Name _____ Date _____ Class _____

# Additional Practice

Another peanut butter survey was conducted more recently than the survey you studied in Investigation 1. The data for natural and regular brands are presented in the table.

## Peanut Butter Comparisons

| Brand | Quality Rating | Sodium per Serving (mg) | Price per Serving | Regular/ Natural | Creamy/ Chunky | Name Brand/ Store Brand |
|---|---|---|---|---|---|---|
| Arrowhead Mills | 85 | 0 | 36 | natural | creamy | name |
| Laura Scudder's (Southeast) | 79 | 165 | 25 | natural | creamy | name |
| Adams (West) | 73 | 173 | 23 | natural | creamy | name |
| Smucker's | 73 | 180 | 26 | natural | creamy | name |
| Nature's Cupboard (Safeway) | 68 | 240 | 26 | natural | creamy | store |
| Laura Scudder's Nutty (Southeast) | 84 | 165 | 26 | natural | chunky | name |
| Arrowhead Mills | 83 | 0 | 37 | natural | chunky | name |
| Smucker's | 79 | 180 | 26 | natural | chunky | name |
| Adams (West) | 75 | 135 | 23 | natural | chunky | name |
| Nature's Cupboard (Safeway) | 72 | 195 | 26 | natural | chunky | store |
| Jif | 85 | 225 | 19 | regular | creamy | name |
| Simply Jif | 85 | 98 | 19 | regular | creamy | name |
| Peter Pan | 82 | 225 | 17 | regular | creamy | name |
| Skippy | 82 | 225 | 18 | regular | creamy | name |
| Kroger | 79 | 195 | 15 | regular | creamy | store |
| Skippy Roasted Honey Nut | 79 | 180 | 19 | regular | creamy | name |
| America's Choice | 77 | 225 | 17 | regular | creamy | store |
| Reese's | 68 | 173 | 19 | regular | creamy | name |
| Townhouse (Safeway) | 68 | 240 | 18 | regular | creamy | store |
| Peter Pan Very Low Sodium | 57 | 15 | 18 | regular | creamy | name |
| Peter Pan Whipped | 49 | 173 | 17 | regular | creamy | name |
| Jif Extra Crunchy | 88 | 195 | 19 | regular | chunky | name |
| Skippy Super Chunk | 87 | 210 | 19 | regular | chunky | name |
| Peter Pan Extra Crunchy | 86 | 180 | 17 | regular | chunky | name |
| Reese's | 86 | 120 | 19 | regular | chunky | name |
| Skippy Roasted Honey Nut | 86 | 180 | 19 | regular | chunky | name |
| Kroger | 84 | 195 | 15 | regular | chunky | store |
| Simply Jif Extra Crunchy | 83 | 75 | 19 | regular | chunky | name |
| America's Choice Krunchy | 80 | 188 | 17 | regular | chunky | store |
| Townhouse (Safeway) | 72 | 195 | 18 | regular | chunky | store |

Source: "Peanut Butter: It's Not Just for Kids Anymore." *Consumer Reports* (September 1995): pp. 576–579.
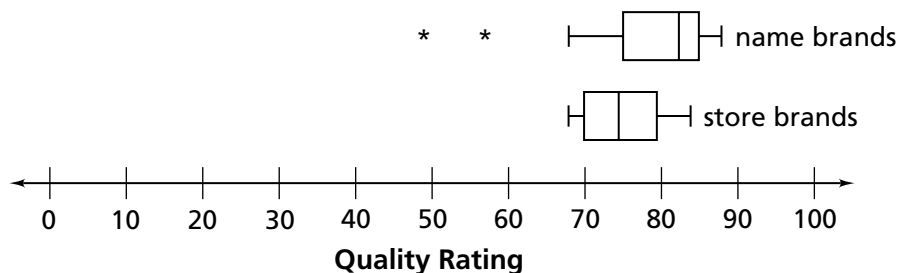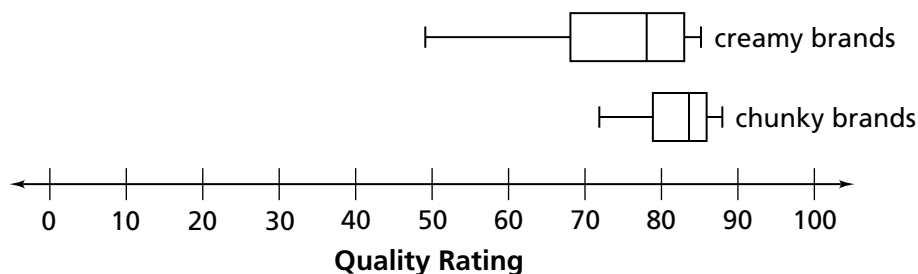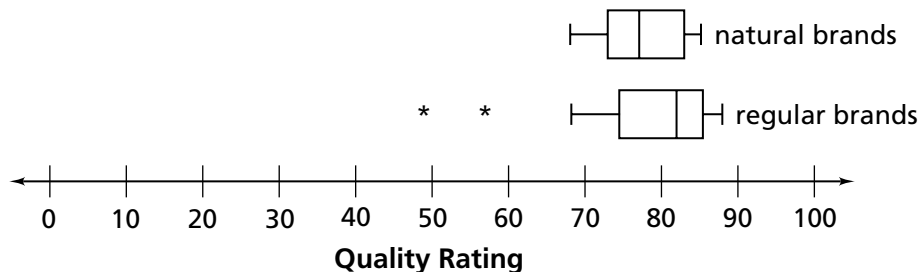
# Additional Practice *(continued)*

**1.** The box plots below show the quality ratings of natural versus regular brands, creamy versus chunky brands, and name brands versus store brands. Based on these box plots, what characteristics would you look for if you wanted to choose a peanut butter based on quality rating? Explain your reasoning.
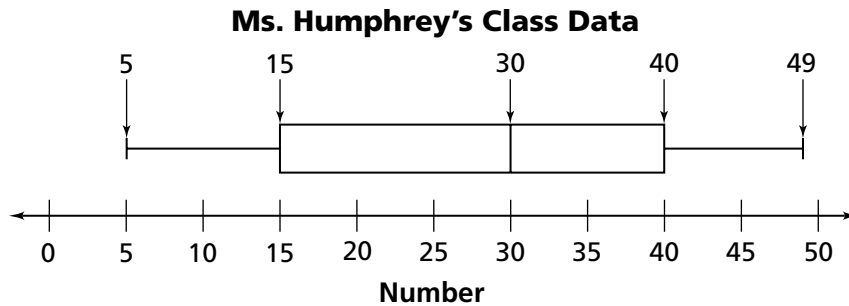
**Quality Comparisons**

natural brands

*   *   regular brands

0   10   20   30   40   50   60   70   80   90   100
**Quality Rating**

creamy brands

chunky brands

0   10   20   30   40   50   60   70   80   90   100
**Quality Rating**

*   *   name brands

store brands

0   10   20   30   40   50   60   70   80   90   100
**Quality Rating**

**2.** Make box plots to compare the peanut butters based on price. Mark any outliers with an asterisk (*). Which characteristic(s) help identify low-price peanut butters? Explain your reasoning.

## Additional Practice *(continued)*

**Ms. Humphrey asked each of the 21 students in her class to choose a number between 1 and 50. Ms. Humphrey recorded the data and made this box plot:**

**Ms. Humphrey's Class Data**

```
    5        15           30        40        49

        0   5   10  15  20  25  30  35  40  45  50
                        Number
```

**3.** What is the median number that was chosen?

**4.** What percent of students in Ms. Humphrey's class chose numbers above 15?
Explain your reasoning.

**5.** About how many students chose numbers between 30 and 40? Explain.

**6.** What were the least and the greatest numbers chosen?

**7.** Is it possible to determine from the box plot whether one of the students
chose the number 27? Explain.

**8.** Is it possible to determine from the box plot whether one of the students
chose the number 4? Explain.

# Additional Practice *(continued)*

**For Exercises 9–12, refer to the table on the next page.**

**9.** Finish computing the values for the fifth column.

**10.** What does it mean when the ratio of wingspan to body length is 1? Greater than 1? Less than 1?

**11.** Compute the five-number summary for jet planes and the five-number summary for propeller planes of the ratio of wingspan to body length. Explain what the medians tell you about the relationship between wingspan and body length for jet planes and for propeller planes.

**12.** Make box plots from your five-number summaries. Explain what your plots reveal about how jet planes and propeller planes compare based on ratio of wingspan to body length.

# Additional Practice *(continued)*

**Airplane Data**

| Plane | Engine Type | Body Length (m) | Wingspan (m) | Wingspan-to-Length Ratio |
|---|---|---|---|---|
| Boeing 707 | jet | 46.6 | 44.4 | 0.953 |
| Boeing 747 | jet | 70.7 | 59.6 | 0.843 |
| Ilyushin IL-86 | jet | 59.5 | 48.1 | |
| McDonnell Douglas DC-8 | jet | 57.1 | 45.2 | |
| Antonov An-124 | jet | 69.1 | 73.3 | |
| British Aerospace 146 | jet | 28.6 | 26.3 | |
| Lockheed C-5 Galaxy | jet | 75.5 | 67.9 | |
| Antonov An-225 | jet | 84.0 | 88.4 | |
| Airbus A300 | jet | 54.1 | 44.9 | |
| Airbus A310 | jet | 46.0 | 43.9 | |
| Airbus A320 | jet | 37.5 | 33.9 | |
| Boeing 737 | jet | 33.4 | 28.9 | |
| Boeing 757 | jet | 47.3 | 38.1 | |
| Boeing 767 | jet | 48.5 | 47.6 | |
| Lockheed Tristar L-1011 | jet | 54.2 | 47.3 | |
| McDonnell Douglas DC-10 | jet | 55.5 | 50.4 | |
| Aero/Boeing Spacelines Guppy | propeller | 43.8 | 47.6 | |
| Douglas DC-4 C-54 Skymaster | propeller | 28.6 | 35.8 | |
| Douglas DC-6 | propeller | 32.2 | 35.8 | |
| Lockheed L-188 Electra | propeller | 31.8 | 30.2 | |
| Vickers Viscount | propeller | 26.1 | 28.6 | |
| Antonov An-12 | propeller | 33.1 | 38.0 | |
| de Havilland DHC Dash-7 | propeller | 24.5 | 28.4 | |
| Lockheed C-130 Hercules/L-100 | propeller | 34.4 | 40.4 | |
| British Aerospace 748/ATP | propeller | 26.0 | 30.6 | |
| Convair 240 | propeller | 24.1 | 32.1 | |
| Curtiss C-46 Commando | propeller | 23.3 | 32.9 | |
| Douglas DC-3 | propeller | 19.7 | 29.0 | |
| Grumman Gulfstream I/I-C | propeller | 19.4 | 23.9 | |
| Ilyushin IL-14 | propeller | 22.3 | 31.7 | |
| Martin 4-0-4 | propeller | 22.8 | 28.4 | |
| Saab 340 | propeller | 19.7 | 21.4 | |

Source: William Berk and Frank Berk. *Airport Airplanes.* Plymouth, Mich.: Plymouth Press, 1993.

# Skill: Histograms

**1.** Would the data below be better displayed on a histogram with 3-minute intervals or 5-minute intervals? Explain.

| Time to Walk to School | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Time (min.)** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| **Tally** | | | II | IIII | III | IIII | I | II | | | I | I | | | I |

**2.** Make a histogram for the time it takes the group of students in Exercise 1 to walk to school.

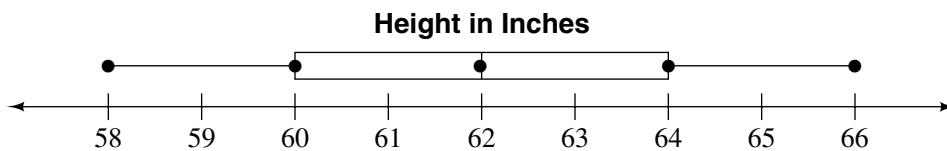**3.** Make a histogram for the data. Use the intervals in the table.

**Hours Spent Doing Homework**

| Number of Hours | Frequency |
|---|---|
| 1 – 1.75 | 1 |
| 2 – 2.75 | 1 |
| 3 – 3.75 | 2 |
| 4 – 4.75 | 6 |
| 5 – 5.75 | 8 |
| 6 – 6.75 | 3 |
| 7 – 7.75 | 2 |
| 8 – 8.75 | 1 |

# Skill: Box-and-Whisker Plots

**Use the box-and-whisker plot to find each value.**

**Height in Inches**

58  59  60  61  62  63  64  65  66

**1.** the median height

**2.** the lower quartile

**3.** the upper quartile

**4.** the greatest height

**5.** the shortest height

**6.** the range of heights

# Skill: Box-and-Whisker Plots *(continued)*

**Make a box-and-whisker plot for each set of data.**

**7.**

| Cargo Airlines in the U.S. (1991) | |
|---|---|
| **Airline** | **Freight ton-miles (1,000,000s)** |
| Federal Express | 3,622 |
| Northwest | 1,684 |
| United | 1,214 |
| American | 884 |
| Delta | 668 |
| Continental | 564 |
| Pan American | 377 |
| Trans World | 369 |
| United Parcel Service | 210 |

**8.**

| Immigration to the U.S. (1981–1990) | |
|---|---|
| **Country** | **Number (1,000s)** |
| Mexico | 1,656 |
| Philippines | 549 |
| China | 347 |
| Korea | 334 |
| Vietnam | 281 |
| Dominican Republic | 252 |
| India | 251 |
| El Salvador | 214 |
| Jamaica | 208 |
| United Kingdom | 159 |

**Use box-and-whisker plots to compare data sets. Use a single number line for each comparison.**

**9.** 1st set:  7 12 25 3 1 29 30 7 15 2 5
10 29 1 10 30 18 8 7 29

2nd set:  37 17 14 43 27 19 32 1 8 48
26 16 28 6 25 18

0  5  10  15  20  25  30  35  40  45  50

1st Set

2nd Set
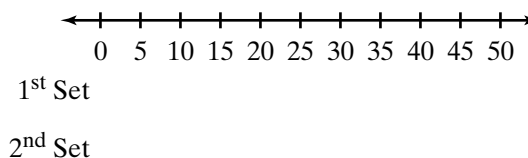
# Additional Practice

**Aaron wants to learn about how much time students at his school spend playing sports. He asks all the boys on the basketball team and all the girls on the volleyball team to estimate how many hours per week they spend playing sports.**

1. Is Aaron's sample a voluntary-response sample, a systematic sample, or a convenience sample? Explain your reasoning.

2. Suppose Aaron asked all the students in his mathematics class to estimate how many hours per week they spend playing sports.

   a. Would this be a voluntary-response sample, a systematic sample, or a convenience sample? Explain your reasoning.

   b. Would you expect the median number of hours spent playing sports for students in Aaron's mathematics class to be higher or lower than his sample from the basketball and volleyball teams? Explain your reasoning.

3. There are 1,232 students enrolled at Aaron's school. The principal's office has an alphabetical list of all the students' names. Suppose Aaron asked every 20th student on the list to estimate the number of hours he or she spends playing sports each week. Would this be a voluntary-response sample, a systematic sample, or a convenience sample? Explain.

4. Aaron placed an ad in the school newspaper with a form for students to complete and return. The form asked how much time the students spent playing sports each week. Aaron received 53 responses. Is this a voluntary-response sample, a systematic sample, or a convenience sample? Explain.

# Additional Practice (continued)

**For Exercises 5–7, use this information: Marci works on the yearbook staff at Metropolis Middle School. Of the 92 businesses in the downtown area, 41 purchased advertising space in the yearbook last year.**

**5.** Suppose Marci wants to investigate why businesses did not advertise in the yearbook last year. Describe a sampling strategy she could use to call 10 businesses.

**6.** Suppose Marci wants to investigate how satisfied advertisers are with yearbook ads. Describe a sampling strategy she could use to call 10 businesses.

**7.** Suppose Marci wants to investigate how likely a typical downtown business is to advertise in the upcoming yearbook. Describe a sampling strategy she could use to call 10 businesses.

**8.** The principal of a nearby school, Megalopolis Middle School, decided to conduct a survey of the 1,107 enrolled students. She asked three teachers how many students they thought should be surveyed. One teacher said to survey 200 girls and 100 boys, the second said to randomly select and survey 50 students, and the third said to survey the first 100 students to enter the building one morning next week.

  **a.** Explain which of the three samples will produce data that may best represent all the students at Megalopolis.

  **b.** Explain why you feel that the other two samples would not be as representative of all the students as the one you chose in part a.

# Additional Practice (continued)

In a survey of the cafeteria food at a middle school, 50 students were asked to rate how well they liked the lunches on a scale of 1 to 10, with 1 being the lowest rating and 10 being the highest rating. The box plot below was made from the collected data.

**Cafeteria Food Survey**
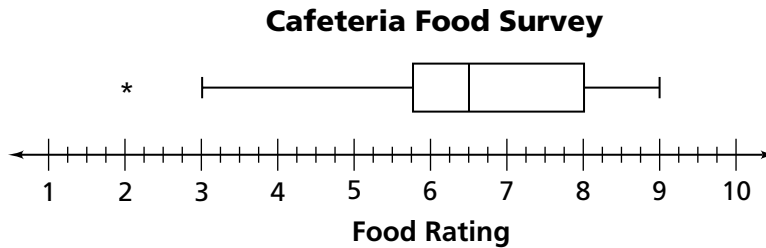


**Food Rating**

9. What is the range of students' ratings in the sample?

10. What percent of the students in the sample rated the cafeteria food between 5.75 and 9?

11. Based on the sample data, how many of the 1,000 students at the school do you estimate would rate the cafeteria food 6 or higher? Explain your reasoning.

12. A rating of 8 to 10 indicates "highly satisfied" on the rating scale.
    a. What percent of students in the sample are "highly satisfied" with the cafeteria food?

    b. Estimate how many students at the middle school would give the cafeteria food a "highly satisfied" rating.

# Skill: Random Samples

**You want to survey students in your school about their exercise habits. Tell whether Exercises 1–2 are likely to give a random sample of the population. Explain.**

**1.** You select every tenth student on an alphabetical list of the students in your school. You survey the selected students in their first-period classes.

**2.** At lunchtime you stand by a vending machine. You survey every student who buys something from the vending machine.

**In a mall, 2,146 shoppers (age 16 and older) were asked, "How often do you eat at a restaurant in the mall?" Here is how they responded.**

**3.** What population does the sample represent?
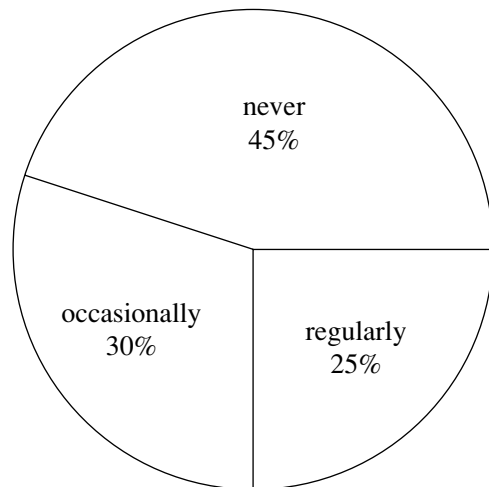
**4.** How many people responded in each of the categories?

**5.** What is the sample size?

**6.** Can you tell if the sample is random?

never
45%

occasionally
30%

regularly
25%

Name _____ Date _____ Class _____

# Additional Practice

1. A group of students surveyed several pizza shops in two parts of the United States. They asked about prices and sizes of small, medium, and large cheese pizzas, and they made box plots from the data they collected.

   a. These box plots show the prices for each size pizza, including outliers. Which size appears to be the least expensive? Explain your reasoning.
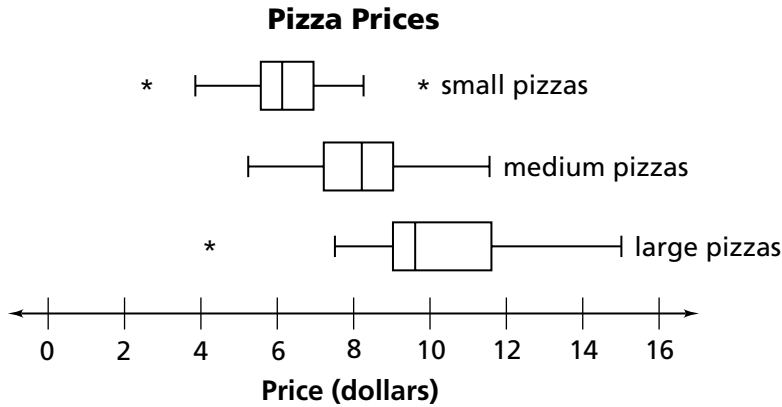
   **Pizza Prices**

   

   b. One of the small pizzas had a diameter of 8 inches and a price of $3.87. Its price per square inch is $0.077. How was this calculated?

## Additional Practice (continued)

**c.** These box plots show the price per square inch of pizza for each size.
Which size appears to be the best buy? Explain.

### Pizza Prices per Square Inch



**Price per Square Inch (dollars)**
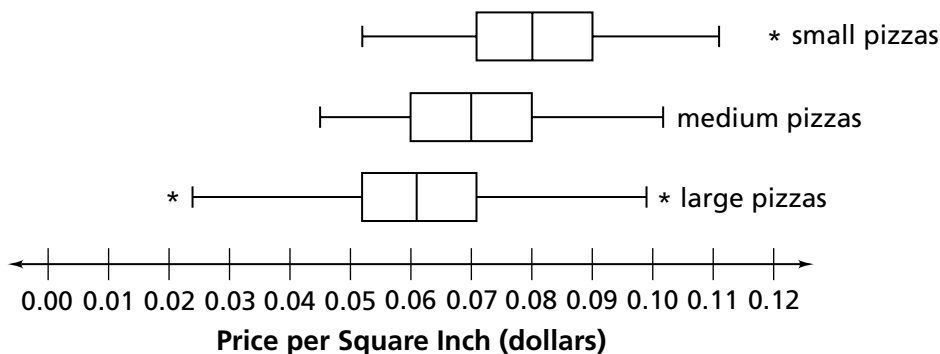
**d.** Consider your responses to parts (a) and (c). Which set of box plots better
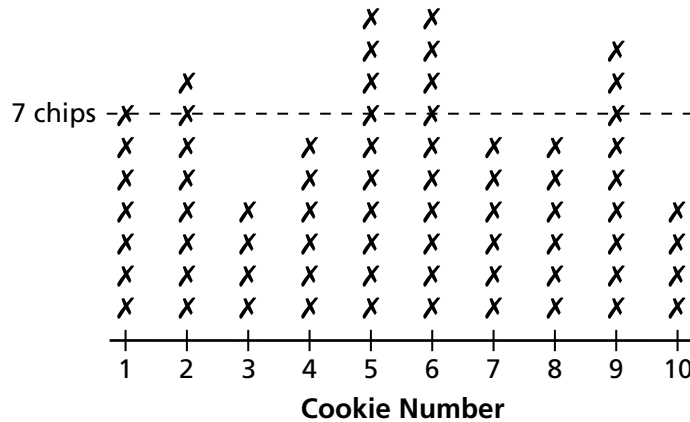reflects the actual price of a pizza? Explain.

# Additional Practice *(continued)*

**2.** Suppose Jeff and Ted decide to change their advertising slogan to "Seven giant chips in every cookie!" They mix 70 chips into a batch of dough and make 10 cookies from the dough. When they remove the cookies from the oven and inspect them, they count the number of chips in each cookie. Their results are shown below. Notice that only 5 of the 10 cookies contained 7 chips or more.

**Chips in a Batch of 10 Cookies**

```
                              X   X
                              X   X                   X
                          X   X   X                   X
  7 chips  -X - -X- - - - - - X - -X - - - - - - - - X - - -
           X   X       X   X   X   X   X   X
           X   X       X   X   X   X   X   X
           X   X   X   X   X   X   X   X   X   X
           X   X   X   X   X   X   X   X   X   X
           X   X   X   X   X   X   X   X   X   X
           X   X   X   X   X   X   X   X   X   X
          -+---+---+---+---+---+---+---+---+---+-
           1   2   3   4   5   6   7   8   9   10
                      Cookie Number
```

**a.** Conduct a simulation to determine the number of chips needed to be added to a batch of 10 cookies until each cookie has at least 7 chips. Carry out the simulation five times so that you have five data values for the number of chips needed.

**b.** What is the minimum number of chips Jeff and Ted should use to be confident that each cookie will have at least 7 chips? Support your answer with statistics and graphs.

# Additional Practice (continued)

**3.** After testing many samples, an egg shipper determined that approximately 3 in every 100 cartons of eggs will contain at least one cracked egg. The company ships 200,000 cartons of eggs every month. Estimate how many cartons of eggs each month will contain at least one cracked egg.

**4.** From a shipment of 500 batteries, a sample of 25 was selected at random and tested. If 2 batteries in the sample were found to be dead, how many dead batteries would be expected in the entire shipment?

# Skill: Simulation

**A soccer player scores a goal on about 1 out of every 6 shots.**

**1.** Explain how you could use a number cube to simulate the player's scoring average.

**2.** Use your simulation to find the probability of the player making 4 out of 5 of her next attempts.

# Additional Practice

Use the tables below, which display the results of a study of 47 half-ounce boxes
of two brands of raisins.

### Vine Hill Raisins

| Number in Box | Mass (grams) | Number in Box | Mass (grams) |
|---|---|---|---|
| 29 | 14.78 | 38 | 16.3 |
| 35 | 16.59 | 38 | 16.85 |
| 35 | 16.01 | 38 | 17.33 |
| 35 | 16.55 | 38 | 17.57 |
| 36 | 16.99 | 40 | 16.2 |
| 38 | 16.34 | 40 | 16.78 |
| 38 | 16.3 | 40 | 17.35 |
| 39 | 17.83 | 41 | 17.43 |
| 39 | 16.66 | 41 | 16.64 |
| 39 | 18.36 | 41 | 16.62 |
| 39 | 16.93 | 31 | 14.7 |
| 40 | 16.25 | 34 | 16.04 |
| 40 | 17.92 | 35 | 16.81 |
| 40 | 17.12 | 36 | 16.86 |
| 40 | 17.37 | 36 | 16.75 |
| 42 | 16.95 | 36 | 17.18 |
| 42 | 17.45 | 36 | 15.77 |
| 44 | 18.48 | 36 | 16.28 |
| 35 | 15.64 | 37 | 16.25 |
| 36 | 16.88 | 37 | 17.42 |
| 36 | 16.36 | 37 | 16.25 |
| 36 | 16.3 | 37 | 15.63 |
| 37 | 17.25 | 37 | 17.74 |
| 37 | 15.61 | | |

### Suntime Raisins

| Number in Box | Mass (grams) | Number in Box | Mass (grams) |
|---|---|---|---|
| 25 | 14.15 | 31 | 16.13 |
| 26 | 16.74 | 31 | 16.6 |
| 27 | 15.42 | 32 | 16.6 |
| 27 | 16.74 | 33 | 16.55 |
| 27 | 15.98 | 33 | 17.11 |
| 28 | 17.43 | 34 | 16.88 |
| 28 | 16.44 | 34 | 18.1 |
| 28 | 16.55 | 35 | 17.63 |
| 28 | 15.55 | 35 | 17.32 |
| 28 | 15.33 | 26 | 15.34 |
| 29 | 16.75 | 28 | 14.11 |
| 29 | 16.19 | 29 | 16.94 |
| 29 | 16.36 | 29 | 15.16 |
| 29 | 17.1 | 29 | 15.75 |
| 29 | 16.58 | 29 | 15.65 |
| 30 | 16.36 | 30 | 16.5 |
| 30 | 16.29 | 31 | 15.83 |
| 31 | 15.9 | 31 | 17.17 |
| 29 | 16.18 | 32 | 16.6 |
| 29 | 15.91 | 32 | 16.59 |
| 30 | 16.66 | 32 | 16.38 |
| 31 | 15.73 | 33 | 17.11 |
| 31 | 16.38 | 34 | 17.24 |
| 31 | 16.92 | | |

# Additional Practice *(continued)*

**1.** The two scatter plots below show the data from the tables. Which scatter plot shows the data for Suntime raisins? Which shows the data for Vine Hill raisins? Explain your reasoning.

**Scatter Plot A**

**Scatter Plot B**
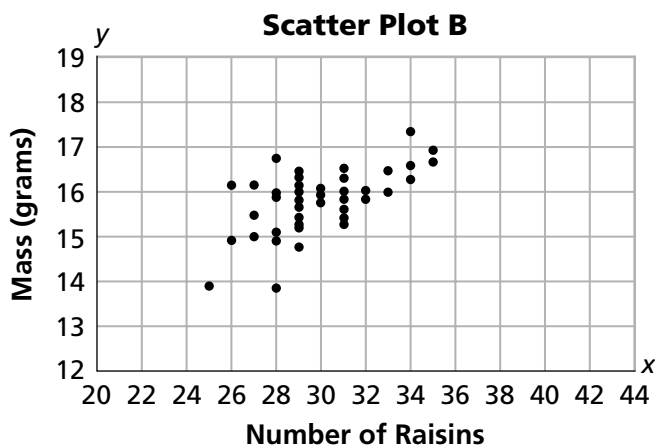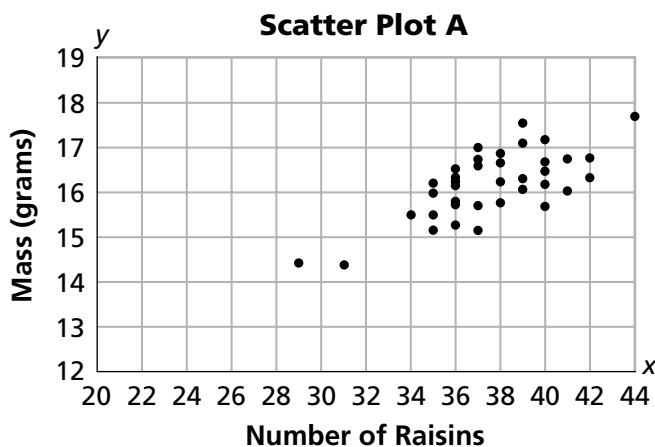
**2.** Is this statement true or false: "Vine Hill raisins typically have more raisins in a box than do Suntime raisins." Explain your reasoning using the two graphs.

**3.** Is there a relationship between the number of raisins in a box and the mass in grams? Explain.

# Additional Practice *(continued)*

**For Exercises 4–6, use the data below.**

## Chicken Sandwiches From Restaurant Chains

| Size (oz) | Calories | Fat (g) | Carbohydrates (g) |
|-----------|----------|---------|-------------------|
| 8 | 360 | 7 | 44 |
| 10 | 370 | 8 | 53 |
| 8 | 380 | 4 | 57 |
| 9 | 400 | 5 | 57 |
| 8 | 400 | 16 | 37 |
| 8 | 470 | 20 | 51 |
| 8 | 470 | 20 | 46 |
| 10 | 500 | 24 | 52 |
| 8 | 510 | 19 | 57 |
| 10 | 540 | 30 | 42 |
| 9 | 550 | 23 | 55 |
| 10 | 550 | 30 | 46 |
| 10 | 570 | 25 | 48 |
| 12 | 580 | 19 | 58 |
| 11 | 640 | 29 | 61 |
| 13 | 660 | 29 | 56 |
| 12 | 720 | 30 | 65 |
| 13 | 740 | 30 | 78 |
| 12 | 910 | 40 | 86 |
| 15 | 950 | 56 | 76 |

**4. a.** Make a scatterplot for size vs. calories.

# Additional Practice *(continued)*

**b.** Describe any relationship you see between the size of the sandwich and calories. Explain your reasoning.

**5. a.** Make a scatterplot for size of sandwich vs. fat.

**b.** What is the relationship between sandwich size and fat content? Explain.

**6. a.** Make a scatterplot for size vs. carbohydrates.

**b.** What is the relationship between size of a sandwich and the carbohydrates? Explain.

# Additional Practice *(continued)*

**7. a.** Make a scatterplot of the data below for price vs. weight.

### Bike Comparisons

| Type of Bike | Price | Weight (lb) |
|---|---|---|
| Front Suspension Mountain Bike | $450 | 29.5 |
| Front Suspension Mountain Bike | $440 | 29.5 |
| Front Suspension Mountain Bike | $440 | 30.5 |
| Front Suspension Mountain Bike | $450 | 31.5 |
| Front Suspension Mountain Bike | $440 | 31.0 |
| Front Suspension Mountain Bike | $500 | 30.5 |
| Front Suspension Mountain Bike | $500 | 31.5 |
| Front Suspension Mountain Bike | $400 | 32.0 |
| Comfort Bike | $300 | 33.0 |
| Comfort Bike | $300 | 32.5 |
| Comfort Bike | $300 | 35.5 |
| Comfort Bike | $300 | 32.0 |
| Comfort Bike | $280 | 31.5 |
| Comfort Bike | $290 | 33.0 |
| Comfort Bike | $285 | 33.5 |
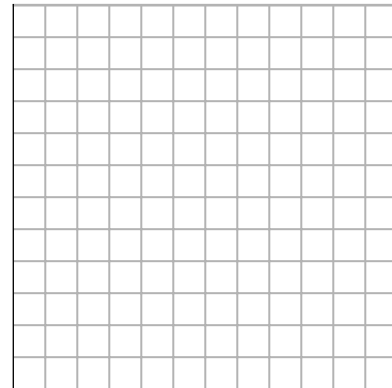
**b.** Is there a strong or weak relationship between the weight of a bike and the price for the bike? Explain your reasoning.

**c.** If you pay more, are likely to get a heavier or lighter bike?

Name _____ Date _____ Class _____

# Skill: Scatter Plots

**1.** Make a scatter plot showing the number of homeowners on one axis and
vacation homeowners on the other axis. If there is a trend, draw a trend line.

| Residents of Maintown | | |
|---|---|---|
| Year | Homeowners | Vacation Homeowners |
| 1997–98 | 2,050 | 973 |
| 1996–97 | 1,987 | 967 |
| 1995–96 | 1,948 | 1,041 |
| 1994–95 | 1,897 | 1,043 |
| 1993–94 | 1,862 | 1,125 |
| 1992–93 | 1,832 | 1,126 |
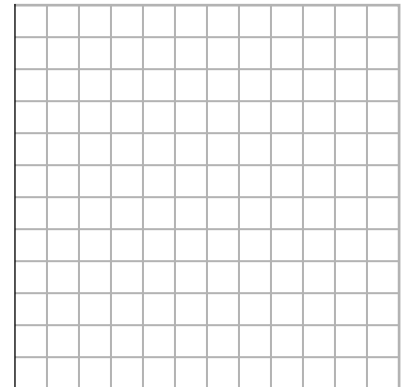
**2.** Make a scatter plot for the data. If there is a trend, draw a trend line.

| Arm Span vs. Height | | |
|---|---|---|
| Person # | Arm Span | Height |
| 1 | 156 | 162 |
| 2 | 157 | 160 |
| 3 | 159 | 162 |
| 4 | 160 | 155 |
| 5 | 161 | 160 |
| 6 | 161 | 162 |
| 7 | 162 | 170 |
| 8 | 165 | 166 |
| 9 | 170 | 170 |
| 10 | 170 | 167 |
| 11 | 173 | 185 |
| 12 | 173 | 176 |
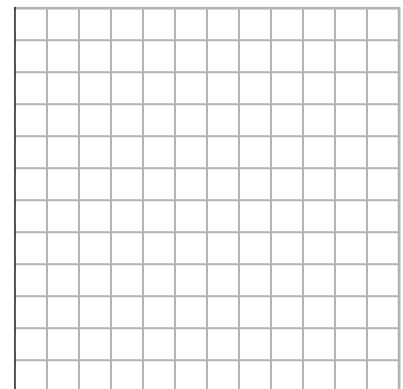
# Skill: Scatter Plots *(continued)*

**Samples and Populations**

**Decide whether the data in each scatter plot follow a linear pattern. If they do, find the equation of a trend line.**

**3.**



**4.**



**5.**