compared to the original range, would the new range increase, decrease, or stay the same?

Increase

The Shape of Data Sets

- The **shape** of a data set reveals the visual patterns in the data.
- **Skewed** data has more points on one side than the other.

Check out **More to Explore** in the Digital Pack to see if there are additional activities for this part of the lesson.

Warm Up

Your student should spend no more than 5 minutes on the Warm Up. This should be a quick review to activate prior knowledge.

2) Q: Why does the mean remain the same in Problem 1?

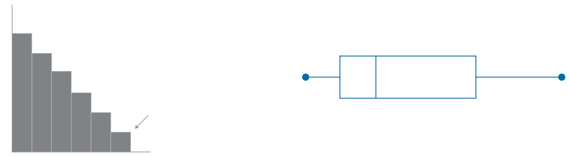
A: *Because if you add the same number as the mean, it will not change*

4) Q: Is the median greatly affected by the additional elements or only slightly?

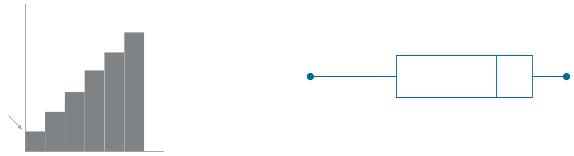
A: *Only slightly.*

6B EXPLORE

- The data in the graphs below is **right** -skewed.



- The data in the graphs below is **left** -skewed.

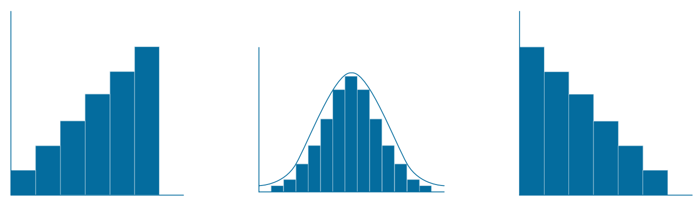


- Data that is normally distributed makes a **bell curve** and has no skew.
  - This is also called a **normal** distribution.

Checkpoint

Make a quick sketch of each of the following types of graphs as histograms.

Left skewed | Normal | Right skewed



Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Your student should focus on the shape rather than making a "perfect" graph.

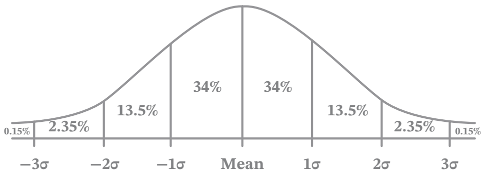
Q: When a graph is left-skewed, where is the tail of the data?
A: *The left.*

Q: Where is the highest point on a normally distributed graph?
A: *The middle/center.*

EXPLORE 6B

Standard Deviation

- **Standard deviation** is a measure of spread based on the mean of a data set.
- Standard deviation represents the average deviation, or **distance**, of elements from the **mean**.
- Because standard deviation is a measure of distance, it is **always** positive.
- The probability of occurrences within normally distributed data and bell curves follows a pattern called the **68-95-99.7** Rule.



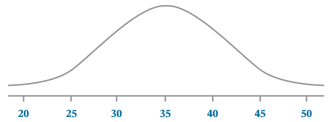
- In the 68-95-99.7 Rule:
  - values that are within **one** standard deviation(s) from the mean will make up 68% of the data.
  - values that are within **two** standard deviation(s) from the mean will make up 95% of the data.
  - values that are within **three** standard deviation(s) from the mean will make up 99.7% of the data.
- Each **vertical** line on a bell curve represents a standard deviation above or below the mean.

6B EXPLORE

Example 1

Fill in the numbers to represent one, two, and three standard deviations from the mean. Then use the normal distribution to answer the following questions.

The mean of the data set for the sum of ten dice is 35 and the standard deviation is approximately 5.



A) What percent chance is there that the sum will be one standard deviation from the mean?

$34\% + 34\% = 68\%$ chance

B) What is the range within two standard deviations? What percentage of the data does this represent?

$25 < x < 45$

Two standard deviations represent ___95___% of the data.

C) What is the percent chance that the sum of all ten dice will be 60?

$100\% - 99.7\%$ (3 standard deviations) $= 0.3\%$

$\frac{0.03\%}{2} = 0.15\%$

D) What is the percent chance that the sum of all ten dice will be 40 or less?

$30 < x < 40 = 68\%$

$25 < x < 30 = 13.5\%$

$20 < x < 25 = 2.35\%$

$x < 20 = 0.15\%$

$68\% + 13.5\% + 2.35\% + 0.15\% = 84\%$

These percentages will remain true for all normally distributed data.

Checkpoint

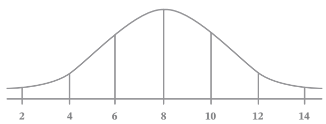
Use the normal distribution to answer the following questions.
The normal distribution represents the average height of a candy floss tree in feet.

A) What is the average height of the tree?

8

B) What is the standard deviation?

2



C) If you see a candy floss tree in the woods, what chance is there that the tree will be between 8 and 10 feet tall?

34%

D) What is the name of the rule for normally distributed graphs?

68-95-99.7 Rule

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Have your student use their notes with the percentages labeled to help determine the answers.

Q: What percentage does one standard deviation represent?

A: *68%*

Q: What does two standard deviations represent?

A: *95%*

Q: What does three standard deviations represent?

A: *99.7%*

Q: If an event is within 3 standard deviations, should a person be confident it will happen?

A: *Yes, because that represents a 99.7% chance which is almost 100%*

EXPLORE 6B

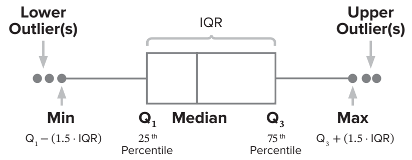
Outliers

- Outliers are data elements that are outside the overall pattern of the data set.
- The outlier formula is used to back up your instinct mathematically.

Outlier Formula:

lower outlier < Q1 − (1.5 · IQR)

upper outlier > Q3 + (1.5 · IQR)



- To solve for outliers using the formula the first and third quartiles and interquartile range must be calculated.
- When outliers are not calculated, they can cause the data to be skewed unintentionally.

Example 2

Mr. Tyrone wants to know if there are any outliers present in the last test given to his students. He believes that the lowest and the highest scores are both outliers. He grades the number of points students earned out of 100.

Grades: {55, 73, 75, 78, 80, 83, 85, 85, 88, 89, 90, 92, 96, 99, 100}

A) Use the outlier formula to help determine if any outliers are present in the data.

Five-Number Summary
- Min: 55
- Q1: 78
- Med: 85
- Q3: 92
- Max: 100

IQR: 92 − 78 = 14

Lower Outlier < Q1 − (1.5 · IQR)

Lower Outlier < **78 − (1.5 · 14)**

Lower Outlier < **57**

The student that earned a 55 is an outlier.

Upper Outlier > Q3 + (1.5 · IQR)

Upper Outlier > **92 + (1.5 · 14)**

Upper Outlier > **113**

There are no upper outliers.

Mr. Tyrone wants to know what effect the outlier has on the class average. He calculated the mean before determining the outliers and found it was about 84.53.

B) Calculate the average without the outlier.

$$\frac{73+75+78+80+83+85+85+88+89+90+92+96+99+100}{14} = \mathbf{86.64}$$

C) How does removing the outlier affect the average?

Removing the outlier decreases the number of elements in the data set by one. The class average increases because the lower outlier is not pulling the average down.

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Your student should focus on the shape rather than making a "perfect" graph.

Q: What do you expect would happen to the average if 32 was removed from the data set?

A: *The average would be lower because 32 is pulling the average up higher that it should be.*

Q: Why should you use the formula for outliers instead of just your gut feeling?

A: *Because outliers close to the boundary number might be missed.*

Example 3

Both classes also have a score of 85. This could also be used to compare the two classes of students.

Checkpoint

Determine the lower and upper bounds for the outliers using the data set. Are there any outliers in the data set? If so, name the outlier(s).

$\{16, 18, 19, 20, 20, 21, 32\}$

Q1: 18	lower < Q1 – 1.5(IQR)	upper > Q3 + 1.5 (IQR)
Q3: 21	lower < 18 – 1.5 (3)	upper > 21 + 1.5 (3)
IQR: 21 – 18 = 3	lower < 13.5	upper > 25.5

The element 32 is an outlier.

Comparing Data Sets

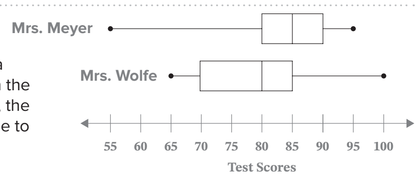
- Some examples of how comparing data sets can be useful in everyday life are:

  weather events, sports statistics, and backing up arguments.

Example 3

Use the graph to compare data sets.

Mrs. Meyer's Algebra class and Mrs. Wolfe's Algebra class were debating about which class did better on the last test. Not wanting to share individual test scores, the teachers made a stacked box plot for students to use to back up their arguments mathematically.



Implement

Mrs. Meyer	Mrs. Wolfe
Min: 55	Min: 65
Q1 80	Q1 70
Med: 85	Med: 80
Q3: 90	Q3: 85
Max: 95	Max: 100
Range: 95 – 55 = 40	Range: 100 – 65 = 35
IQR: 90 – 80 = 10	IQR: 85 – 70 = 15

Explain

75% of Mrs. Meyer's class scored above 80.
50% of Mrs. Wolfe's class scored above 80.
Since a greater percentage of Mrs. Meyer's class scored above 80, her class did better on the test.

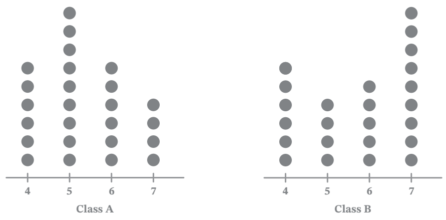
EXPLORE 6B

Checkpoint

Use the measures of center to determine which class grew more according to the data. Which measure best indicates this?

Two elementary classrooms measured their heights in centimeters at the start and end of the school year. Since the growth range was the same for both classes, the teachers decided to use measures of center to determine which class had a more significant height change.

Growth in Centimeters



mean = 4.84
median = 5 cm
mode = 5 cm

mean = 5.64
median = 6 cm
mode = 7 cm

Class B grew more. All of the measures of center are higher than Class A. The measure that best indicates their growth is the mode. Nine students grew 7 cm, while in Class A, nine students grew 5 cm.

Checkpoint

To continue past this checkpoint, students should confidently and correctly answer this problem.

Practice 1

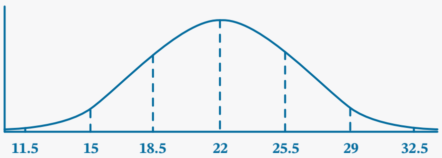
Worked solutions for these problems are located in the Digital Pack.

1) normally distributed

2) right-skewed

3) Sample:
This rule states that 68% of the data elements will fall within one standard deviation from the mean, 95% of the data elements will fall within two standard deviations from the mean, and 99.7% of the data elements will fall within three standard deviations from the mean.

7)



Have your student start with the mean in the center and work their way out in one direction. Moving left, they should subtract 3.5 from each subsequent value. Moving right, they should add 3.5 to each subsequent value.

Labeling the percentages between the dashed vertical lines will help your student see how the 68-95-99.7 Rule works.

9) Your student may need a reminder to divide the percentage in half since they are only working on one side of the bell curve. Forty-five days is 2 standard deviations away from the mean.

100% − 95% (2 st dev) = 5%

$(5\%)\left(\text{left } \frac{1}{2} \text{ of data}\right) = 2.5\%$ chance

10) Recall, above day 65 is 50% of the data. Day 55 to day 65 is one standard deviation, or 34% on the left side. These percentages are added together to determine the percent chance of the plant blooming.

11) Ms. Nance's class has a much better chance of being correct.

Mr. Miller's class was −2 and −3 standard deviations away from the mean.

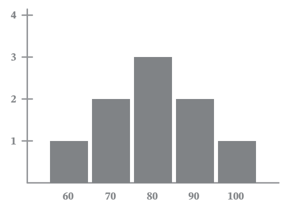
Ms. Nance's class was −1 standard deviation and 1 standard deviation away from the mean.

Practice 1

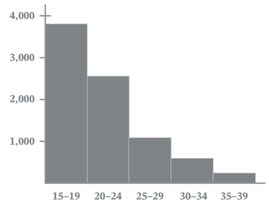
Complete the problems on a separate sheet of paper.

Label the shape of the graph as left-skewed, right-skewed, or normally distributed.

1)

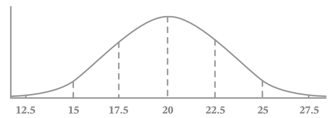


2)



3) What is the 68-95-99.7 Rule?

Use the graph for problems 4–6.



4) What is the mean of this data set? **20**

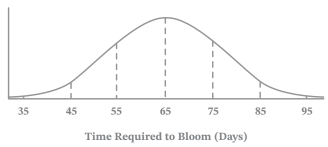
5) What is the standard deviation of this data set? **2.5**

6) Write the inequality that would represent about 68% of the elements in the data set. $17.5 < x < 22.5$

7) Draw a normal curve. Then label the graph for the data set when the mean = 22, and the standard deviation = 3.5.

Use the graph for problems 8–11.

It takes an average time of 65 days for a certain flowering plant to grow and bloom.



8) About what percentage of the plants bloom between day 55 and 75? **68%**

9) About what percentage of plants bloom before day 45? **2.5%**

10) What percent chance would a plant bloom after day 55? **84%**

11) Mr. Miller's class hypothesized that the plant would bloom between day 35 and day 55. Ms. Nance's class hypothesized that the plant would bloom between day 55 and day 75. The range of days is equal for both classes. What class has a better chance of having a correct hypothesis? Explain.

12) The data set represents Allison's test scores for the last grading period in numerical order: {60, 82, 85, 87, 90, 91, 92, 96}. Determine the lower and upper outliers for the data set. Name the outliers if any occur. **Allison's score of 60 is a lower outlier.**

PRACTICE 1 6B

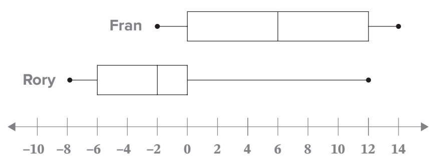
Mikey recorded the number of birds that landed on a bird feeder for ten days during the same hour each day. Then he listed his data set from greatest to least:

$$\{16, 10, 9, 8, 6, 5, 5, 3, 2, 2\}$$

13) Mikey believes that 16 is an outlier because it seems far above the other numbers. Determine if this is correct using the outlier formula.

14) On the eleventh day, Mikey saw 22 birds on the bird feeder. If he included this number in his data set, what would happen to the mean?

In golf, a lower score is better than a high score, and par is a score of 0. Rory and Fran each played sixteen rounds of golf and recorded their scores.



15) Find the five-number summary as well as the range and interquartile range for each golfer.

16) Fran claims that he is a better golfer because his range in scores is lower. Based on the box plots, who is the better golfer?

Two coffee shops were competing to be the best cup of coffee in the town. The plan was to give the win to the shop that earned the most votes but both received the same number of reviews and had the same mode.

17) Calculate the mean and median for both coffee shops.

18) Use the calculations from the previous question to determine the better coffee shop.

Joe's coffee shop has a higher mean and median than Cup o' Coffee. Therefore, Joe's is the better coffee shop.

13) upper > 18

Mikey is incorrect. Sixteen is not an outlier because it is not above the upper boundary of 18.

14) If Mikey included 22, an outlier, when calculating the mean, the average will increase because the outlier is higher than the rest of the data.

15)

	min	Q1	med	Q3	max	range	IQR
Rory	−8	−6	−2	0	12	20	6
Fran	−2	0	6	12	14	16	12

16) Rory is the better golfer because 75% of his scores are better (below) Fran's Q1 data. Fran's range may be smaller, but 75% of his scores are above zero.

Make sure that your student understands that a lower score is better than a higher score (like winning a race).

17) Cup o' Coffee: mean = 3.61, median = 3.5

Joe's: mean = 3.78, median = 4

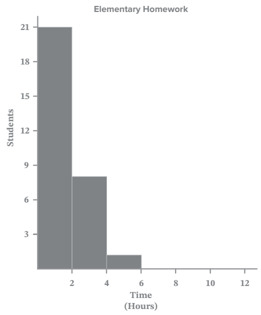
Your student does not need to list the data sets. They can count in to find the 9th and 10th element in the data set and take the average of those numbers to find the median.

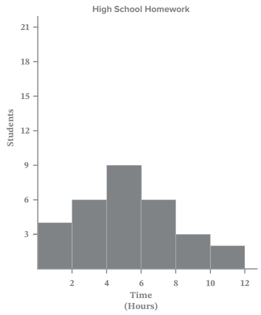
6B MASTERY CHECK

Mastery Check

Show What You Know

Two groups of students were asked to record the time spent on homework last week.





A) Without doing any calculations, where would you expect the measures of center to be for the *elementary* students? Is the data skewed or normal in its distribution? Explain.

The mean, median, and mode are likely in the 0–2 hour interval. This is where most of the data elements are (21 out of 30). This data is skewed to the right because the tail of the data is on the right side.

B) In general, how much homework do the elementary students have each week?

In general, elementary students have between 0–2 hours of homework each week.

C) Without doing any calculations, where would you expect the measures of center to be for the *high school* students? Is the data skewed or normal in its distribution? Explain.

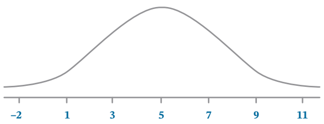
The mean and median are likely between 4–6 hours of homework. The mode is also between 4–6 hours since this is the tallest bar on the histogram. The data is fairly normal in its distribution because it is almost in the shape of a bell.

CONTINUE

120 Lesson 6: Understanding Data > Part B: Interpreting Data > Mastery Check Algebra 1 Student Worktext

MASTERY CHECK 6B

D) Suppose the high school teachers surveyed 1,000 students. The average time for this group was 5 hours and the standard deviation was 2. Label the normal curve correctly. What is the range of hours that will include 95% of the students surveyed?



Between 1 and 9 hours will include 95% of the students surveyed.

E) Three students say this cannot be right because they spend 16 hours a week doing homework. How would you identify this group of students?

This group of students is an outlier. They are in the 0.3% outside of three standard deviations (or 99.7%) of the data set.

Say What You Know

In your own words, talk about what you have learned using the objectives for this part of the lesson and your work on this page.

Say What You Know

Your student should be able to restate the objectives of the lesson in their own words. If your student is unable to restate the lesson objectives, have them go back and reread the objectives and then explain them.

- You will be able to use the 68-95-99.7 Rule and bell curves to analyze standard deviations.
- You will be able to use the outlier formula to determine if a data set contains outliers.
- You will be able to compare center and spread for multiple data sets, including their outliers.

Lesson and Unit Tests

As students reach the end of of this unit, they can complete the Lesson Test and the Unit Test.

Students should complete the Lesson Test in the same manner as they have in previous lessons.

The next day, they may need to review Lessons 1-6, using their guided notes, Mastery Checks, and Lesson Tests before beginning the Unit Test.

Practice 2

Worked solutions for these problems are located in the Digital Pack.

1) left-skewed

There is only a tail (or whisker) on the left side of the graph, making this left-skewed.

2) normally distributed

3) Two standard deviations: 95%
One standard deviations: 68%

7)

11) 25 minutes is 2 standard deviations from the mean. $100\% - 95\% = 5\%$, but since this is only referring to ≥ 25 minutes of reading, $\frac{5\%}{2} = 2.5\%$ chance that students will read for more than 25 minutes.

12) lower < -1
upper > 7

There are no outliers in the data set.

13) Having two games with zero goals will bring the average down, because those scores increase the number of elements without increasing the sum of the scores.

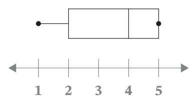
6B PRACTICE 2

Practice 2

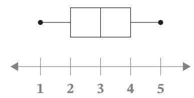
Complete the problems on a separate sheet of paper.

Label the shape of the graph as left-skewed, right-skewed, or normally distributed.

1)

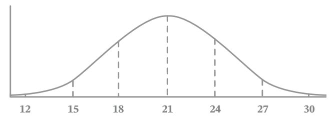


2)



3) According to the 68-95-99.7 Rule, what percentage of values will fall within two standard deviations from the mean? What percentage will fall within one standard deviation from the mean?

Use the graph for problems 4–6.



4) What is the mean of this data set? **21**

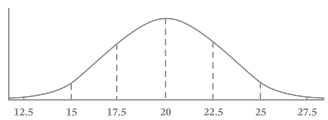
5) What is the standard deviation of this data set? **3**

6) Write the inequality that would represent about 68% of the elements in the data set. $\mathbf{12 < x < 30}$

7) Draw a normal curve. Then label the graph for the data set when the mean = 63, and the standard deviation = 5

Use the graph for problems 8–11.

Students in primary grades were asked to read for 20 minutes on average each night.



8) About what percentage of students read less than 25 minutes? **97.5%**

9) About what percentage of students read between 15 and 22.5 minutes? **81.5%**

10) About what percentage of students read for more than 27.5 minutes each night? **0.15%**

11) Ms. Casey asked her class to read for 25 minutes or more every night. What is the likelihood that all of her students will read 25 minutes or more? Would there be a better range of times to get more students to read? Explain.

The soccer team statistician listed the number of goals scored this season:

$$\{0, 0, 2, 3, 3, 3, 4, 4, 5, 6\}$$

When calculating the average, the statistician thought the number seemed lower than expected given the number of goals scored during the season.

12) Determine the lower and upper outliers for the data set. Name the outliers if any occur.

13) What is the cause for the average being lower than expected?

PRACTICE 2 6B

Mr. Riley's biology class asked for a retest. Mr. Riley said that a retest was unnecessary based on the class average of 75.5 that he calculated from the following test scores:

{52, 58, 60, 62, 62, 63, 65, 65, 68, 100, 100}

14) Use what you know about outliers to convince Mr. Riley that the average is not a good indication of how the class performed.

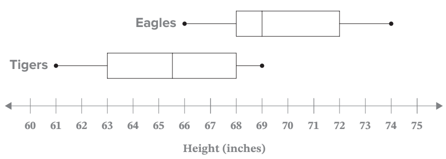
15) Mr. Riley decides to remove the outlier before recalculating the average. What will this do to the average? Should he allow a retest based on the new average? Explain.

There were 24 Eagles players and 36 Tigers players surveyed on the two volleyball teams. Compare the data by answering the following questions.

16) How many players on the Tigers have a height of 68 inches or less? **27**

17) What percentage of Eagles players are 68 inches or shorter? **25%**

18) How many Eagles players are in each 25% of the data? How many Tigers players are in each 25% of the data? **Eagles: 6** **Tigers: 9**



19) Explain how the data shows that Eagles players are overall taller than Tigers players.

A group of 600 people was asked to determine how long it takes them to get ready for school in minutes each morning. Three hundred surveyed were high school students, and the rest were college students.

20) Explain why using a dot plot would not be the best way to represent the data.

21) Use the data in the table to explain how the two groups can have different means but the same median and mode.

High School Student	College Student
mean = 37 min	mean = 29 min
median = 30 min	median = 30 min
mode = 30 min	mode = 30 min

For high school students, there is a group of students that takes much longer than the median and pulls the average up. For the college students, there is a group of students that takes much less time than the median which pulls the average down.

14) upper > 80

Any score above 80 is an outlier. The two students that scored 100 are making the class average much higher.

15) When the outliers are removed the class average is a 61.67, a very significant drop. Because this is a very low score, Mr. Riley should retest the class on the material.

19) Fifty percent of Eagle player's heights are greater than all of the heights of Tiger players, since the median height for Eagles players is equal to the maximum height of Tiger players.

20) A dot plot should be used for small data sets. If you had to graph 600 dots on a number line, there is a very good chance that errors will be made.

If needed, have your student go back to the Mastery Check and reapply what they have learned to say and show what they know.

Lesson Test

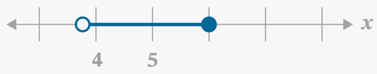
Refer to the Part B Mastery Check instructor note to determine if your student is ready for the test.

Targeted Review

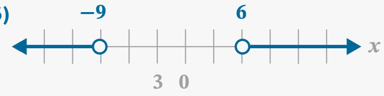
Worked solutions for these problems are located in the Digital Pack.

If your student is going to take the Lesson Test, it is recommended that they do so before beginning the Targeted Review.

5)



6)



9) Distractor Rationale:

- A) This divides the terms by −3 rather than multiplying terms by −3 and has the incorrect sign for y.
- B) This divides the terms by −3 rather than multiplying terms by −3.
- C) This has an incorrect sign for $15y$.

10) Distractor Rationale:

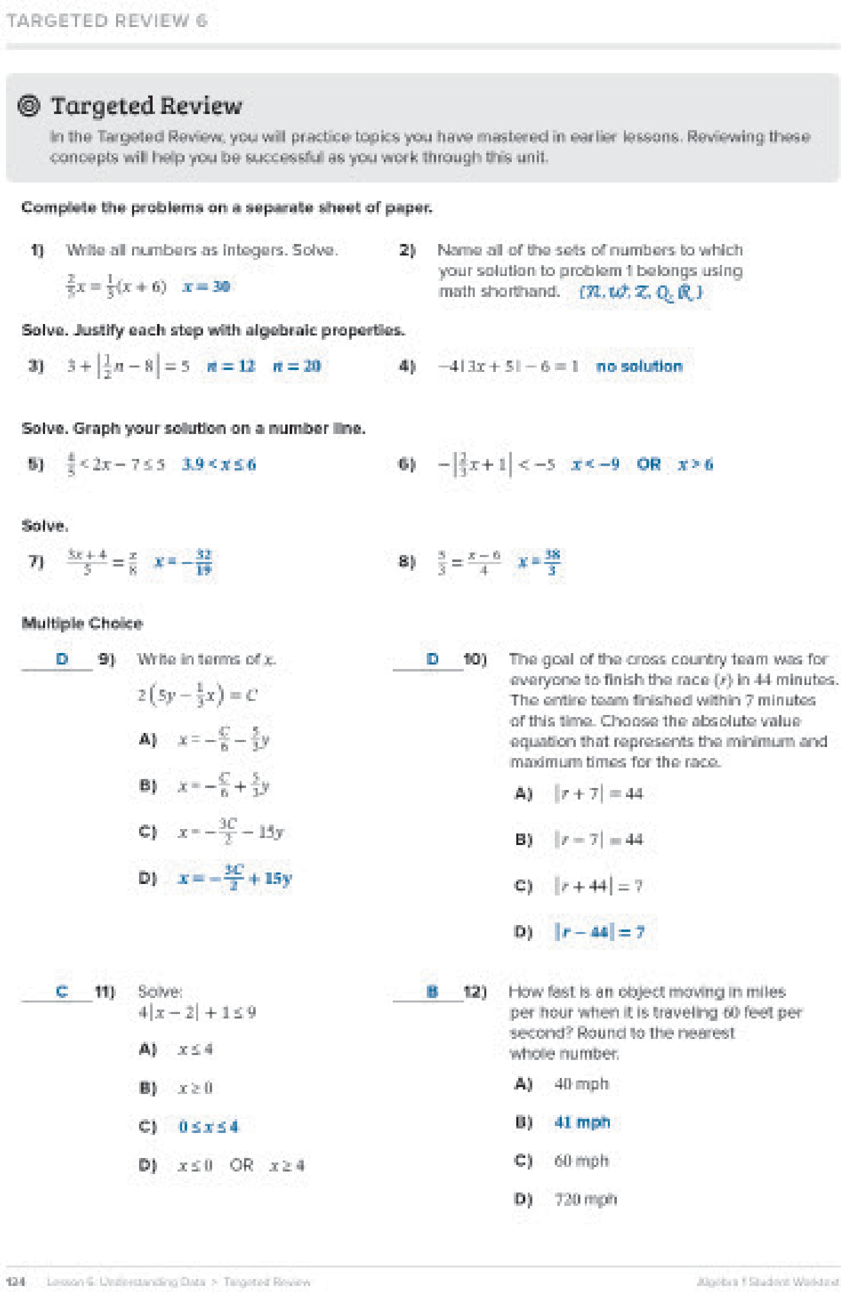
- A) This incorrectly has 44 as the distance rather than the midpoint and uses addition rather than subtraction.
- B) This incorrectly has 44 as the distance rather than the midpoint.
- C) This uses addition rather than subtraction. This would result in negative race times.

11) Distractor Rationale:

- A) Both cases of the absolute value inequality were not considered.
- B) Both cases of the absolute value inequality were not considered.
- D) The inequality symbol was incorrectly changed resulting in an OR rather than AND inequality.

12) Distractor Rationale:

- A) This number rounds 40.9 down to 40 rather than to 41 mph
- C) This sets mph $= \frac{f}{s}$ without any unit conversion
- D) This multiplies 60 ft by 12 in rather than converting to miles.



TARGETED REVIEW 6

Targeted Review

In the Targeted Review, you will practice topics you have mastered in earlier lessons. Reviewing these concepts will help you be successful as you work through this unit.

Complete the problems on a separate sheet of paper.

1) Write all numbers as integers. Solve.
$\frac{2}{5}x = \frac{1}{3}(x+6)$ $x = 30$

2) Name all of the sets of numbers to which your solution to problem 1 belongs using math shorthand. $(\mathbb{N}, \mathbb{W}, \mathbb{Z}, \mathbb{Q}, \mathbb{R})$

Solve. Justify each step with algebraic properties.

3) $3 + \left|\frac{1}{2}n - 8\right| = 5$ $n = 12$ $n = 20$

4) $-4|3x+5| - 6 = 1$ no solution

Solve. Graph your solution on a number line.

5) $\frac{4}{5} < 2x - 7 \le 5$ $3.9 < x \le 6$

6) $-\left|\frac{2}{3}x + 1\right| < -5$ $x < -9$ OR $x > 6$

Solve.

7) $\frac{3x+4}{5} = \frac{x}{8}$ $x = -\frac{32}{19}$

8) $\frac{5}{3} = \frac{x-6}{4}$ $x = \frac{38}{3}$

Multiple Choice

D 9) Write in terms of x.
$2\left(5y - \frac{1}{3}x\right) = C$
- A) $x = -\frac{C}{6} - \frac{5}{3}y$
- B) $x = -\frac{C}{6} + \frac{5}{3}y$
- C) $x = -\frac{3C}{2} - 15y$
- D) $x = -\frac{3C}{2} + 15y$

D 10) The goal of the cross country team was for everyone to finish the race (r) in 44 minutes. The entire team finished within 7 minutes of this time. Choose the absolute value equation that represents the minimum and maximum times for the race.
- A) $|r+7| = 44$
- B) $|r-7| = 44$
- C) $|r+44| = 7$
- D) $|r-44| = 7$

C 11) Solve:
$4|x-2| + 1 \le 9$
- A) $x \le 4$
- B) $x \ge 0$
- C) $0 \le x \le 4$
- D) $x \le 0$ OR $x \ge 4$

B 12) How fast is an object moving in miles per hour when it is traveling 60 feet per second? Round to the nearest whole number.
- A) 40 mph
- B) 41 mph
- C) 60 mph
- D) 720 mph

124 Lesson 6: Understanding Data > Targeted Review Algebra 1 Student Worktext

Problem	1	2	3	4	5	6	7	8	9	10	11	12
Lesson Origin	2	1	3	1	4	4	5	5	2	3	4	5

Lesson		Part	Guided Notes	Practice 1	Practice 2	Mastery Check	Targeted Review	Lesson Test
7 Functions	A	Relations and Functions						
	B	Understanding Functions						
8 Using Graphs	A	Intercepts and Slope from a Graph						
	B	Translating the Linear Parent Function						
9 Slope and Linear Functions	A	Slope and Graphed Scenarios						
	B	Point-Slope Form and Slope-Intercept Form						
10 Writing Linear Functions	A	Writing Equations in Slope-Intercept Form						
	B	Applications of Linear Equations						

Lesson Objectives

Lesson 7: Part A

- ☐ Find the domain and range of a relation from a graph, table, and mapping.
- ☐ Express the definition of a function using words and diagrams.

Lesson 7: Part B

- ☐ Write equations with two variables in function notation.
- ☐ Identify variables as dependent or independent.
- ☐ Evaluate a function for the dependent variable given a set of values for the independent variable.
- ☐ Determine whether a specific point is a solution for a function presented as a graph, table, or equation.

Lesson 8: Part A

- ☐ Identify intercepts of a line from a graph, table, or equation.
- ☐ Given a graph of a line, determine the slope using slope triangles or rise over run.
- ☐ Plot the graph of a line given a point and the slope.

Lesson 8: Part B

- ☐ Express the linear parent function in all forms (table, graph, and equation).
- ☐ Demonstrate translations by a factor of b to a linear function.
- ☐ Explain how b translates a linear function up or down.

Lesson 9: Part A

- ☐ Use the slope formula, $m = \frac{\Delta y}{\Delta x}$, to calculate the slope of a line when given two points on the line.
- ☐ Describe a graph as a scenario using mathematical vocabulary and sketch a graph from a written scenario.

Lesson 9: Part B

- ☐ Write linear equations in point-slope form from a given graph or a point and the slope.
- ☐ Write linear equations in slope-intercept form from a graph or given the slope and the y-intercept.
- ☐ Graph equations on the coordinate plane in point-slope or slope-intercept form.

Lesson 10: Part A

- ☐ Write an equation in slope-intercept form given the slope and one point.
- ☐ Write an equation in slope-intercept form given two points.

Lesson 10: Part B

- ☐ Write an equation in slope-intercept form given any type of scenario.
- ☐ Explain what a given point, the slope, and the x- and y-intercept represent within the context of a word problem.

Lesson		Part		Guided Notes	Practice 1	Practice 2	Mastery Check	Targeted Review	Lesson Test
11	More Forms of Lines	A	Standard Form						
		B	Horizontal and Vertical Lines						
12	Parallel and Perpendicular Lines	A	Parallel Lines						
		B	Perpendicular Lines						
13	Scatter Plots	A	Correlation and Scatter Plots						
		B	The Line of Best Fit						
14	Types of Functions and Arithmetic Sequences	A	Continuous or Discrete Functions						
		B	Arithmetic Sequences						

Unit Test II Date ________ Score ________

Lesson Objectives

Lesson 11: Part A

- ☐ Solve for the x- and y-intercepts from standard form and use the intercepts to create a graph of the line.
- ☐ Convert the equation of a line to standard form. Determine the slope and intercept formulas found in a linear equation in standard form.

Lesson 11: Part B

- ☐ Graph horizontal and vertical lines.
- ☐ Find the domain, range, slope, and y-intercept for horizontal and vertical lines.
- ☐ Determine the equation of horizontal and vertical lines that pass through a given point.

Lesson 12: Part A

- ☐ Identify parallel lines.
- ☐ Write the equation of a line that is parallel to another known line and passes through a given point.

Lesson 12: Part B

- ☐ Identify perpendicular lines.
- ☐ Write the equation of a line that is perpendicular to another known line and passes through a given point.

Lesson 13: Part A

- ☐ Identify a correlation of a scatter plot as strong or weak, positive or negative, or no correlation.
- ☐ Explain the meanings of correlations in real-life examples.
- ☐ Create a scatter plot with accurate scale, labels, and ordered pairs.

Lesson 13: Part B

- ☐ Estimate and draw the line of best fit for a set of data.
- ☐ Write the equation for the line of best fit in the requested form.
- ☐ Use the line of best fit to interpolate, extrapolate, and explain the context of the data.

Lesson 14: Part A

- ☐ Decide if a function is discrete or continuous and explain the difference.
- ☐ Use interval notation to define the domain and range of functions.
- ☐ Choose the most appropriate form of the equation of a line for a given scenario.

Lesson 14: Part B

- ☐ Describe the arithmetic sequence of a given set.
- ☐ Use a sequence to find additional terms.