Name _____

Teacher Notes:

- Refer students to "Statistics" on page 20 in the *Student Reference Guide.*
- Students will need a protractor to complete this Investigation.

page 254

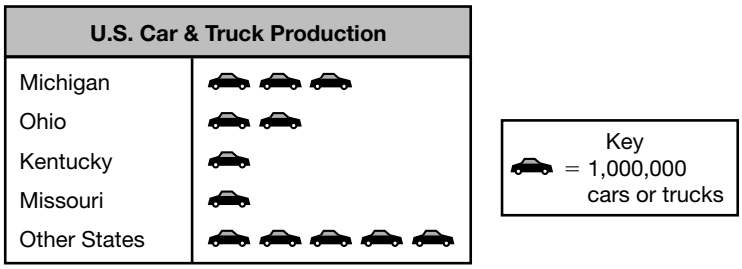
Focus on

• Statistics and Sampling

Math Language

Data, or information, is a collection of numbers, called **data points.** One number can be used to stand for all the numbers in the data set. This number may be the **mean, median,** or **mode.**

- Bar graphs and circle graphs display data.
- Data can also be shown in **pictographs.** Each object in a pictograph represents a certain number. The key tells you this number.



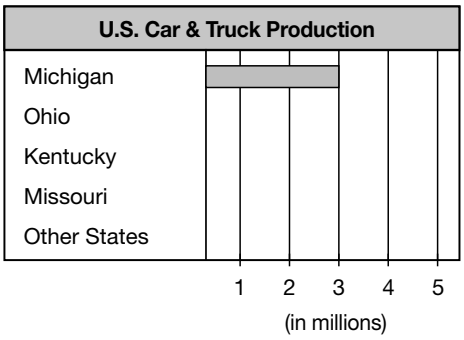
In the pictograph above, how many cars and trucks are produced

in Michigan? _____

In the four named states? _____

In the nation? _____

1. Display the car and truck production data on this horizontal bar graph.



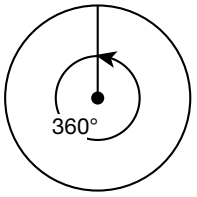
2. What fraction of U.S. car and truck production took place

in Michigan? _____

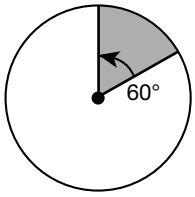
Michigan
total production $\frac{\quad}{\quad} =$

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- Another way to display qualitative data is a **circle graph.** It is sometimes called a pie graph.
- Each category is called a **sector** (pie piece) of the circle.
- The central angle of a sector is an angle at the center of the circle. To calculate the central angle of each sector, find the fraction of the whole each part represents.
- A whole circle is 360°, so each sector is a fraction of 360°.



A full circle is 360°.



This sector is $\frac{1}{6}$ of a circle, so the central angle is $\frac{1}{6} \times 360° = 60°$.

- From the data on page 259, we know that 12 million cars and trucks were produced. This table shows the fraction produced by each state.
- The sector of the circle graph representing Michigan will cover 90°.

$\frac{3}{12} \times 360° = 90°$

Category	Count (millions)	Fraction
Michigan	3	$\frac{3}{12}$
Ohio	2	$\frac{2}{12}$
Kentucky	1	$\frac{1}{12}$
Missouri	1	$\frac{1}{12}$
Other States	5	$\frac{5}{12}$
Total	12	$\frac{12}{12}$

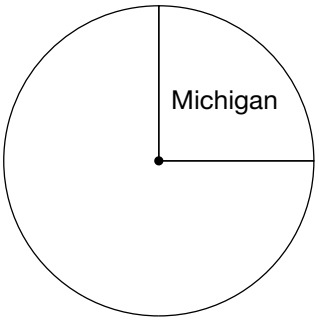
3. What is the central angle measure of the sector for each category?

Michigan _____ Ohio _____ Kentucky _____

Missouri 90° Other States _____

4. The circle graph at the right shows a 90° $\left(\frac{1}{4}\right)$ sector for Michigan. Complete the circle graph with the data for each remaining category.

Put the center of a protractor over the center of the circle and draw the angles for each category.



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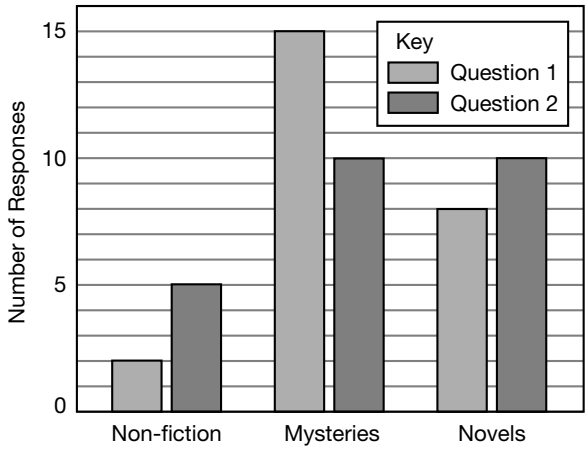
5. Compare the pictograph, bar graph, and circle graph.

The pictograph compares states using p_____. The bar graph also compares, but with b_____ instead of pictures. The circle graph uses a p_____ of the whole for each sector.

- A **double-bar graph** is useful for comparing two sets of data.

  Question 1: Would you rather read boring nonfiction, exciting mysteries, or dry novels?

  Question 2: Would you rather read nonfiction, mysteries, or novels?



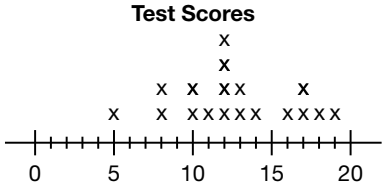
6. Look at the bar graph above. How did the way in which the questions were asked affect the results?

The first question used words that might change people's answers. Answering Question 1, people may be _____ likely to say they liked _____ and _____ likely to say they liked _____ or_____.

- **Quantitative** data consists of numbers.
- Each number is a **data point.**
- To see each separate data point, draw the points on a **line plot.**
- Draw a line plot using a number line. Put an X over a number on the line to show each matching data point.

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- Suppose 18 students take a test that has 20 possible points.
- This line plot shows the data points. Each X shows the score for one student.
- Data can be grouped. When data are grouped, the separate data points do not show.
- The terms **mean, median, mode,** and **range** help to describe data.



- The **mean** is the average of the data. To find the mean of the test scores:

  1. Find the total of the scores.
  2. Divide by the number of students.

$$\frac{\text{total of scores}}{\text{number of students}}$$

  The mean is $12\frac{11}{18}$, or about 12.6.

- The **median** is the middle number when the data are listed in order.

  If there are two middle numbers, find the average of these two.

  5, 8, 8, 10, 10, 11, 12, 12, (12), (12), 13, 13, 14, 16, 17, 17, 18, 19

  The median test-score score is 12.

- The **mode** is the number that occurs most often in the data. A line plot makes the mode easy to see.

  The mode of the test scores is 12.

  If **two** numbers both occur most often, the data is called **bimodal.** (Think of a **bi**cycle with **two** wheels; **bi**modal data have **two** modes.)

- The **range** is the difference between the greatest and least of the data.

  The range of the test scores is 19 − 5, or 14.

7. The daily high temperatures in degrees Fahrenheit for 20 days in a row are listed below. Write the temperatures in increasing order. Then display them on a line plot.

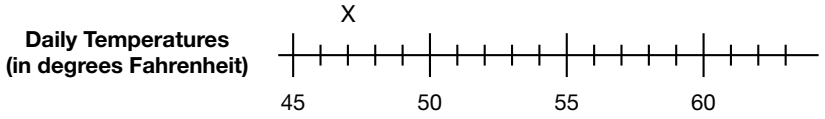
60, 52, 49, 51, 47, 53, 62, 60, 57, 56,

58, 56, 63, 58, 53, 50, 48, 60, 62, 53

____, ____, ____, ____, ____, ____, ____, ____, ____, ____,

____, ____, ____, ____, ____, ____, ____, ____, ____, ____

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8. What is the **median** of the temperatures? _____

9. The distribution of the temperatures is **bimodal** because there are two modes. What are the two modes? _____ and _____

10. What is the **range** of the temperatures? _____ degrees

- The mean, median, and range each use one number to describe the data.
- Outliers are data points that are way below or above the rest of the data.
- When there are outliers, use the median to represent the data. When there are no outliers, use the mean.
- Half of the data points are above the median and half are below. So, use the median to represent the middle.
- The range tells how widely scattered the data are.
- The mode is the most frequent data point, the one that occurs most often. So, use the mode to show the most common number.

Use your textbook to complete problems **11–15.** Use the following to help.

The prices for sales of homes in a certain neighborhood are shown below.

$720,000	$550,000	$640,000	$520,000
$500,000	$620,000	$680,000	$1,500,000

11. a. Find the mean and the median. List the prices in increasing order.

$500,000, _____, _____,

_____, _____,

_____, _____, $1,500,000.

$$\frac{\text{total of prices}}{\text{number of homes}} = \frac{_____}{8}$$

mean = _____

middle numbers: _____, and _____

Find the average (halfway between) of these.

median = _____

b. Which represents the data better: mean or median?

The _____ is a better indicator because of the o_____.

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c. The outlier, or very high price, is _____.

Take the outlier out of the data set.

new mean: $\frac{\text{new total}}{7} = \frac{\text{_____}}{7} =$ _____

new median: _____

Because the outlier was _____ than the rest of the data, the mean and median _____.

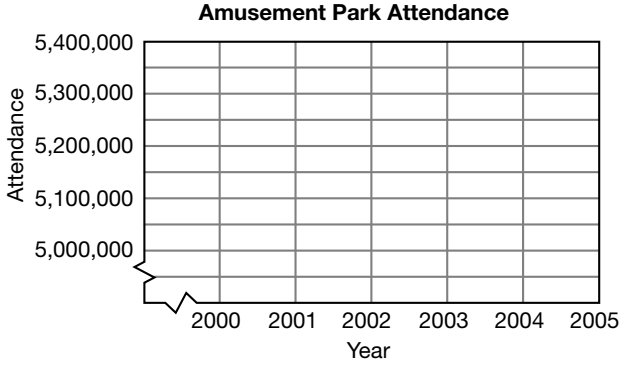
d. $600,000 and $700,000 are l_____ than the original mean, so the mean will _____ when these data are added.

12. To represent the average value of all the scores, use the _____ and not the _____.

- A **line graph** is useful for showing how two sets of data are related.

13. Plot the data points on the graph axes below. Connect the data points with line segments.

Year	Attendance
2000	5,100,000
2001	5,000,000
2002	5,200,000
2003	5,300,000
2004	5,300,000
2005	5,400,000



14. a. range _____ − _____ = _____

b. The growth in attendance for the next _____ years may not equal the last _____ years. Other factors could affect attendance, such as the number of p_____ the park can hold.

15. Look at the graphs on page 259 of your textbook. The top line of data was collected at a gas station. The second line of data was collected throughout an entire city. Why might the data collected at the gas station have been biased?

People with l_____ commutes will be more likely to stop for gas on their way to work.

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