## Exercises

**P.7 Cool car colors** Here are data on the most popular car colors for vehicles made in North America during the 2003 model year.[8]

| Color | Percent of vehicles |
|---|---|
| Silver | 20.1 |
| White | 18.4 |
| Black | 11.6 |
| Medium/dark gray | 11.5 |
| Light brown | 8.8 |
| Medium/dark blue | 8.5 |
| Medium red | 6.9 |

(a) Display these data in a bar graph. Be sure to label your axes and title your graph.

(b) Describe what you see in a few sentences. What percent of vehicles had other colors?

**P.8 Comparing car colors** Favorite vehicle colors may differ among types of vehicle. Here are data on the most popular colors in 2003 for luxury cars and SUVs, trucks, and vans. The entry "—" means "less than 1%."

| Color | Luxury car percent | SUV/truck/van percent |
|---|---|---|
| Black | 10.9 | 11.6 |
| Light brown | — | 6.3 |
| Medium/dark blue | 3.8 | 9.3 |
| Medium/dark gray | 23.3 | 8.8 |
| Medium/dark green | — | 7.0 |
| Medium red | 3.9 | 6.2 |
| White | 30.4 | 22.3 |
| Silver | 18.8 | 17.0 |

(a) Make a side-by-side bar graph to compare colors by vehicle type.

(b) Write a few sentences describing what you see.

**P.9 U.S. women's soccer scores** In Example P.7 (page 16), we examined the number of goals scored by the U.S. women's soccer team in games during the 2004 season. Here are data on the goal differential for those same games, computed as U.S. score minus opponent's score.

3 0 2 7 8 2 4 1 4 1 −2 3 4 3 0 1 2 2 3 2 0
1 1 1 1 3 5 6 1 4 5 0 −2 5

(a) Make a dotplot of these data.

(b) Describe what you see in a few sentences.

**P.10 Olympic gold!** Olympic athletes like Michael Phelps, Natalie Coughlin, Amanda Beard, and Paul Hamm captured public attention by winning gold medals in the 2004 (a)

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## Answers to Exercises P.7–P.12

**P.7** (a) See the *Teacher's Solutions Manual* for graph.
(b) Consumers seem to prefer lighter colors (silver and white) to darker colors. Silver seems to be the most popular color. The percent of vehicles with other colors is 14.2.

**P.8** (a) See the *Teacher's Solutions Manual* for graph.
(b) White was the most popular color for these two types of cars. The medium/dark colors were much less popular, with one exception. Medium/dark gray was a popular color for luxury cars.

**P.9** (a) See the *Teacher's Solutions Manual* for graph.
(b) The dotplot is centered around 2 with a long right tail. Only two of the 34 differentials are negative. The team scored at least as many goals as their opponents in 32 of 34 games.

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**P.10** (a) See the *Teacher's Solutions Manual* for graph. The overall distribution is skewed to the right with a mode of 0, which indicates that many countries did not win any gold medals. The United States had 35 gold medals, which is clearly unusual.

(b) Yes. It makes sense that the distribution is skewed to the right. Most countries win no medals or very few medals and a few countries win a lot of medals.

**P.11** *Who?* The individuals are the AP Statistics students who completed a questionnaire on the first day of class.

*What?* The categorical variables are gender, handedness, and favorite type of music. The quantitative variables are height (in inches), amount of time the student is expecting to spend on homework (in minutes per week), and the total value of coins in a student's pocket (in cents).

*Why?* The data were collected for the teacher to learn more about her/his students and to provide an interesting data set for the students to analyze.

*When, where, how,* and by *whom?* A teacher collected these data using a questionnaire on the first day of class at a high school.



Summer Olympic Games in Athens, Greece. Table P.1 displays the total number of gold medals won by a sample of countries in the 2004 Summer Olympics.

**Table P.1** *Gold medals won by selected countries in the 2004 Summer Olympics*

| Country | Gold medals | Country | Gold medals |
|---|---|---|---|
| Sri Lanka | 0 | Netherlands | 4 |
| Qatar | 0 | India | 0 |
| Vietnam | 0 | Georgia | 2 |
| Great Britain | 9 | Kyrgyzstan | 0 |
| Norway | 5 | Costa Rica | 0 |
| Romania | 8 | Brazil | 4 |
| Switzerland | 1 | Uzbekistan | 2 |
| Armenia | 0 | Thailand | 3 |
| Kuwait | 0 | Denmark | 2 |
| Bahamas | 0 | Latvia | 0 |
| Kenya | 1 | Czech Republic | 1 |
| Trinidad and Tobago | 0 | Hungary | 8 |
| Greece | 6 | Sweden | 4 |
| Mozambique | 0 | Uruguay | 0 |
| Kazakhstan | 1 | United States | 35 |

**Source:** BBC Olympics Web site. news.bbc.co.uk/sport1/hi/olympics_2004.

Make a dotplot to display these data. Describe the distribution of number of gold medals won.

(b) Overall, 202 countries participated in the 2004 Summer Olympics, of which 57 won at least one gold medal. Do you believe that the sample of countries listed in the table is representative of this larger population? Why or why not?

**P.11 A class survey** Here is a small part of the data set that describes the students in an AP Statistics class. The data come from anonymous responses to a questionnaire on the first day of class.

| | A | B | C | D | E | F |
|---|---|---|---|---|---|---|
| 1 | GENDER | HAND | HEIGHT | HOMEWORK TIME | MUSIC | COINS IN POCKET |
| 2 | F | L | 65 | 200 | RAP | 50 |
| 3 | M | L | 72 | 30 | COUNTRY | 35 |
| 4 | M | R | 62 | 95 | ROCK | 35 |
| 5 | F | L | 64 | 120 | R&B | 0 |
| 6 | M | R | 63 | 220 | CLASSICAL | 0 |
| 7 | F | R | 58 | 60 | ROCK | 76 |
| 8 | F | R | 67 | 150 | TOP 40 | 215 |
| 9 | | | | | | |

Sheet1 Sheet2 Sheet3

Answer the key questions (who, what, why, when, where, how, and by whom) for these data. For each variable, tell whether it is categorical or quantitative. Try to identify the units of measurement for any quantitative variables.

**P.12 Medical study variables** Data from a medical study contain values of many variables for each of the people who were the subjects of the study. Which of the following variables are categorical and which are quantitative?

(a) Gender (female or male)
(b) Age (years)
(c) Race (Asian, black, white, or other)
(d) Smoker (yes or no)
(e) Systolic blood pressure (millimeters of mercury)
(f) Level of calcium in the blood (micrograms per milliliter)

## Probability: What Are the Chances?

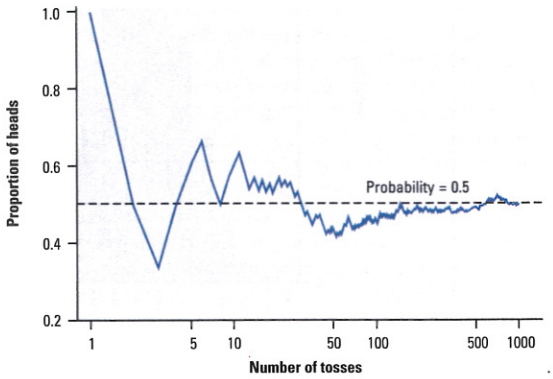
Consider tossing a single coin. The result is a matter of chance. It can't be predicted in advance, because the result will vary if you toss the coin repeatedly. But there is still a regular pattern in the results, a pattern that becomes clear only after many tosses. This remarkable fact is the basis for the idea of ***probability.***

*probability*

**Example P.9** *Coin tossing*
Probability: what happens in the long run

When you toss a coin, there are only two possible outcomes, heads or tails. Figure P.5 shows the results of tossing a coin 1000 times. For each number of tosses from 1 to 1000, we have plotted the proportion of those tosses that gave a head. The first toss was a head, so the proportion of heads starts at 1. The second toss was a tail, reducing the proportion

**Figure P.5** *The behavior of the proportion of coin tosses that give a head, from 1 to 1000 tosses of a coin. In the long run, the proportion of heads approaches 0.5, the probability of a head.*

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**P.12** *Categorical:* Gender (a), Race (c), Smoker (d).
*Quantitative:* Age (b), Systolic blood pressure (e), Level of calcium in the blood (f).

### ◆ AP Tip

This section refers to Section III of the AP Course Description: *Anticipating Patterns: Exploring random phenomena using probability and simulation.*

The study of *random variables*, which includes the study of ***probability,*** provides the mathematical basis through which we can use results from data to make inferences about populations.

### ✎ Teaching Tip

Emphasize the key concept in the introductory paragraph of this section: chance behavior, while not predictable in the short run, *is* predictable in the long run.