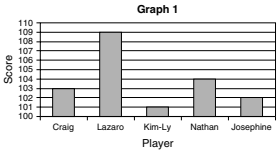
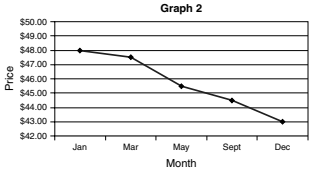
LESSON 10-4

Practice A

Misleading Graphs and Statistics





Graph 1 shows the number of points scored by five players in a game.

1. Explain why the graph is misleading. The vertical axis does not start at 0. This exaggerates the differences in the scores.

2. What might someone believe because of the graph? Lazaro scored more than twice as much as the other players.

3. Which player do you think made the graph? Lazaro

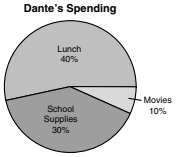
Graph 2 shows the price change of Product X over one year.

4. Explain why the graph is misleading. The vertical axis does not start at 0 and the categories on the horizontal axis are not at equal time intervals.

5. What might someone believe because of the graph? that the cost of Product X decreased very rapidly

6. Who might want to use this graph? sellers of Product X

The circle graph shows how Dante spent his allowance.



7. Explain why the graph is misleading.
The sectors do not add to 100%.

8. Who might Dante show this graph to and why?
his parents; to make them think he doesn't waste his money and that most goes towards school.

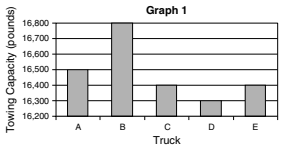
9. Joe surveyed people at an Italian restaurant about their favorite foods. Explain why his statement is misleading: "75% of our community prefers Italian foods."
People eating at an Italian restaurant are more likely to favor Italian food.

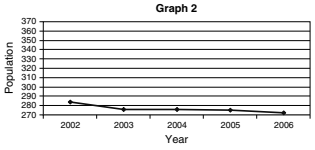
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LESSON 10-4

Practice B

Misleading Graphs and Statistics





Graph 1 shows the maximum towing capacity of five full-size pickup trucks.

1. Explain why the graph is misleading. The vertical axis does not start at 0. This exaggerates the differences in the towing capacities.

2. What might someone believe because of the graph? Truck B has a far greater towing capacity than any other full-size pickup.

3. The manufacturer of which truck would be most upset with this graph? D

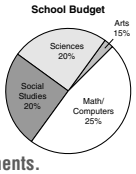
Graph 2 shows the change in population of a certain animal species in a wooded area.

4. Explain why the graph is misleading. The vertical axis does not start at 0 and extends beyond what is needed for this data.

5. What might someone believe because of the graph? Someone might believe that the population of this animal species is very low and nearly extinct.

6. Who might want to use this graph? someone advocating for support of this animal

The circle graph shows how a school distributed money.



7. Explain why the graph is misleading.
The sectors do not add to 100%.

8. What might someone believe because of the graph?
The art classes get very little money and the math and computer classes get far more money than the other departments.

9. Who might want to use this graph? art teachers or other supporters of the arts

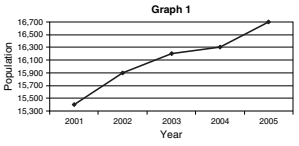
10. Sue surveyed people at a baseball stadium about their leisure activities. Explain why her statement is misleading: "85% of this town prefers sports over music."
People attending a baseball game are more likely to prefer sports.

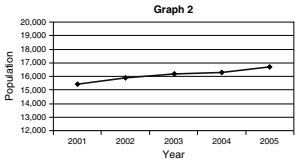
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LESSON 10-4

Practice C

Misleading Graphs and Statistics



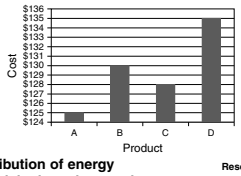


Graphs 1 and 2 show the same town's population over five years.

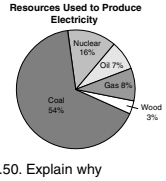
1. Which graph should a group defending the town's "healthy growth" use to defend its position? Which graph should a group defending the town's "unhealthy growth" use? Explain how the structure of each graph supports each opinion.
graph 2; graph 1; On graph 2, the vertical axis has a large range, making the change appear minimal. It also puts the graph in the center, making it appear there is room for growth. On graph 1, the vertical axis has a small range, making the change appear drastic. It also puts the last value at the very top, making it appear there is no room for growth.

2. Make a bar graph that would make people think Product A is significantly cheaper than others.

Product	Cost
A	$125
B	$130
C	$128
D	$135



The circle graph shows the distribution of energy resources used to produce electricity in a given region.



3. Explain why the graph is misleading.
The sectors do not add to 100%.

4. What might someone believe because of this graph?
Nearly 75% of the resources came from coal.

5. The costs of pens in one catalog are $3, $2.50, $45, $5, and $3.50. Explain why this statement is misleading: "The average cost of a pen in that catalog is $11.80."
All but one pen is less than $11.80. The mean should not be used with an outlier.

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LESSON 10-4

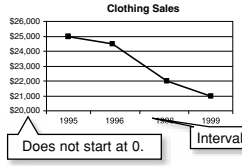
Reteach

Misleading Graphs and Statistics

Graphs can be used to mislead people.

Bar Graphs and Line Graphs: If the vertical scale does not start at 0, the difference between categories or time intervals can look larger than it is. If the horizontal scale is not at equal intervals, the rate of change can look steeper than it is.

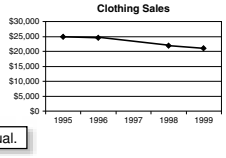
Misleading Graph



Does not start at 0.

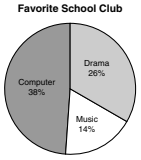
Intervals not equal.

Corrected Graph



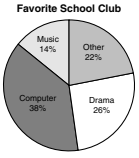
Circle Graphs: If the sections in a circle graph do not sum to 100%, sections will appear larger than they actually are.

Misleading Graph

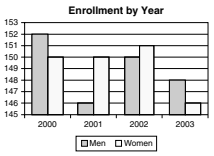


Sectors do not sum to 100%.

Corrected Graph



1. The graph shows the number of men and women who have enrolled in a school.



   a. Explain why the graph is misleading.
The vertical scale does not start at zero.

   b. What might someone believe because of the graph?
Someone may believe there are large differences between the number of men and women who have enrolled at the school.

   c. Who might want to use this graph? Possible answer: Someone who may want to show that inequalities exist in admissions.

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Reteach

LESSON 10-4

Misleading Graphs and Statistics (continued)

Statistics can be misleading because of the way the data is collected or because of the way the results are reported.

- A sample is biased if it only surveys a certain group of people.
- A sample is biased if it is too small.
- Statistics can mislead if the measures used are not a good representation of the data.

A researcher surveys kindergarteners and asks if they have too much homework. Explain why the following statement is misleading: "Only 5% of students in West Branch School District think they have too much homework."

The sample is biased because students in kindergarten tend to have little or no homework. Students from other grades, who get more homework, were not surveyed.

A researcher asks 2 people whether they approve of the way their town is being run. Explain why the following statement is misleading: "50% of townspeople are unhappy with local government."

This sample is biased because only 2 people were surveyed. The sample size is too small.

A car dealership is selling 5 cars at the following prices: $12,000, $13,000, $15,000, $55,000, and $13,000. Explain why the following statement made by a competitor is misleading: "The car dealership sells cars at an average price of $21,600."

This statistic is misleading because most of the cars are less than $21,600. The mean is not a good descriptor of this data set because it has an outlier.

2. Houses on Main Street sold for the following amounts: $175,000, $182,000, $178,000, and $389,000. Explain why the following statement is misleading: "Houses on Main Street are selling for an average of $231,000."

Most of the houses are selling for under $231,000.

The mean is not a good descriptor.

3. A researcher is contacting people by e-mail to see what proportion of them use a computer every day. Explain why the following statement is misleading: "85% of people use a computer every day."

The sample is biased. People who don't have e-mail cannot be surveyed.

4. A researcher asks 5 students if they think the cost of school lunches is too high. Explain why the following statement is misleading: "Four-fifths of all students think school lunches are too expensive."

The sample size is too small.

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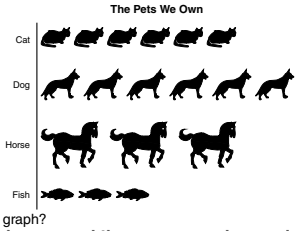
Challenge

LESSON 10-4

A Picture is Worth Too Many Words

In order to make bar graphs more interesting, pictures are often used to replace the bars. However, this sometimes results in misleading graphs.

This graph shows the number and type of pets owned by the students in a fourth-grade class. Each picture represents one animal. (*Note:* When pictures are used to count items in this manner, the graph is frequently called a *pictograph*.)



1. Explain why the graph is misleading.

The pictures are different sizes, so the numbers of some pets are exaggerated.

2. What might someone believe because of the graph?

There is the same number of cats as horses; and there are more dogs and fewer fish than any other animal.

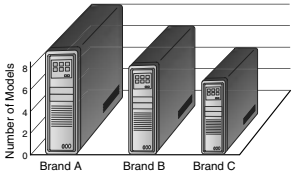
3. Who might want to use this graph? Why?

A breeder of dogs; to suggest that dogs are the most popular pet.

4. How could you improve the graph?

Make the individual pictures the same sizes, or use a standard bar graph.

This graph shows the number of computer models, by brand, that are sold at a store.



5. Explain why the graph is misleading.

Because it is 3-D, the relative numbers of computers are exaggerated by the volumes.

6. What might someone believe because of the graph?

The number of Brand A models is about 4 times greater than the number of Brand C models.

7. Who might want to use this graph? Why?

The manufacturer of Brand A; to suggest that their models offer significantly more variety.

8. How could you improve the graph?

Use 2-dimensional bars that only vary by height, not by width and/or depth.

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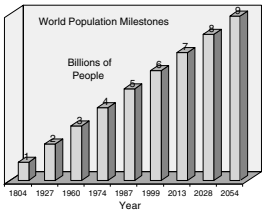
Problem Solving

LESSON 10-4

Misleading Graphs and Statistics

Analyze these misleading graphs.

1. This graph shows the years in which the world population reached, or is projected to reach, integer multiples of 1 billion people.



a. Explain why the graph is misleading.

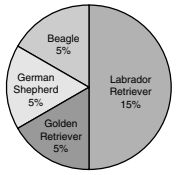
The years are not at equal time intervals.

b. What might someone believe because of the graph?

that world population is increasing in a linear fashion

2. This graph shows dog registrations with the American Kennel Club.

Dog Breeds Registered with the American Kennel Club, 2004



a. Explain why the graph is misleading.

The sectors of the graph do not add to 100% because several dog breeds are omitted.

b. Who might want to use this graph, and why?

A breeder of labrador retrievers might use the graph to overemphasize the popularity of the breed.

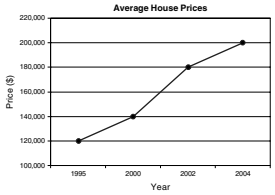
Use the graph to select the best answer.

3. The graph is misleading because of which scale(s)?

A horizontal only **C** both
B vertical only **D** neither

4. Which statement is certainly true?

F The average house price increased every year between 1995 and 2004.
G The average house prices have increased $80,000 between 1995 and 2004.
H The average house price in 2001 was about $160,000.
J None of the above.



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Reading Strategies

LESSON 10-4

Analyzing Information

There are several ways for graphs and statistics to be misleading.

Graphs	Statistics
• The scale on the vertical axis does not start at 0, or extends beyond what is needed. • The intervals on the horizontal or vertical axis are not equal. • The sectors of a circle graph do not total 100%.	• The sample size is too small to be representative. • The population surveyed has a bias toward the topic. • The mean is used to represent data that has an outlier.

Answer the following.

1. When is it misleading to use the mean as a descriptor of a data set?

when there is an outlier in the data set

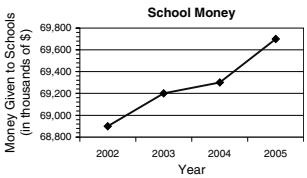
2. What should you check when analyzing a circle graph?

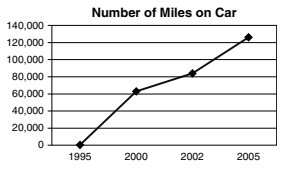
check if the percents add to 100%

3. Which would be more trustworthy: a survey of 10 people or a survey of 100 people?

a survey of 100 people

Look at the line graphs below.





4. How is the first graph misleading? What might someone believe because of it?

The vertical axis starts and ends just beyond the data values. Someone might believe there's been a big increase in money given to schools.

5. How is the second graph misleading? What might someone believe because of it?

The horizontal axis is not equally spaced. Someone might believe a lot of miles were put on very quickly when the car was new.

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