CHAPTER 7

Solutions Key

Collecting, Displaying, and Analyzing Data

ARE YOU READY? PAGE 373

1. line segment

2. interval; scale

3. frequency

4. 15, 18, 23, 42, 45, 65

5. 87, 102, 103, 104, 105, 118

6. 19, 24, 33, 56, 65, 76, 82

7. 2, 2, 3, 3, 4, 5, 6, 8, 9

8. 18 + 26 = 44

9. 23 + 17 = 40

10. 75 + 37 = 112

11. 98 + 64 = 162

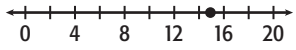
12. 133 − 35 = 98

13. 54 − 29 = 25

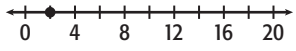
14. 200 − 88 = 112

15. 1055 − 899 = 156

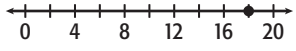
16.



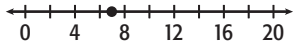
17.



18.



19.



20. lion

21. zebra

7-1, PAGES 378-380

Think and Discuss

1. Cumulative frequency table; Because the number of data values is given in the final entry in the cumulative frequency column; to find the number of data values in a stem-and-leaf plot, it would be necessary to count each value.

Exercises

1. Data Set: 55, 15, 11, 17, 31, 21, 15, 21, 8, 15, 20, 34

Step 1: Look at the range to choose the scale and equal intervals for the data. The least data value is 8 and the greatest data value is 55, so the data ranges from 8 to 55. Choose 1 to 59 for the scale and intervals 1−19, 20−39, and 40−59.

Step 2: Find the number of data values in each interval. Write these numbers in the "Frequency" column.

Step 3: Find the cumulative frequency for each row by adding all the frequency values that are above or in that row.

6 states had fewer than 20 electoral votes in 2004.

Number of Electoral Votes for Select States (2004)		
Votes	**Frequency**	**Cumulative Frequency**
1−19	6	6
20−39	5	11
40−59	1	12

2. Data Set: 55, 15, 11, 17, 31, 21, 15, 21, 8, 15, 20, 34

Step 1: Find the least data value and the greatest data value. Since the data values range from 8 to 55, use tens digits for the stems and ones digits for the leaves.

Step 2: List the stems from least to greatest on the plot.

Step 3: List the leaves for each stem from least to greatest.

Step 4: Add a key and a title.

3 of the states had more than 30 electoral votes in 2004.

Stems	Leaves
0	8
1	1, 5, 5, 5, 7
2	0, 1, 1
3	1, 4
4	
5	5

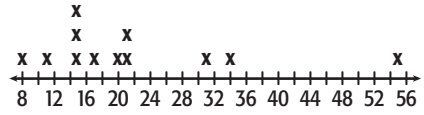
Key: 10|6 = 106

3. Data Set: 55, 15, 11, 17, 31, 21, 15, 21, 8, 15, 20, 34

Step 1: The data values range from 8 to 55. Draw a number line that includes this range.

Step 2: Put an ✗ above the number on the number line that corresponds to the number of electoral votes.

15 is the most common number of electoral votes in 2004.



4. Data Set: 57, 61, 57, 57, 58, 57, 61, 54, 68, 51, 49, 64, 50, 48, 65, 52, 56, 46

Step 1: Look at the range to choose the scale and equal intervals for the data. The least data value is 48 and the greatest data value is 68, so the data ranges from 48 to 68. Choose 45 to 69 for the scale and intervals 45−49, 50−54, 55−59, 60−64, and 65−69.

Step 2: Find the number of data values in each interval. Write these numbers in the "Frequency" column.

Step 3: Find the cumulative frequency for each row by adding all the frequency values that are above or in that row.

16 presidents were under the age of 65 when they took office.

Ages of American Presidents		
Age	**Frequency**	**Cumulative Frequency**
45−49	3	3
50−54	4	7
55−59	6	13
60−64	3	16
65−69	2	18

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5. Data Set: 57, 61, 57, 57, 58, 57, 61, 54, 68, 51, 49, 64, 50, 48, 65, 52, 56, 46

Step 1: Find the least data value and the greatest data value. Since the data values range from 48 to 68, use tens digits for the stems and ones digits for the leaves.

Step 2: List the stems from least to greatest on the plot.

Step 3: List the leaves for each stem from least to greatest.

Step 4: Add a key and a title.

3 presidents were in their 40s when they took office.

Ages of American Presidents

Stems	Leaves
4	6 8 9
5	0 1 2 4 6 7 7 7 8
6	1 1 4 5 8

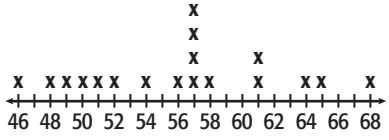
6. Data Set: 57, 61, 57, 57, 58, 57, 61, 54, 68, 51, 49, 64, 50, 48, 65, 52, 56, 46

Step 1: The data values range from 48 to 68. Draw a number line that includes this range.

Step 2: Put an ✗ above the number on the number line that corresponds to the ages of the presidents.

57 is the most common age at which the presidents took office.

Ages of American Presidents



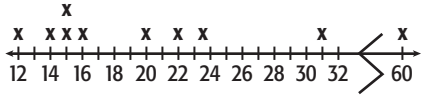
7. 4; 31

8. 18

9. B; Most of the values are not likely to be the shoe size of middle-school students. Many of the higher values are not likely to indicate the number of boxes of cereal in a house. Values ranging from a low of 4 and a high of 31 are not likely to indicate the monthly temperatures in Chicago. However, values ranging from 4 to 31 are reasonable values for the number of hours 12 adults may have exercised in one month.

10. a.

Largest Meteorites



b. 8

11. Guyana and Suriname; Colombia

12. 8:

Number of Critically Endangered Animal Species in South America		
Species	**Frequency**	**Cumulative Frequency**
0–19	8	8
20–39	2	10
40–59	1	11
60–79	2	13

13. **Numbers of Critically Endangered Animal Species in South America**

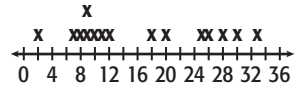
Stems	Leaves
0	3 3 4 4 5 9
1	0 3
2	4
3	1
4	
5	2
6	8
7	2

14. Possible answer: By making the intervals in the table smaller, I might be able to better see where the numbers are grouped.

15. 19|0

16. D

17. Line plot; The range of the data is displayed on the line plot, so the distribution of data is more clear than on the stem-and-leaf plot.



Stems	Leaves
0	2 7 8 9 9
1	0 1 2 8
2	0 5 6 8
3	0 3

18. $18 \div 1\frac{1}{5} = 18 \div \frac{6}{5} = 18 \cdot \frac{5}{6} = \frac{90}{6} = 15$

19. 12 hr for $102
102 ÷ 12 = 8.5
$8.50 per hr

20. $2,289 in 7 mo
2,289 ÷ 7 = 327
$327 per mo

21. 48 point in 3 games
48 ÷ 3 = 16
16 points per game

7-2, PAGES 383-385

Think and Discuss

1. Possible answer: A mean can be used when determining grades from several scored assignments.

2. mode

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3. An outlier usually has the most affect on the mean. The median may not be affected as much because it is the data value in the middle position. The mode will not be affected at all.

Exercises

1. Data set: 5, 30, 35, 20, 5, 25, 20
$5 + 30 + 35 + 20 + 5 + 25 + 20 = 140$
$140 \div 7 = 20$
The mean is 20.
Arrange the numbers in order: 5, 5, 20, **20**, 25, 30, 35
The median is 20.
The numbers that appear most often are 5 and 20.
The modes are 5 and 20.
greatest value $-$ least value $= 35 - 5 = 30$
The range is 30.

2. Data set: 44, 68, 48, 61, 59, 48, 63, 49
$44 + 68 + 48 + 61 + 59 + 48 + 63 + 49 = 440$
$440 \div 8 = 55$
The mean is 55.
Arrange the numbers in order: 44, 48, 48, **49**, **59**, 61, 63, 68
Determine the average of the middle two numbers.
$49 + 59 = 108$
$108 \div 2 = 54$
The median is 54.
The number that appears most often is 48.
The mode is 48.
greatest value $-$ least value $= 68 - 44 = 24$
The range is 24.

3. Median; There is an outlier that skews the data.

4. Data set: 4, 12, 3, 1, 4, 7, 5, 4
The outlier is 12.

Without the outlier
$4 + 3 + 1 + 4 + 7 + 5 + 4 = 28$
$28 \div 7 = 4$
The mean is 4.
Arrange the numbers in order: 1, 3, 4, **4**, 4, 5, 7
The median is 4.
The number that appears most often is 4.
The mode is 4.

With the outlier
$4 + 12 + 3 + 1 + 4 + 7 + 5 + 4 = 40$
$40 \div 8 = 5$
The mean is 5.
Arrange the numbers in order: 1, 3, 4, **4**, **4**, 5, 7, 12
Determine the average of the middle two numbers.
$4 + 4 = 8$
$8 \div 2 = 4$
The median is 4.
The number that appears most often is 4.
The mode is 4.
12; Adding the outlier increased the mean by 1. The median and mode did not change.

5. Data set: 92, 88, 65, 68, 76, 90, 84, 88, 93, 89
$92 + 88 + 65 + 68 + 76 + 90 + 84 + 88 + 93 + 89 = 833$
$833 \div 10 = 83.3$
The mean is 83.3.
Arrange the numbers in order: 65, 68, 76, 84, **88**, **88**, 89, 90, 92, 93
Determine the average of the middle two numbers.
$88 + 88 = 176$
$176 \div 2 = 88$
The median is 88.
The number that appears most often is 88.
The mode is 88.
greatest value $-$ least value $= 93 - 65 = 28$
The range is 28.

6. Data set: 23, 43, 5, 3, 4, 14, 24, 15, 15, 13
$23 + 43 + 5 + 3 + 4 + 14 + 24 + 15 + 15 + 13 = 159$
$159 \div 10 = 15.9$
The mean is 15.9.
Arrange the numbers in order: 3, 4, 5, 13, **14**, **15**, 15, 23, 24, 43
Determine the average of the middle two numbers.
$14 + 15 = 29$
$29 \div 2 = 14.5$
The median is 14.5.
The number that appears most often is 15.
The mode is 15.
$43 - 3 = 40$ is the difference between the greatest and least values. The range is 40.

7. Data set: 2.0, 4.4, 6.2, 3.2, 4.4, 6.2, 3.7
$2.0 + 4.4 + 6.2 + 3.2 + 4.4 + 6.2 + 3.7 = 30.1$
$30.1 \div 7 = 4.3$
The mean is 4.3.
Arrange the numbers in order: 2.0, 3.2, 3.7, **4.4**, 4.4, 6.2, 6.2
The median is 4.4.
The numbers that appear most often are 4.4 and 6.2.
The modes are 4.4 and 6.2.
greatest value $-$ least value $= 6.2 - 2.0 = 4.2$
The range is 4.2.

8. Data set: 13.1, 7.5, 3.9, 4.8, 17.1, 14.6, 8.3, 3.9
$13.1 + 7.5 + 3.9 + 4.8 + 17.1 + 14.6 + 8.3 + 3.9 = 73.2$
$73.2 \div 8 = 9.15$
The mean is 9.15.
Arrange the numbers in order: 3.9, 3.9, 4.8, **7.5**, **8.3**, 13.1, 14.6, 17.1
Determine the average of the middle two numbers.
$7.5 + 8.3 = 15.8$
$15.8 \div 2 = 7.9$
The median is 7.9.
The number that appears most often is 3.9.
The mode is 3.9.
greatest value $-$ least value $= 17.1 - 3.9 = 13.2$
The range is 13.2.

9. Mean and median; The mode focuses on one data value and does not reflect the data set as a whole.

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10. Data set: 13, 18, 20, 5, 15, 20, 13, 20
The outlier is 5.

Without the outlier
$13 + 18 + 20 + 15 + 20 + 13 + 20 = 119$
$119 \div 7 = 17$
The mean is 17.
Arrange the numbers in order: 13, 13, 15, **18**, 20, 20, 20
The median is 18.
The number that appears most often is 20.
The mode is 20.

With the outlier
$13 + 18 + 20 + 5 + 15 + 20 + 13 + 20 = 124$
$124 \div 8 = 15.5$
The mean is 15.5.
Arrange the numbers in order: 5, 13, 13, **15**, **18**, 20, 20, 20
Determine the average of the middle two numbers.
$15 + 18 = 33$
$33 \div 2 = 16.5$
The median is 16.5.
The number that appears most often is 20.
The mode is 20.
5; Adding the outlier decreased the mean and the median by 1.5. The mode did not change; mean; median.

11. Data set: 45, 48, 63, 85, 151, 47, 88, 44, 68
The outlier is 151.

Without the outlier
$45 + 48 + 63 + 85 + 47 + 88 + 44 + 68 = 488$
$488 \div 8 = 61$
The mean is 61.
Arrange the numbers in order: 44, 45, 47, **48**, **63**, 68, 85, 88
Determine the average of the middle two numbers.
$48 + 63 = 111$
$111 \div 2 = 55.5$
The median is 55.5.
No number appears more often than the others.
There is no mode.

With the outlier
$45 + 48 + 63 + 85 + 151 + 47 + 88 + 44 + 68 = 639$
$639 \div 9 = 71$
The mean is 71.
Arrange the numbers in order: 44, 45, 47, 48, **63**, 68, 85, 88, 151
Determine the average of the middle two numbers.
The median is 63.
No number appears more often than the others.
There is no mode.
151; Adding the outlier increased the mean by 10 and the median by 7.5. The mode did not change because there was no mode; median; mean.

12. Because the mean of three data items is 62, the sum of the three data items must be 186.
$3 \cdot 62 = 186$.
Two of the data items are 58 and 61. Subtract the sum of the two known data items from 186 to find the missing data item.
$58 + 61 = 119$
$186 - 119 = 67$
Jon's height at the third checkup was 67 in.

13. Data set: 2, 4, 5, 5, 7, 8, 8, 10, 11, 12, 12, 12, 21
$2 + 4 + 5 + 5 + 7 + 8 + 8 + 10 + 11 + 12 + 12 + 12 + 21 = 117$
$117 \div 13 = 9$
The mean is 9.
Arrange the numbers in order: 2, 4, 5, 5, 7, 8, **8**, 10, 11, 12, 12, 12, 21
The median is 8.
The number that appears most often is 12.
The mode is 12.
The outlier is 21.

Without the outlier
$2 + 4 + 5 + 5 + 7 + 8 + 8 + 10 + 11 + 12 + 12 + 12 = 96$
$96 \div 12 = 8$
The mean is 8.

With the outlier
$2 + 4 + 5 + 5 + 7 + 8 + 8 + 10 + 11 + 12 + 12 + 12 + 21 = 117$
$117 \div 13 = 9$
The mean is 9.
9; 8; 12; adding the outlier increased the mean by 1.

14. Data set: 95, 93, 91, 95, 100, 99, 92
$95 + 93 + 91 + 95 + 100 + 99 + 92 = 665$
$665 \div 7 = 95$
The mean is 95.
Arrange the numbers in order: 91, 92, 93, **95**, 95, 99, 100
The median is 95.
The number that appears most often is 95.
The mode is 95.
The mean, median, and mode of the original data set is 95. Since all three measures of central tendencies are the same value, adding that value to the data set will not change any of the original central tendencies.
The added value is 95.

15. Possible answer: The mean or the median, since most of the participants were in their twenties.

16. Possible answers: When estimating this data you can use the whole number values given in the table.
$0 + 1 + 1 + 2 + 3 + 4 = 11$
$11 \div 6 \approx 2$
The mean is approximately 2.
The middle two numbers when the numbers are arranged in order are 1 and 2.
The median is approximately 2.
greatest value $-$ least value $= 4 - 1 = 3$
The range is approximately 3.

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17. Data set: 10, 7, 9, 5, 13, 10, 7, 14, 8, 11
$10 + 7 + 9 + 5 + 13 + 10 + 7 + 14 + 8 + 11 = 94$
$94 \div 10 = 9.4$
The mean is 9.4.
Arrange the numbers in order: 5, 7, 7, 8, **9**, **10**, 10, 11, 13, 14
Determine the average of the middle two numbers.
$9 + 10 = 19$
$19 \div 2 = 9.5$
The median is 9.5.
The numbers that appear most often are 7 and 10.
The modes are 7 and 10.
The only measure of central tendency that has a value of 9.5 is the median.
Answer: What is the median of the data set?

18. Possible answer: The mean is most often affected by including an outlier. Often the median and mode will not change, but the mean will always change.

19. a. Median; Use when there are outliers that may distort the data or to describe the middle value.
b. Mean; use when there are no outliers to distort the data.

20. B; Data set: 272, 276, 281, 279, 276
$272 + 276 + 281 + 279 + 276 = 1{,}384$
$1{,}384 \div 5 = 276.8$
The mean is 276.8.

21. J; Data set: 4, 3, 4, 3, 4, 6, 4
$4 + 3 + 4 + 3 + 4 + 6 + 4 = 28$
$28 \div 7 = 4$
The mean is 4.
Arrange the numbers in order: 3, 3, 4, **4**, 4, 4, 6
The median is 4.
The number that appears most often is 4.
The mode is 4.
Data set J has the mean, median, and mode of 4.

22. $A = P + I$
$4{,}800 = 4{,}000 + I$
$-4{,}000 \quad -4{,}000$
$800 = I$
$I = P \cdot r \cdot t$
$800 = 4{,}000 \cdot 0.045 \cdot t$
$800 = 180t$
$\frac{800}{180} = \frac{180t}{180}$
$4.\overline{4} = t$
It will take almost 4.5 years.

23.

Stems	Leaves
4	3 5 8
5	1 7
6	0 2 2

7-3, PAGES 387-389

Think and Discuss

1. Possible answer: Add the values in the frequency column.

2. Possible answer: It is easier to compare two related sets of data in a double bar graph.

3. Possible answer: In a histogram the bars are connected, but they are separated in a bar graph; the width of each bar of a histogram shows a range. This is not true for a bar graph. The height or length of each bar in a histogram shows a frequency, whereas each bar of a bar graph shows a number.

Exercises

1. The bar labeled "grapes" is the shortest, so grapes was the fruit eaten the least.

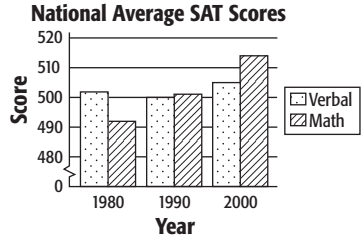
2. About 17.5 pounds

3. bananas − oranges = 28 − 13 = 15
About 15 pounds

4. Data set:

Year	Verbal	Math
1980	502	492
1990	500	501
2000	505	514

Step 1: Choose a scale and interval for the vertical axis. The least data value is 492 and the greatest data value is 514, so choose 480 to 520 for the scale. Because the scale will not begin at 0, indicate that the vertical axis is broken by a "zigzag" symbol. Choose intervals of 1 each or 2 each.
Step 2: Draw a pair of bars for each year. Use different patterns to show verbal and math.
Step 3: Label the axis and give the graph a title.
Step 4: Make a key to show what each bar represents.

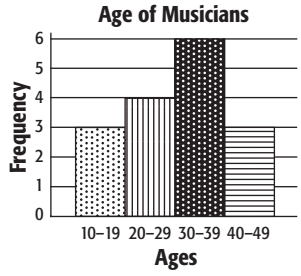


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5. Data set: 14, 35, 22, 18, 49, 38, 30, 27, 45, 19, 35, 46, 27, 21, 32, 30

Age	Frequency
10–19	3
20–29	4
30–39	6
40–49	3

Step 1: Make a frequency table of the data. Be sure to use equal intervals.
Step 2: Choose an appropriate scale and interval for the vertical axis. The greatest value on the scale should be at least as great as the greatest frequency. The greatest frequency is 6, so the greatest value on the scale should be at least 6.
Step 3: Draw a bar for each interval. The height of the bar is the frequency for that interval. Bars must touch but not overlap.
Step 4: Label the axes and give the graph a title.



6. The bar for Florida is the longest, so Florida received the most precipitation.

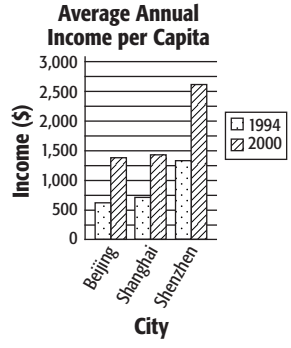
7. About 27 inches

8. About 4 inches

9. Data set:

City	1994	2000
Beijing	$614	$1,256
Shanghai	$716	$1,424
Shenzhen	$1,324	$2,626

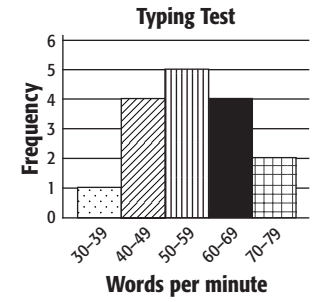
Step 1: Choose a scale and interval for the vertical axis. The least data value is $614 and the greatest data value is $2,626, so choose $0 to $3,000 for the scale. Choose intervals of $250 each or $500 each.
Step 2: Draw a pair of bars for each city. Use different patterns to show the years 1994 and 2000.
Step 3: Label the axis and give the graph a title.
Step 4: Make a key to show what each bar represents.



10. Data set: 62, 55, 68, 47, 50, 41, 62, 39, 54, 70, 56, 47, 71, 55, 60, 42

Words per minute	Frequency
30–39	1
40–49	4
50–59	5
60–69	4
70–79	2

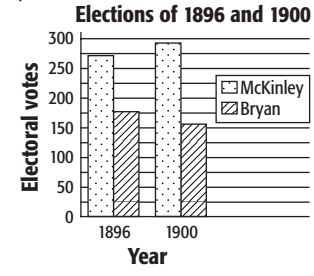
Step 1: Make a frequency table of the data. Be sure to use equal intervals.
Step 2: Choose an appropriate scale and interval for the vertical axis. The greatest value on the scale should be at least as great as the greatest frequency. The greatest frequency is 5, so the greatest value on the scale should be at least 5.
Step 3: Draw a bar for each interval. The height of the bar is the frequency for that interval. Bars must touch but not overlap.
Step 4: Label the axes and give the graph a title.



11. Data set:

Candidate	1896	1900
McKinley	271	292
Bryan	176	155

Step 1: Choose a scale and interval for the vertical axis. The least data value is 155 and the greatest data value is 292, so choose 0 to 300 for the scale. Choose intervals of 25 each or 50 each.
Step 2: Draw a pair of bars for each year. Use different patterns to show the years of McKinley and Bryan.
Step 3: Label the axis and give the graph a title.
Step 4: Make a key to show what each bar represents.



12. Use compatible numbers; 270 − 170 = 100; about 100 more votes.

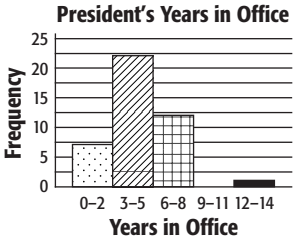
13. No; the third row of the table includes years 6, 7, and 8, not just year 6.

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14.

Years in Office	Frequency
0–2	7
3–5	22
6–8	12
9–11	0
12–14	1

Step 1: Use the frequency table of the data.
Step 2: Choose an appropriate scale and interval for the vertical axis. The greatest value on the scale should be at least as great as the greatest frequency. The greatest frequency is 22, so the greatest value on the scale should be at least 22.
Step 3: Draw a bar for each interval. The height of the bar is the frequency for that interval. Bars must touch but not overlap.
Step 4: Label the axes and give the graph a title.



15. Possible answer: Most presidents spent 3 to 8 years in office.

16. A; 1988

17. H; 2000

18. Write the ratios with a common denominator, such as 72.

$\frac{10}{24} = \frac{10 \cdot 3}{24 \cdot 3} = \frac{30}{72}$

$\frac{15}{36} = \frac{15 \cdot 2}{36 \cdot 2} = \frac{30}{72}$

Since both ratios are equal to $\frac{30}{72}$, they are proportional.

19. Write the ratios with a common denominator, such as 594.

$\frac{5}{22} = \frac{5 \cdot 27}{22 \cdot 27} = \frac{135}{594}$

$\frac{10}{27} = \frac{10 \cdot 22}{27 \cdot 22} = \frac{220}{594}$

Since $\frac{135}{54} \neq \frac{220}{594}$, the ratios are not proportional.

20. Write the ratios with a common denominator, such as 60.

$\frac{2}{20} = \frac{2 \cdot 3}{20 \cdot 3} = \frac{6}{60}$

$\frac{3}{30} = \frac{3 \cdot 2}{30 \cdot 2} = \frac{6}{60}$

Since both ratios are equal to $\frac{6}{60}$, they are proportional.

21. Write the ratios with a common denominator, such as 96.

$\frac{72}{96}$

$\frac{9}{12} = \frac{9 \cdot 8}{12 \cdot 8} = \frac{72}{96}$

Since both ratios are equal to $\frac{72}{96}$, they are proportional.

22. Data set: 42, 29, 49, 32, 19
$42 + 29 + 49 + 32 + 19 = 171$
$171 \div 5 = 34.2$
The mean is 34.2.
Arrange the numbers in order: 19, 29, **32**, 42, 49
The median is 32.
No number appears more often than the others.
There is no mode.
greatest value − least value $= 49 - 19 = 30$
The range is 30.

23. Data set: 15, 34, 26, 15, 21, 30
$15 + 34 + 26 + 15 + 21 + 30 = 141$
$141 \div 6 = 23.5$
The mean is 23.5.
Arrange the numbers in order: 15, 15, **21**, **26**, 30, 34
Determine the average of the middle two numbers.
$21 + 26 = 47$
$47 \div 2 = 23.5$
The median is 23.5.
The number that appears most often is 15.
The mode is 15.
greatest value − least value $= 34 - 15 = 19$
The range is 19.

24. Data set: 4, 3, 3, 3, 3, 4, 1
$4 + 3 + 3 + 3 + 3 + 4 + 1 = 21$
$21 \div 7 = 3$
The mean is 3.
Arrange the numbers in order: 1, 3, 3, **3**, 3, 4, 4
The median is 3.
The number that appears most often is 3.
The mode is 3.
greatest value − least value $= 4 - 1 = 3$
The range is 3.

7-4, PAGES 391-393

Think and Discuss

1. Possible answer: You can compare the parts within a data set, or you can compare one part of the data set to the entire set.

2. Possible answer: Bar graphs are used to compare numbers of different items. Circle graphs are used to show how parts of a whole are divided.

Exercises

1. The sector labeled "outdoor" is the smallest, so the least amount of money was spent for outdoor advertising.

2. The radio and magazine advertising sectors together make up about one-fourth of the circle. Because the circle represents 100% of the data, about one-fourth of 100%, or 25%, of advertising spending was on radio and magazine advertising.

3. Television and magazine spending made up about 50%, or about one-half, of the total amount spent. If the total amount spent was $100,000, then television and magazine spending was about one-half of $100,000. One half of $100,000 is $50,000.

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4. Bar graph; each bar would show the length of one river.

5. Circle graph; Each candidate's share of the votes can be shown in comparison to 100% of the votes.

6. The sector for basketball is larger than the sector for tennis. Therefore, the graph indicates that more teens picked basketball than tennis.

7. The sector for soccer makes up a little less than one-third of the circle. Because the circle represents 100% of the data, a little less than one-third of the circle would represent about 30% of the data. Therefore, the graph indicates that approximately 30% of teens picked soccer.

8. 100 teens were surveyed.
5%, or 0.05, of the teens chose golf.
$0.05 \times 100 = 5$
5 teens chose golf.

9. Circle graph; The total number of calories eaten in one day could be 100%.

10. Bar graph; each bar would show the amount of rain for 1 month.

11. Determine which sector is the largest, second largest, third largest, and so on. List in that order the countries that correspond to those sectors. Asia, Africa, North America, South America, Antarctica, Europe, Australia

12. The sector for Asia is a little less than one-third of the circle. Because the circle represents 100% of the data, a little less than one-third of the circle represents about 30% of the data. Therefore, the sector for Asia represents about 30% of the Earth's total land area.

13. The sector labeled "North America" and "South America" together make up about one-fourth of the circle. Because the circle represents 100% of the data, one-fourth of the circle represents 25% of the data. Together, the sectors of North America and South America represent about 25% of the earth's total land area.

14. No; The percents add up to more than 100%.

15. Possible answer: 25% of the total number of students would be 9 students who own a dog, but the table shows that 11 students own a dog.

16. Possible answer: estimation, percentages, fractions, and ordering numbers.

17. Earth's total land area is approximately 57,900,00 mi^2.
10%, or 0.10, of that total land area is Antarctica.
$0.1 \times 57{,}900{,}000\ mi^2 = 5{,}790{,}000\ mi^2$

18. B; The sector for Gold is a little less than one-half of the circle. Because the circle represents 100% of the data, a little less than one-half of the circle represents about 40% of the data. Therefore, the sector for Gold represents about 40% of the total land area.

19. Possible answer: The sector for bronze medals makes up about one-third of the circle. Since the circle shows about one-third of the data, one-third of 500 is about 150 bronze medals.

20. Write ratios using the corresponding sides of each flag. Check if they form a proportion by applying the cross product rule.
$\frac{10}{19} \blacksquare \frac{60}{114}$
$1140 = 1140$
Yes, they are similar.

21. $0.1 \blacksquare 0.09$
$\frac{1}{10} \blacksquare \frac{9}{100}$
$\frac{1}{10} > \frac{9}{100}$

22. $1.71 \blacksquare \frac{24}{11}$
$\frac{171}{100} \blacksquare \frac{24}{11}$
$\frac{1881}{1100} < \frac{2400}{1100}$

23. $1.25 \blacksquare 125\%$
$1.25 \blacksquare \frac{125}{100}$
$1.25 = 1.25$

24. $32.5 \blacksquare 69\%$
$32.5 \blacksquare \frac{69}{100}$
$32.5 > 0.69$

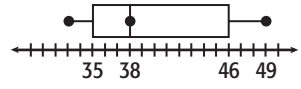
7-5, PAGES 395-397

Think and Discuss

1. Possible answer: You can tell the range and median of the data set, as well as how the data is distributed around the median.

2. Possible answer: The range of a set of data is the difference between the greatest and least values. The interquartile range is the difference between the upper and lower quartiles. The interquartile range tells how large the spread of data around the median is.

Exercises

1. 

Data set: 46, 35, 46, 38, 37, 33, 49, 42, 35, 40, 37
Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.
Order the data from least to greatest.
33, 35, 35, 37, 37, 38, 40, 42, 46, 46, 49
Find the lower and upper extremes.
(33,) 35, 35, 37, 37, 38, 40, 42, 46, 46, (49)
Find the median.
33, 35, 35, 37, 37, (38,) 40, 42, 46, 46, 49
Find the first and third quartiles.
33, 35, (35,) 37, 37, 38, 40, 42, (46,) 46, 49
Step 2: Draw a number line. Above the number line, plot points representing the lower and upper extremes, the median, and the first and third quartiles.
The range is 16, the interquartile range is 11, the lower quartile is 35, and the upper quartile is 46.

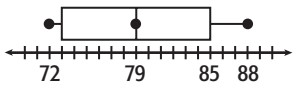
2. airplane A

3. airplane B

4. airplane A

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5.



Data set: 81, 73, 88, 85, 81, 72, 86, 72, 79, 75, 76

Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.

Order the data from least to greatest.

72, 72, 73, 75, 76, 79, 81, 81, 85, 86, 88

Find the lower and upper extremes.

(72,) 72, 73, 75, 76, 79, 81, 81, 85, 86, (88)

Find the median.

72, 72, 73, 75, 76, (79,) 81, 81, 85, 86, 88

Find the first and third quartiles.

33, 35, (35,) 37, 37, 38, 40, 42, (46,) 46, 49

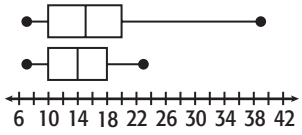
Step 2: Draw a number line. Above the number line, Plot points representing the lower and upper extremes, the median, and the first and third quartiles.

The range is 16, the interquartile range is 12, the lower quartile is 73, and the upper quartile is 85.

6. city A **7.** city A

8. city B

9.



Data set: 12, 7, 15, 23, 10, 18, 39, 15, 20, 8, 13

Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.

Order the data from least to greatest.

7, 8, 10, 12, 13, 15, 15, 18, 20, 23, 39

Find the lower and upper extremes.

(7, 8,) 10, 12, 13, 15, 15, 18, 20, 23, (39)

Find the median.

7, 8, 10, 12, 13, (15,) 15, 18, 20, 23, 39

Find the first and third quartiles.

7, 8, 10, (12,) 13, 15, 15, 18, 20, (23,) 39

Step 2: Draw a number line. Above the number line, plot points representing the lower and upper extremes, the median, and the first and third quartiles.

The outlier is 39. In the following steps, 39 is not included in the data.

Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.

Order the data from least to greatest.

7, 8, 10, 12, 13, 15, 15, 18, 20, 23

Find the lower and upper extremes.

(7, 8,) 10, 12, 13, 15, 15, 18, 20, (23)

Find the median.

7, 8, 10, 12, (13, 15,) 15, 18, 20, 23

$\text{Median} = \frac{13 + 15}{2} = 14$

Find the first and third quartiles.

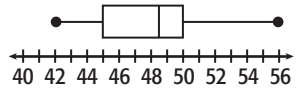
7, 8, (10,) 12, 13, 15, 15, (18,) 20, 23

Step 2: Above the same number line, plot points representing the lower and upper extremes, the median, and the first and third quartiles.

10. The interquartile range increases with the outlier present.

11. The range because it is either the lower or upper extreme.

12.



Data set: 42, 42, 44, 45, 45, 45, 47, 47, 48, 48, 48, 49, 49, 50, 50, 50, 50, 51, 51, 52, 54, 56

Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.

Order the data from least to greatest.

42, 42, 44, 45, 45, 45, 47, 47, 48, 48, 48, 49, 49, 50, 50, 50, 50, 51, 51, 52, 54, 56

Find the lower and upper extremes.

(42,) 42, 44, 45, 45, 45, 47, 47, 48, 48, 48, 49, 49, 50, 50, 50, 50, 51, 51, 52, 54, (56)

Find the median.

42, 42, 44, 45, 45, 45, 47, 47, 48, 48, (48, 49,) 49, 50, 50, 50, 50, 51, 51, 52, 54, 56

The median is 48.5

Find the first and third quartiles.

42, 42, 44, 45, 45, (45,) 47, 47, 48, 48, 48,

49, 49, 50, 50, 50, (50,) 51, 51, 52, 54, 56

Step 2: Draw a number line. Above the number line, plot points representing the lower and upper extremes, the median, and the first and third quartiles.

13. a. Data set: 103, 92, 63, 49, 48, 37, 33, 32, 30, 30, 27, 23, 22, 19, 19

Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.

Order the data from least to greatest.

19, 19, 22, 23, 27, 30, 30, 32, 33, 37, 48, 49, 63, 92, 103

Find the lower and upper extremes.

(19,) 19, 22, 23, 27, 30, 30, 32, 33, 37, 48, 49, 63, 92, (103)

Find the median.

19, 19, 22, 23, 27, 30, 30, (32,) 33, 37, 48, 49, 63, 92, 103

Find the first and third quartiles.

19, 19, 22, (23,) 27, 30, 30, 32,

33, 37, 48, (49), 63, 92, 103

Step 2: Draw a number line. Above the number line, plot points representing the lower and upper extremes, the median, and the first and third quartiles.

b. Possible answer: Most countries won between 23 and 49 medals.

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14. a. Data set: 53, 55, 56, 56, 58, 58, 58, 59, 59, 60, 60, 61, 61, 61, 61, 61, 62, 62, 62, 64

Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.

Order the data from least to greatest.

53, 55, 56, 56, 58, 58, 58, 59, 59, 60, 60, 61, 61, 61, 61, 61, 62, 62, 62, 64

Find the lower and upper extremes.

(53,) 55, 56, 56, 58, 58, 58, 59, 59, 60, 60, 61, 61, 61, 61, 61, 62, 62, 62, (64)

Find the median.

53, 55, 56, 56, 58, 58, 58, 59, 59, (60, 60,) 61, 61, 61, 61, 61, 62, 62, 62, 64

The median is 60

Find the first and third quartiles.

[53, 55, 56, 56, 58, 58, 58, 59, 59, 60,]

[60, 61, 61, 61, (61, 61,) 62, 62, 62, 64]

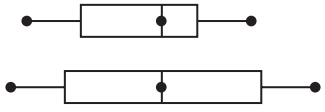
Step 2: Draw a number line. Above the number line, plot points representing the lower and upper extremes, the median, and the first and third quartiles.

b. 58 in.

c. 61 in.

15. The student made an error in finding the median of the upper half of the data. The upper quartile is 11.

16. The plot with the larger box represents a greater range of numbers. To see why, draw two box-and-whisker plots with the same median, equally long whiskers, and boxes of different lengths.



17. Data set: 1, 2, 4, 2, 1, 0, 6, 8, 1, 6, 2

Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.

Order the data from least to greatest.

0, 1, 1, 1, 2, 2, 2, 4, 6, 6, 8

Find the lower and upper extremes.

(0,) 1, 1, 1, 2, 2, 2, 4, 6, 6, (8)

Find the median.

0, 1, 1, 1, 2, (2,) 2, 4, 6, 6, 8

Find the first and third quartiles.

[0, 1, (1,) 1, 2,] 2, [2, 4, (6,) 6, 8]

Step 2: Draw a number line. Above the number line, plot points representing the lower and upper extremes, the median, and the first and third quartiles.

The interquartile range is 5, so an outlier is 5 times 1.5.

$5 \cdot 1.5 = 7.5$

Since 8 is larger than 7.5, 8 is considered an outlier.

18. D; The interquartile range for the top box-and-whisker plot is $24 - 15 = 9$. The interquartlie range for the bottom box-and-whisker plot is $21 - 12 = 9$.

19. 15; The top box-and-whisker plot has the greatest range, so its lower quartile is 15.

20. Let x be the height of the tree.

$$\frac{6}{10.5} = \frac{x}{21.25}$$

$$10.5x = 127.5$$

$$x \approx 12.1$$

The estimated height of the tree is 12 ft.

21. 15% of \$24.69 $= 0.15 \cdot 24.69 = 3.75$

The tip should be \$3.75.

HANDS ON LAB 7-5, PAGES 398-399

Activity 1

Think and Discuss

1. They represent all the people who play team sports and all the people who play an instrument.

2. Three circles would overlap to show three data sets. The Venn diagram would have four overlapping areas.

Try This

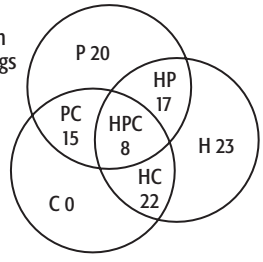
1. 20

2. 0

3. 23

4.

Key:
C = Chicken
H = Hot dogs
P = Pasta



Activity 2

Think and Discuss

1. There will be 4 individual sets of data and 8 overlapping areas in the movie data in activity 2.

2. A Venn diagram of student ages might be simply a row of circles. There would be no overlap, because one does not officially turn the next higher age until the date of birth.

Try This

1. Check students' work.

2. a. 33

b. 12

c. 7

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READY TO GO ON? PAGE 400

1. Data Set: 42, 55, 62, 48, 65, 51, 47, 59, 67, 61, 49, 54, 55, 52, 44

Step 1: Look at the range to choose the scale and equal intervals for the data. The least data value is 42 and the greatest data value is 67, so the data ranges from 42 to 67. Choose 40 to 69 for the scale and intervals 40–49, 50–59, and 60–69.

Step 2: Find the number of data values in each interval. Write these numbers in the "Frequency" column.

Step 3: Find the cumulative frequency for each row by adding all the frequency values that are above or in that row.

Land Animals		
Speeds	Frequency	Cumulative Frequency
40–49	5	5
50–59	6	11
60–69	4	15

2. Data Set: 42, 55, 62, 48, 65, 51, 47, 59, 67, 61, 49, 54, 55, 52, 44

Step 1: Find the least data value and the greatest data value. Since the data values range from 42 to 67, use tens digits for the stems and ones digits for the leaves.

Step 2: List the stems from least to greatest on the plot.

Step 3: List the leaves for each stem from least to greatest.

Step 4: Add a key and a title.

Speeds of Various Land Animals

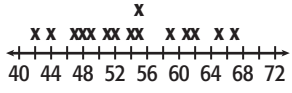
Stems	Leaves
4	2 4 7 8 9
5	1 2 4 5 5 9
6	1 2 5 7

Key: 5|1 = 51

3. Data Set: 42, 55, 62, 48, 65, 51, 47, 59, 67, 61, 49, 54, 55, 52, 44

Step 1: The data values range from 8 to 55. Draw a number line that includes this range.

Step 2: Put an ✗ above the number on the number line that corresponds to the number of electoral votes.



4. Data set: 18, 22, 5, 21, 19, 21, 17, 3, 19, 20, 29, 18, 17

18 + 22 + 5 + 21 + 19 + 21 + 17 + 3 + 19 + 20 + 29 + 18 + 17 = 229

229 ÷ 13 ≈ 17.6

The mean is about 17.6.

Arrange the numbers in order: 3, 5, 17, 17, 18, 18, **19**, 19, 20, 21, 21, 22, 29

Determine the average of the middle two numbers. The median is 19.

The numbers that appear most often are 17, 18, 19, and 21.

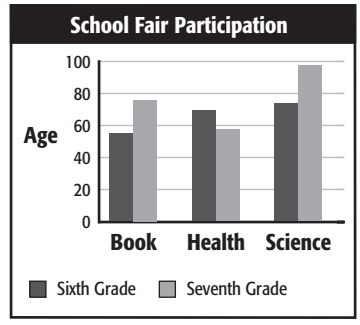
The modes are 17, 18, 19, and 21.

greatest value − least value = 29 − 3 = 26

The range is 26.

5. Median; The outliers affect the mean, so the median is best.

6. Data set: 55, 76, 69, 58, 74, 98



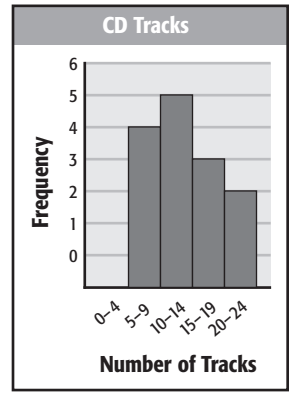
Step 1: Choose a scale and interval for the vertical axis. The least data value is 55 and the greatest data value is 98, so choose 0 to 100 for the scale. Choose intervals of 20 each.

Step 2: Draw a pair of bars for each grade. Use different patterns to show the grades sixth and seventh.

Step 3: Label the axis and give the graph a title.

Step 4: Make a key to show what each bar represents.

7. Data set: 13, 7, 10, 8, 15, 17, 22, 9, 11, 10,16, 12, 9, 20



Step 1: Make a frequency table of the data. Be sure to use equal intervals.

Step 2: Choose an appropriate scale and interval for the vertical axis. The greatest value on the scale should be at least as great as the greatest frequency. The greatest frequency is 5, so the greatest value on the scale should be at least 5.

Step 3: Draw a bar for each interval. The height of the bar is the frequency for that interval. Bars must touch but not overlap.

Step 4: Label the axes and give the graph a title.

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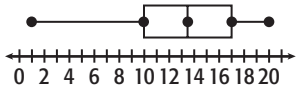
8. The sector for cheese is a little less than one-half of the circle. Because the circle represents 100% of the data, a little less than one-half of the circle represents about 40% of the data. Therefore, the sector for cheese represents about 40% of the total land area.

9. $200 \cdot 25\% = 200 \cdot 0.25 = 50$
50 students picked pepperoni as their favorite topping.

10. Data set: 14, 8, 13, 20, 15, 17, 1, 12, 18, 10
Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.
Order the data from least to greatest.
1, 8, 10, 12, 13, 14, 15, 17, 18, 20
Find the lower and upper extremes.
(1,) 8, 10, 12, 13, 14, 15, 17, 18, (20)
Find the median.
1, 8, 10, 12, (13, 14,) 15, 17, 18, 20

$$\text{Median} = \frac{13 + 14}{2} = 13.5$$

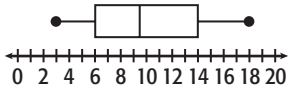
Find the first and third quartiles.
1, 8, (10,) 12, 13, | 14, 15, (17,) 18, 20
Step 2: Above the same number line, plot points representing the lower and upper extremes, the median, and the first and third quartiles.



11. Data set: 3, 8, 5, 12, 6, 18, 14, 8, 15, 11
Step 1: Find the lower and upper extremes, the median, and the first and third quartiles.
Order the data from least to greatest.
3, 5, 6, 8, 8, 11, 12, 14, 15, 18
Find the lower and upper extremes.
(3,) 5, 6, 8, 8,11, 12, 14, 15, (18)
Find the median.
3, 5, 6, 8, (8, 11,) 12, 14, 15, 18

$$\text{Median} = \frac{8 + 11}{2} = 9.5$$

Find the first and third quartiles.
3, 5, (6,) 8, 8, | 11, 12, (14,) 15, 18
Step 2: Above the same number line, plot points representing the lower and upper extremes, the median, and the first and third quartiles.



12. The plot of the second data set has a greater interquartile range.

FOCUS ON PROBLEM SOLVING, PAGE 401

1. Add; The word *total* indicates addition; 48 + 55 + 51.
48 + 55 + 51 = 154 s

2. Subtract; The words *how much taller* indicate subtraction; 111 − 90.
111 − 90 = 21 ft

3. Add; Mr. Hutchins needs to find the total cost of the items in order to find out if he has enough money;
\$19.75 + \$8.49 + \$7.10 = \$35.34
\$35.34 > \$35
So, Mr. Hutchins does not have enough money.

4. Subtract: The words *how many minutes does he have left* indicate subtraction;
83 − 25.
83 − 25 = 58 min

5. Subtract; The words *how much more* indicate subtraction; 3,600 − 200.
3,600 − 200 = 3,400 kg

6. Add; The words *find the total weight* indicate addition; 400 + 200 + 750.
400 + 200 + 750 = 1,350 kg

7-6, PAGES 403-405

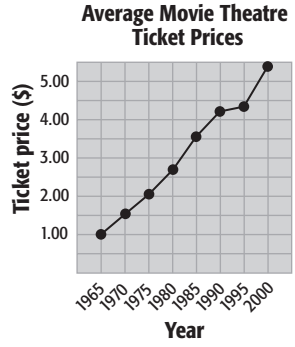
Think and Discuss

1. Possible answer: The line would rise and then fall.

2. Possible answer: A graph comparing the temperatures of two liquids over a period of time, when one cool liquid is heated and one warm liquid is cooled, could have lines that intersect when the temperatures are the same.

Exercises

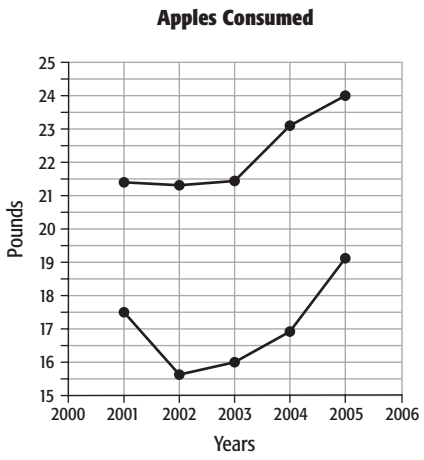
1. Step 1: Determine the scale and interval for each axis. Place years on the horizontal axis and dollar amounts on the vertical axis.
Step 2: Plot a point for each pair of values. Connect the points using line segments.
Step 3: Label the axis and give the graph a title.
The graph shows the least increase between 1990 and 1995. This means that the average ticket price increased the least between 1990 and 1995.



2. Use the graph you drew for number 1.
To estimate the average ticket price in 1997, find the point on the line between 1995 and 2000 that corresponds to 1997. Find the corresponding value on the vertical axis. The graph shows about \$4.90.

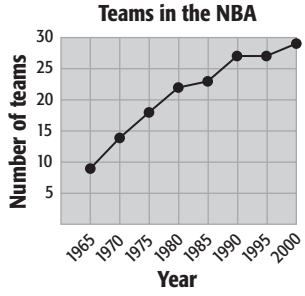
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3.



Plot a point for the amount of raw apples consumed each of the years listed and connect the points with solid lines. Then, plot a point for the amount of apple juice consumed each of the years listed and connect those points with a broken line. Make a key to show what each line represents.

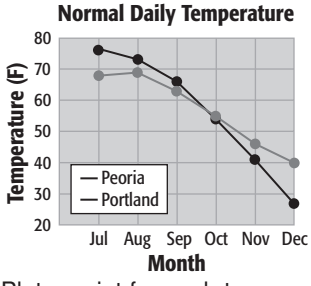
4. Step 1: Determine the scale and interval for each axis. Place years on the horizontal axis and number of teams on the vertical axis.
Step 2: Plot a point for each pair of values. Connect the points using line segments.
Step 3: Label the axis and give the graph a title. The graph shows that the number of NBA teams increased the least between 1965 and 1970.



5. Use the graph that you drew for number 4. The graph shows no increase between 1990 and 1995. This means that the number of teams increased the least between 1990 and 1995.

6. Use the graph that you drew for number 4. To estimate the number of NBA teams in 1998, find the point on the line between 1985 and 1990 that corresponds to 1988. Find the corresponding value on the vertical axis. The graph shows 25.

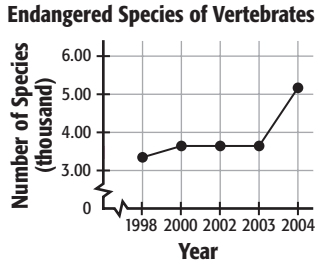
7.



Plot a point for each temperature listed for Peoria and connect the points with solid lines. Then, plot a point for each temperature listed for Portland and connect those points with a broken line. Make a key to show what each line represents.

8. They affect the steepness of the line segments.

9. a.



b. Use the graph that you drew for Part a. To estimate the number of endangered species of vertebrates in 1999, find the point on the line between 1998 and 2000 that corresponds to 1999. Find the corresponding value on the vertical axis. The graph shows 3.4 thousand or 3,400.

10. a. 1996; 2000
b. Possible answer: No, there is no trend.

11. Line graph; It shows how data changes over a period of time.

12. A double-line graph takes less time to draw and makes it easier to compare data.

13. The pattern is that the city grows by 800 people every ten years. Take the population in 2000 and add 800, this will give you the population in 2010.
$6100 + 800 = 6900$
The population in 2010 will be 6,900 people.

14. C; The graph shows the greatest increase between 1997 and 2001. This means that the average cost of a major league baseball ticket increased the most between 1997 and 2001.

15. To estimate the average cost of a major league baseball ticket in 2003, find the point on the line between 2001 and 2005 that corresponds to 2003. Find the corresponding value on the vertical axis. The graph shows about $19.

16. $0.15 = \frac{15}{100}$, or 15%

17. $1.36 = \frac{136}{100}$, or 136%

18. $\frac{2}{3} = 2 \div 3 = 0.\overline{6} \approx 66.7\%$

19. $\frac{11}{20} = 11 \div 20 = 0.55 = 55\%$

20. Bar graph; each bar shows the average temperature for 1 day.

TECHNOLOGY LAB 7-6, PAGES 406-407

Think and Discuss

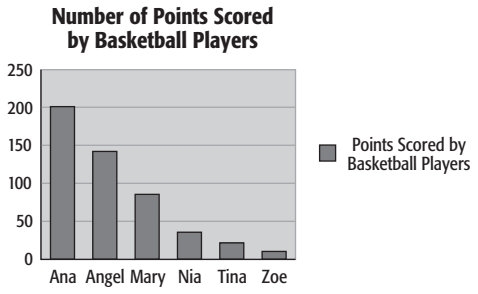
1. The bar graph best displays the Student Council budget because it displays the amounts budgeted for each activity in an easy to read manner.

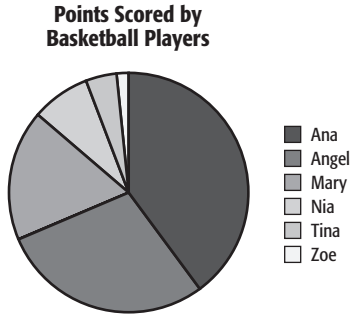
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2. A line graph would not be an appropriate display of the data because the data does not occur over time. A line graph is for showing changes in data over time.

Try This

1.





2. The bar graph is a better display of data because the scores are for one game and not over time.

7-7, PAGES 409-411

Think and Discuss

1. Possible answer: Both a stem-and-leaf plot and a line plot show individual data values. They can be used to show how often data values occur.

2. Possible answer: height of a plant over a period of time, population over several years

Exercises

1. Bar graph; It compares data.

2. Line graph; It shows how data changes over a period of time.

3. The line graph is the better display because it shows earnings over time.

4. The line plot does not represent the data appropriately because there are only 4 data values, and how often they occur is unimportant.

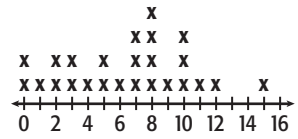
5. Line plot or stem-and-leaf plot; it shows the frequency of values

6. Bar graph; It compares data.

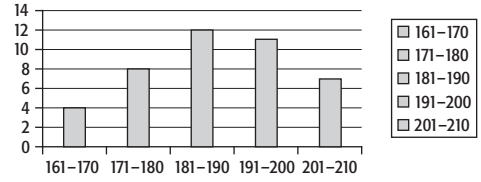
7. The bar graph is the better display because the data are being compared.

8. The stem-and-leaf plot is not a good display because how often data values occur and how they are distributed is not important.

9. Possible answer: line plot

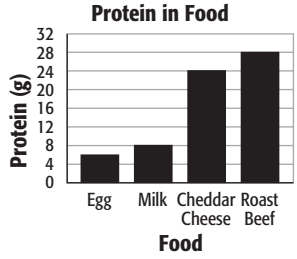


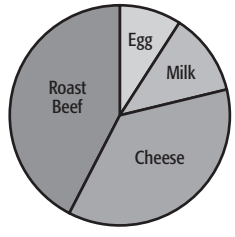
10.



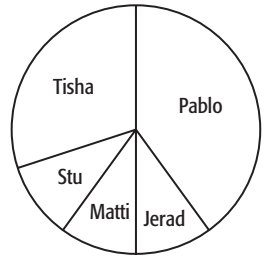
11. Possible answer: A line graph would best display the data because it would show the growth of the vines each month.

12. Both the bar and the circle graph allow easy comparison of the data.





13.



14. Possible answer: No, a circle graph cannot be used unless the percents are part of a whole that totals 100%.

15. A bar graph would show the comparison of the three color preferences best.

16. B; bar graph; It compares data.

17. A circle graph would best display the data because it would show where 100% of the budget went.

18. $0.27 = \frac{27}{100}$, or 27%

19. $0.9 = \frac{9}{10} = \frac{90}{100}$, or 90%

20. $0.02 = \frac{2}{100}$, or 2%

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21. $0.406 = \frac{40.6}{100}$, or 40.6%

22. 36% of $75 = 0.36 \cdot 75 = 27$
27 campers are scheduled to go horseback riding on Tuesday.

7-8, PAGES 413-415

Think and Discuss

1. Possible answer: You would use a sample to survey voters before a national election since it is not possible to survey the entire population.

2. Possible answer: It may not be possible for every member of the population to have an equal chance of being chosen.

Exercises

1. Daria's method is best; It uses a random sample, and Nadia's method uses a convenience sample.

2. The sample is not biased; It is a random sample.

3. The sample is biased; All city residents do not eat at a single restaurant.

4. The claim is not true because the data shows that about 1,200 defective light bulbs are produced each day.

5. Vonetta's method is best; It uses a random sample, and Suzanne's method uses a convenience sample.

6. The sample is biased; Listeners who call the station are more likely to enjoy the music the station plays.

7. The sample is not biased; It is a random sample.

8. Let x represent the students who speak three or more languages.

$$\frac{30{,}600}{x} = \frac{240}{20}$$
$$240x = 612{,}000$$
$$\frac{240x}{240} = \frac{612{,}000}{240}$$
$$x = 2{,}550$$

2,550 students speak three or more languages.

9. Survey the entire population because the population is relatively small.

10. Use a sample because the population is too large to survey.

11. Survey the entire population because the population is relatively small.

12. Agree. Based on data from the sample, there are 30 fruit flies with deformed wings.

13. People with unlisted numbers cannot be surveyed.

14. Possible Answer: Jacy should have used the whole class as the sample because it is a more accurate prediction.

15. Possible answer: Give a questionnaire to 25 students whose names are randomly chosen from a list of all seventh graders.

16. No; If the manager had chosen a random sample of 200 employees, only 6 or 7 of them would walk to work.

17. B; let x represent the students who have pet dogs.

$$\frac{580}{x} = \frac{30}{12}$$
$$30x = 6960$$
$$\frac{30x}{30} = \frac{6960}{30}$$
$$x = 232$$

18. A survey of the listeners of a sports radio program inquiring as to whether they read the sports page in the local paper; Listeners to a sports radio program are likely to read the local sports pages.

19. $52\% = \frac{52}{100} = 0.52$

20. $7\% = \frac{7}{100} = 0.07$

21. $110\% = \frac{110}{100} = 1.1$

22. $0.4\% = \frac{0.4}{100} = \frac{4}{10{,}000} = 0.004$

23. 11% of $50 = 0.11 \cdot 50 = 5.5$

24. 48% of $600 = 0.48 \cdot 600 = 288$

25. 0.5% of $82 = 0.005 \cdot 82 = 0.41$

26. 210% of $16 = 2.1 \cdot 16 = 33.6$

7-9, PAGES 417-419

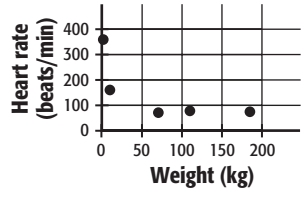
Think and Discuss

1. Possible answer: Negative correlation; the more frequently students are absent, the more work they would probably miss, and the poorer their grades would be.

2. Possible answer: Negative correlation: number of days spent practicing a jump in skating and the number of times you fall per practice session; positive correlation: time spent studying for a test and the final test grade.

Exercises

1. Step 1: Determine the scale and interval for each axis. Place units of weight on the horizontal axis and units of heart rate on the vertical axis.
Step 2: Plot a point for each pair of values.
Step 3: Label the axis and title the graph.
The scatter plot shows that, for different species of mammals, the species' heart rate tends to decrease as the species' typical weight increases. Therefore, the correlation is negative.



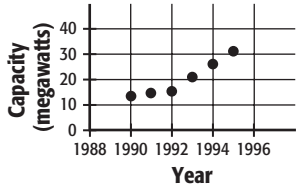
2. A person's shoe size is not related to his or her math score. Therefore, there seems to be no correlation between the data sets.

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3. The scatter plot shows that as a person's age increases, his or her number of years of work experience increases. Therefore, the graph shows a positive correlation between the data sets.

4. The time it takes to drive 100 miles decreases as the driving speed increases. Therefore, there is a negative correlation between the data sets.

5. Step 1: Determine the scale and interval for each axis. Place years on the horizontal axis and units of capacity on the vertical axis.
Step 2: Plot a point for each pair of values.
Step 3: Label the axis and title the graph.
The scatter plot shows that as years pass (that is, as the number of years of use increases), the capacity of the solar energy cell increases. That shows a positive correlation between the data sets.



6. Positive correlation; The graph shows that as advertising costs increase, weekly sales increase.

7. Negative correlation; The graph shows that as mileage increases, the car's value decreases.

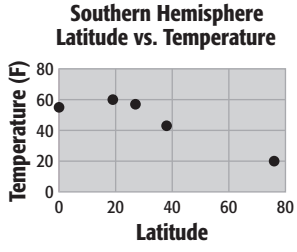
8. Positive correlation; As the number of students increases, the number of buses increases.

9. Average temperature and rainfall amounts may not be related. Therefore, there seems to be no correlation between the data sets.
Possible answer: No correlation

10. Positive correlation; the greater the latitude, the more snow expected.

11. The number of hours of daylight and the amount of rainfall in a day is not related. Therefore, there seems to be no correlation between the data sets.
Possible answer: No correlation

12. As latitude increases, temperature decreases.



13. Negative correlation; The lower the temperature, the more snow the location receives.

14. B; The data shows a positive correlation; as the years increase, the prize money increases.

15. Possible answer: The amount of time a student studies for a test and the grade the student receives.

16. 95% of 80 = 0.95 · 80 = 76

17. 120% of 63 = 1.2 · 63 = 75.6

18. 62% of 14 = 0.62 · 14 = 8.7

19. 7% of 50 = 0.07 · 50 = 3.5

20. 15% of $499 = 0.15 · 499 = 74.85
499 − 74.85 = 424.15
The sale price is $424.15.

TECHNOLOGY LAB 7-9, PAGES 420-421

Activity 1

Think and Discuss

1. Possible answer: The scatter plot shows that as the height increases, the length of the foot increases. Therefore, there is a positive correlation between the data sets.

2. Possible answer: As height increases, age increases and length of forearm increases. There is no relationship between height and month of birth.

Try This

1. Answers will vary. It is expected that the variables for height and length of foot will show a positive correlation, there is no negative correlation, and that the variables for height and month of birth will show no correlation.

Activity 2

Think and Discuss

1. Answers will vary. The more data points you have, the easier it is to draw a line that is close to most of the data.

2. A sample from one class would most likely be representative of the students in a grade, if the students are placed in classes randomly.

Try This

1. **a.** Check students' work
b. Check students' work.
Possible answer: This sample is a convenience sample. The means will vary, because a 3-student sample is not as accurate as a 30-student sample.
c. Check students' work.
Possible answer: The mean height of 15 students is closer to the mean height of the entire population than the mean height of three students is. This is because 15 students is a larger sample of the population.

7-10, PAGES 423-425

Think and Discuss

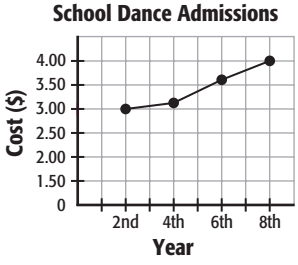
1. Possible answer: Check that the scale starts at zero, check for a broken axis, and check that the intervals are equal.

2. Possible answer: If a graph has very dramatic differences, it is a good idea to check the data closely to make sure that the graph does not distort the actual information.

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3. Possible answer: If a reporter has a bias toward a particular point of view, he or she might use a misleading graph to sway the opinion of the reader.

Exercises

1. Graph A; The broken graph exaggerates the differences in lengths.
2. The vertical axis is broken, so differences in weight appear greater.
3. The vertical axis does not begin with zero, so differences in sales appear greater.
4. Graph B; It suggests a greater change between months.
5. The scale of the graph changes, so differences in sales appear less than they actually are.
6. The horizontal axis is broken, so differences in numbers of species appear less than they actually are.
7. The graphs do not use the same scale, so it looks as though September had fewer sales than October, which is not true; redraw the graphs using the same scale.
8. The first graph exaggerates the differences in length of the trail within the three states.
9. Possible answer: three quarters, four dimes, and four pennies
10. Possible answer: The graph may seem to support a claim that the data really do not support.
11. Possible answer: The statement ignores the majority, those who prefer brand Purely White.
12. C; The vertical scale is not small enough.
13. 

14. $\frac{3}{5}x = \frac{1}{5}$

$\frac{3}{5}x \cdot \frac{5}{3} = \frac{1}{5} \cdot \frac{5}{3}$

$x = \frac{5}{15}$, or $\frac{1}{3}$

15. $x + \frac{2}{3} - \frac{2}{3} = \frac{5}{6} - \frac{2}{3}$

$x = \frac{5}{6} - \frac{4}{6}$

$x = \frac{1}{6}$

16. $-\frac{1}{8}x = \frac{3}{4}$

$-\frac{1}{8}x \cdot -\frac{8}{1} = \frac{3}{4} \cdot -\frac{8}{1}$

$x = -\frac{24}{4}$, or -6

17. $x - \frac{3}{8} = -\frac{5}{6}$

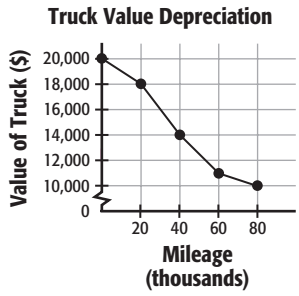
$x - \frac{3}{8} + \frac{3}{8} = -\frac{5}{6} + \frac{3}{8}$

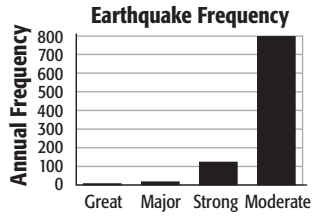
$x = -\frac{20}{24} + \frac{9}{24}$

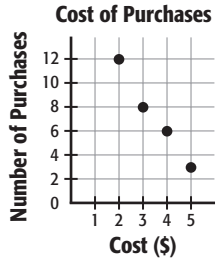
$x = -\frac{11}{24}$

18. no correlation
19. negative correlation

READY TO GO ON? PAGE 426

1. 

2. Use the graph you drew for number 1. To estimate the value of a truck when it has 12,000 miles, find the point on the line between 0 and 20 thousand that corresponds to 12,000. Find the corresponding value on the vertical axis. The graph shows less than $19,000.
3. Bar graph
4. 

5. Biased; It may not be likely that families with grown children or no children would attend an amusement park with their immediate families.
6. Not biased; The sample is random.
7. The claim is likely to be true; The data shows that about 1,875 fish are in the quarry.
8. 

9. Negative correlation
10. The graph with the vertical axis showing an interval of 0 to 20; Besides the break not being indicated on the vertical axis, the scale makes the change in sales over time appear to be much greater than it actually is.

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MULTI-STEP TEST PREP, PAGE 427

1. Mean: $40; median $1; mode: $1; range: $4,999

2.

Number of Envelopes	Amount of Money
1	$10,000
2	$500
4	$100
12	$20
6	$10
25	$4
100	$2

3. Mean: $80; median $2; mode: $2; range: $9,998

4.

Number of Envelopes	Amount of Money
2	$5,000
4	$250
8	$50
24	$10
12	$5
50	$2
200	$1

5. Mean: $40; median $1; mode: $1; range: $4,999

STUDY GUIDE: REVIEW, PAGES 430-432

1. population; sample

2. mean

3.

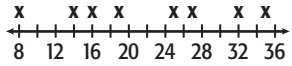
	Frequency	Cumulative Frequency
0–9	1	1
10–19	3	4
20–29	3	7
30–39	2	9

4.

Stems	Leaves
0	8
1	4 6 9
2	5 7 9
3	2 5

Key: 1\|4 means 14

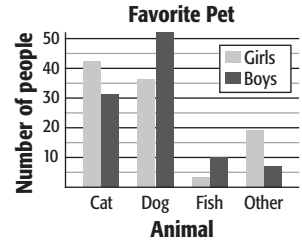
5.



6. Mean: 324 + 233 + 324 + 399 + 233 + 299 = 1812 ÷ 6 = 302
Median: 233, 233, 299, 324, 324, 399
(299 + 324) ÷ 2 = 311.5
Mode: 233 and 324
Range: 399 − 233 = 166

7. Mean: 48 + 39 + 27 + 52 + 45 + 47 + 49 + 37 = 344 ÷ 8 = 43
Median: 27, 37, 39, **45**, **47**, 48, 49, 52
(45 + 47) ÷ 2 = 46
Mode: none
Range: 25

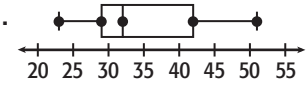
8.



9. yellow

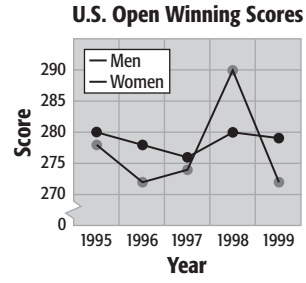
10. 35 people

11.



12. 13

13.

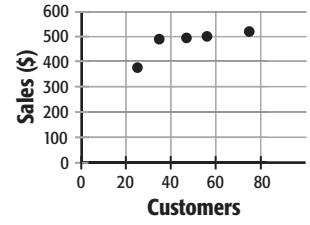


14. line graph

15. bar graph

16. 2,500 is a reasonable estimate based on the data.

17. Positive correlation



18. Because the vertical axis is broken, it appears that there was a big change in temperature from day to day. The temperature changed very little.

CHAPTER TEST, PAGE 433

1. Mean: 22.2; median: 22.5; mode: 12; range: 26

2. The outlier would increase the mean.

3.

	Frequency	Cumulative Frequency
10–19	4	4
20–29	4	8
30–39	2	10

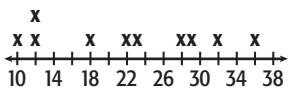
4.

Stem	Leaves
1	0 2 2 8
2	2 3 8 9
3	2 6

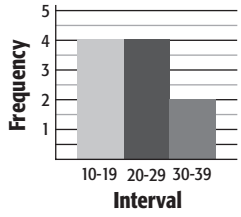
Key: 3\|2 means 32

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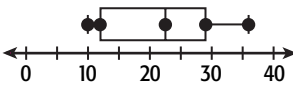
5.



6.

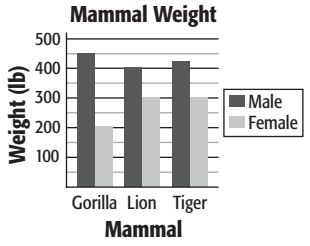


7.



8. 18.5

9.

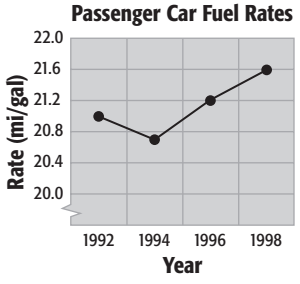


10. gorilla

11. 25%

12. No; about $\frac{1}{3}$ of the school is grade 8, and $\frac{1}{3}$ of 1,200 is 400.

13. 1992-1994



14. 21.4 miles per gallon

15. bar graph

16. no correlation

17. positive correlation

18. Part of the vertical scale is missing, making the values appear to differ greatly.

TEST TACKLER, PAGES 434-435

1. 0-point response; The information in the answer is incorrect.

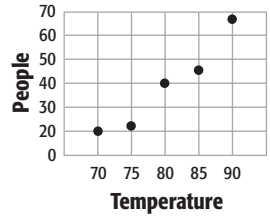
2. Possible answer: The range of data shows that the shortest student is 54 inches tall and the tallest is 68 inches tall. Fifty-eight inches is the median height of all of the students surveyed.

3. 1-point response. An explanation for why the graph was chosen is missing.

4. Possible answer: I would use a bar graph or histogram to show how many of each car model was sold during the month because a bar graph would be useful for comparing data for each kind of car sold.

5. 1-point response. The scatter plot is missing.

6.



There is a positive correlation between the temperature and the number of people at the pool because as it gets hotter, more people want to go swimming.

7. 1-point response. No explanation was given about which group saw the most movies.

8. The 14–26 age group saw the most movies.

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