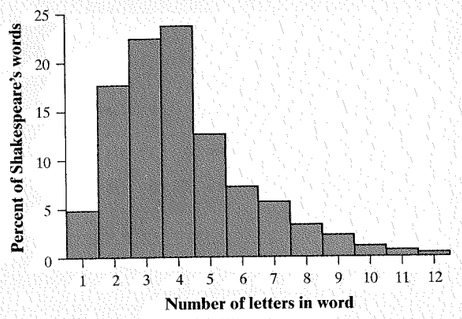
52. **Shakespeare** The histogram below shows the distribution of lengths of words used in Shakespeare's plays.[29] Describe the shape, center, and spread of this distribution.




53. **Traveling to work** How long do people travel each day to get to work? The following table gives the average travel times to work (in minutes) for workers in each state and the District of Columbia who are at least 16 years old and don't work at home.[30]

| | | | | | |
|---|---|---|---|---|---|
| AL | 23.6 | LA | 25.1 | OH | 22.1 |
| AK | 17.7 | ME | 22.3 | OK | 20.0 |
| AZ | 25.0 | MD | 30.6 | OR | 21.8 |
| AR | 20.7 | MA | 26.6 | PA | 25.0 |
| CA | 26.8 | MI | 23.4 | RI | 22.3 |
| CO | 23.9 | MN | 22.0 | SC | 22.9 |
| CT | 24.1 | MS | 24.0 | SD | 15.9 |
| DE | 23.6 | MO | 22.9 | TN | 23.5 |
| FL | 25.9 | MT | 17.6 | TX | 24.6 |
| GA | 27.3 | NE | 17.7 | UT | 20.8 |
| HI | 25.5 | NV | 24.2 | VT | 21.2 |
| ID | 20.1 | NH | 24.6 | VA | 26.9 |
| IL | 27.9 | NJ | 29.1 | WA | 25.2 |
| IN | 22.3 | NM | 20.9 | WV | 25.6 |
| IA | 18.2 | NY | 30.9 | WI | 20.8 |
| KS | 18.5 | NC | 23.4 | WY | 17.9 |
| KY | 22.4 | ND | 15.5 | DC | 29.2 |

(a) Make a histogram of the travel times using classes of width 2 minutes, starting at 14 minutes. That is, the first class is 14 to 16 minutes, the second is 16 to 18 minutes, and so on.

(b) The shape of the distribution is a bit irregular. Is it closer to symmetric or skewed? Describe the center and spread of the distribution. Are there any outliers?

($CO_2$), which contributes to global warming. The table below displays $CO_2$ emissions per person from countries with populations of at least 20 million.[31]

(a) Make a histogram of the data using classes of width 2, starting at 0.

(b) Describe the shape, center, and spread of the distribution. Which countries are outliers?

**Carbon dioxide emissions (metric tons per person)**

| Country | $CO_2$ | Country | $CO_2$ |
|---|---|---|---|
| Algeria | 2.6 | Mexico | 3.7 |
| Argentina | 3.6 | Morocco | 1.4 |
| Australia | 18.4 | Myanmar | 0.2 |
| Bangladesh | 0.3 | Nepal | 0.1 |
| Brazil | 1.8 | Nigeria | 0.4 |
| Canada | 17.0 | Pakistan | 0.8 |
| China | 3.9 | Peru | 1.0 |
| Colombia | 1.3 | Philippines | 0.9 |
| Congo | 0.2 | Poland | 7.8 |
| Egypt | 2.0 | Romania | 4.2 |
| Ethiopia | 0.1 | Russia | 10.8 |
| France | 6.2 | Saudi Arabia | 13.8 |
| Germany | 9.9 | South Africa | 7.0 |
| Ghana | 0.3 | Spain | 7.9 |
| India | 1.1 | Sudan | 0.3 |
| Indonesia | 1.6 | Tanzania | 0.1 |
| Iran | 6.0 | Thailand | 3.3 |
| Iraq | 2.9 | Turkey | 3.0 |
| Italy | 7.8 | Ukraine | 6.3 |
| Japan | 9.5 | United Kingdom | 8.8 |
| Kenya | 0.3 | United States | 19.6 |
| Korea, North | 3.3 | Uzbekistan | 4.2 |
| Korea, South | 9.3 | Venezuela | 5.4 |
| Malaysia | 5.5 | Vietnam | 1.0 |

55. **DRP test scores** There are many ways to measure the reading ability of children. One frequently used test is the Degree of Reading Power (DRP). In a research study on third-grade students, the DRP was administered to 44 students.[32] Their scores were:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 40 | 26 | 39 | 14 | 42 | 18 | 25 | 43 | 46 | 27 | 19 |
| 47 | 19 | 26 | 35 | 34 | 15 | 44 | 40 | 38 | 31 | 46 |
| 52 | 25 | 35 | 35 | 33 | 29 | 34 | 41 | 49 | 28 | 52 |
| 47 | 35 | 48 | 22 | 33 | 41 | 51 | 27 | 14 | 54 | 45 |



56. **Drive time** Professor Moore, who lives a few miles outside a college town, records the time he takes to drive to the college each morning. Here are the times (in minutes) for 42 consecutive weekdays:

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 8.25 | 7.83 | 8.30 | 8.42 | 8.50 | 8.67 | 8.17 | 9.00 | 9.00 | 8.17 | 7.92 |
| 9.00 | 8.50 | 9.00 | 7.75 | 7.92 | 8.00 | 8.08 | 8.42 | 8.75 | 8.08 | 9.75 |
| 8.33 | 7.83 | 7.92 | 8.58 | 7.83 | 8.42 | 7.75 | 7.42 | 6.75 | 7.42 | 8.50 |
| 8.67 | 10.17 | 8.75 | 8.58 | 8.67 | 9.17 | 9.08 | 8.83 | 8.67 | | |

Make a histogram to display the data. Write a paragraph describing the distribution of Professor Moore's drive times.

57. **The statistics of writing style** Numerical data can distinguish different types of writing and, sometimes, even individual authors. Here are data on the percent of words of 1 to 15 letters used in articles in *Popular Science* magazine:[33]

| Length: | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Percent: | 3.6 | 14.8 | 18.7 | 16.0 | 12.5 | 8.2 | 8.1 | 5.9 | 4.4 | 3.6 | 2.1 | 0.9 | 0.6 | 0.4 | 0.2 |

(a) Make a histogram of this distribution. Describe its shape, center, and spread.

(b) How does the distribution of lengths of words used in *Popular Science* compare with the similar distribution for Shakespeare's plays in Exercise 52? Look in particular at short words (2, 3, and 4 letters) and very long words (more than 10 letters).

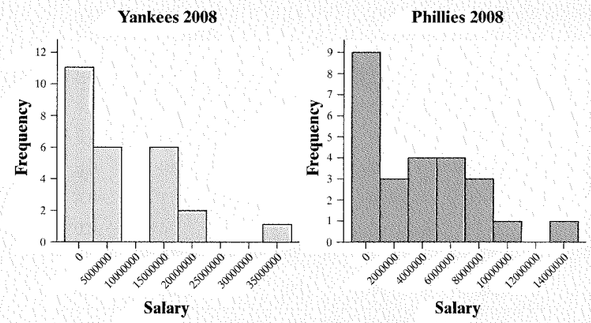
58. **Chest out, Soldier!** In 1846, a published paper provided chest measurements (in inches) of 5738 Scottish militiamen. The table below summarizes the data.[34]

| Chest size | Count | Chest size | Count |
|---|---|---|---|
| 33 | 3 | 41 | 934 |
| 34 | 18 | 42 | 658 |
| 35 | 81 | 43 | 370 |
| 36 | 185 | 44 | 92 |
| 37 | 420 | 45 | 50 |
| 38 | 749 | 46 | 21 |
| 39 | 1073 | 47 | 4 |
| 40 | 1079 | 48 | 1 |

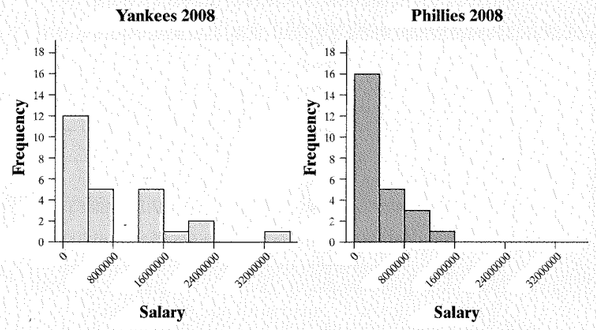
(a) Make a histogram of this distribution.

(b) Describe the shape, center, and spread of the chest measurements distribution. Why might this information be useful?

59. **Paying for championships** Does paying high salaries lead to more victories in professional sports? The New York Yankees have long been known for having Major League Baseball's highest team payroll. And Philadelphia Phillies won the World Series. Maybe the Yankees didn't spend enough money that year. The graph below shows histograms of the salary distributions for the two teams during the 2008 season. Why can't you use this graph to effectively compare the team payrolls?




60. **Paying for championships** Refer to Exercise 59. Here is another graph of the 2008 salary distributions for the Yankees and the Phillies. Write a few sentences comparing these two distributions.




61. **Birth months** Imagine asking a random sample of 60 students from your school about their birth months. Draw a plausible graph of the distribution of birth months. Should you use a bar graph or a histogram to display the data?

62. **Die rolls** Imagine rolling a fair, six-sided die 60 times. Draw a plausible graph of the distribution of die rolls. Should you use a bar graph or a histogram to display the data?

63. **Who makes more?** A manufacturing company is reviewing the salaries of its full-time employees below the executive level at a large plant. The clerical staff is almost entirely female, while a majority of the production workers and technical staff is male. As a result, the distributions of salaries for male and female employees may be quite different. The following