

EXTENSION

Dot Plots and Distributions

A **dot plot** is a data representation that uses a number line and x's, dots, or other symbols to show frequency. Dot plots are sometimes called line plots.

EXAMPLE 1 Making a Dot Plot

Objectives

Create dot plots.

Use a dot plot to describe the shape of a data distribution.

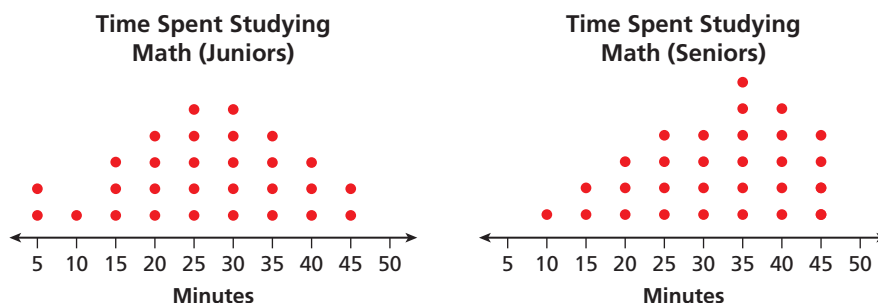
Vocabulary

dot plot
uniform distribution
symmetric distribution
skewed distribution

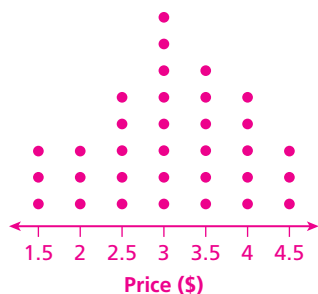
Mrs. Montoya asked her junior and senior students how many minutes each of them spent studying math in one day, rounded to the nearest five minutes. The results are shown below. Make a dot plot showing the data for juniors and a dot plot showing the data for seniors.

Time Spent Studying Math (min)	Frequency (Juniors)	Frequency (Seniors)
5	2	0
10	1	1
15	3	2
20	4	3
25	5	4
30	5	4
35	4	6
40	3	5
45	2	4

Find the least and greatest values in each data set. Then use these values to draw a number line for each graph. For each student, place a dot above the number line for the number of minutes he or she spent studying.



1. Cafeteria Sales



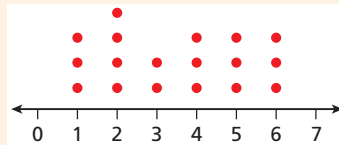
- The cafeteria offers items at six different prices. John counted how many items were sold at each price for one week. Make a dot plot of the data.

Price (\$)	1.50	2.00	2.50	3.00	3.50	4.00	4.50
Items	3	3	5	8	6	5	3

A dot plot gives a visual representation of the distribution, or “shape”, of the data. The dot plots in Example 1 have different shapes because the data sets are distributed differently.

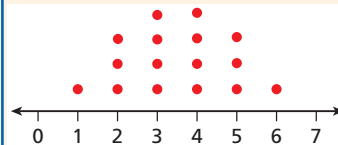
Types of Distributions

UNIFORM DISTRIBUTION



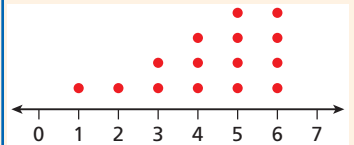
In a **uniform distribution**, all data points have an approximately equal frequency.

SYMMETRIC DISTRIBUTION



In a **symmetric distribution**, a vertical line can be drawn and the result is a graph divided in two parts that are approximate mirror images of each other.

SKEWEED DISTRIBUTION



In a **skewed distribution**, the data is not uniform or symmetric. The data may be skewed to the right or skewed to the left.

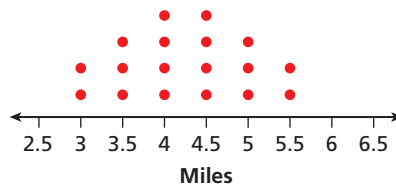
EXAMPLE 2 Shapes of Data Distributions

The data table shows the number of miles run by members of two track teams during one day. Make a dot plot and determine the type of distribution for each team. Explain what the distribution means for each.

Miles	3	3.5	4	4.5	5	5.5	6
Team A	2	3	4	4	3	2	0
Team B	1	2	2	3	4	6	5

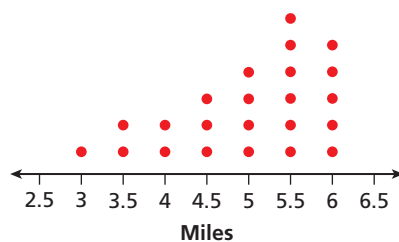
Make dot plots of the data.

Team A



The data for team A show a symmetric distribution. The distances run are evenly distributed about the mean.

Team B



The data for team B show a skewed right distribution. Most team members ran a distance greater than the mean.

2. Uniform; all team members ran about the same distance.



2. Data for team C members are shown below. Make a dot plot and determine the type of distribution. Explain what the distribution means.

Miles	3	3.5	4	4.5	5	5.5	6
Team C	3	2	2	2	3	2	2

Exercises

1. **Biology** Michael is collecting data for the growth of plants after one week. He planted nine seeds for each of three different types of plants and recorded his data in the table below.

Growth of Plants (in.)		
Type A	Type B	Type C
0.9	2.1	1.9
0.9	2.2	2.0
1.0	2.2	2.0
1.0	2.2	2.1
1.1	2.3	2.1
1.2	2.3	2.1
1.2	2.4	2.2
1.3	2.5	2.2
1.4	2.6	2.3

- Create a dot plot for each type of plant.
- Describe the distributions.
- Which data value(s) occur(s) the most often in each dot plot? the least often?
- For each dot plot, list the heights in order from least frequent to most frequent.

2. **Nutrition** Julia researched grape juice brands to determine how many grams of sugar each brand contained per serving (8 fluid ounces = 1 serving). The data she collected is shown in the table.

Grams of Sugar in Grape Juice (per serving)					
15	0	36	18	30	10
30	15	35	30	36	30
36	30	38	16	35	16



© Ocean/Corbis

- Identify any outlier(s) in the data set. **0**
- Make a dot plot for the data with the outlier(s) and a dot plot for the data without the outlier(s).
- Describe the distribution of the data with and without the outlier(s).
- How does excluding the outlier(s) affect the mean, median, and mode of the data set? **Mean increases by ≈ 1.5 ; median and mode are unchanged.**

3. The frequency table shows the number of siblings of each student in a class. Use the table to make a dot plot of the data, and describe the distribution.

Number of Siblings	Frequency
0	7
1	9
2	5
3	1
4	1

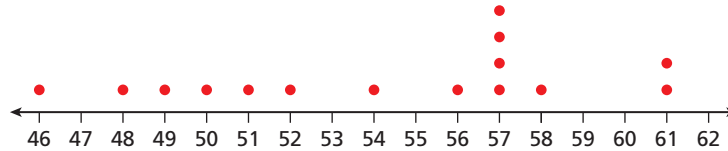
2.C. Skewed right with or without the outlier

4. **School** The list below shows which grade each member of a high school marching band belongs to.

9, 12, 9, 10, 9, 12, 9, 9, 11, 12, 12, 10, 10, 9, 9, 11, 9, 10,
10, 12, 9, 12, 11, 9, 12, 11, 10, 9, 12, 12, 9, 9, 11, 12

- Make a dot plot of the data.
- Explain how you can use the dot plot to find the mean, median, and mode of the data set. Then find each of these values.

Use the dot plot for Exercises 5 and 6.



- Write About It** Compare stem-and-leaf plots and dot plots.
 - How are they similar and how are they different?
 - What information can you get from each graph?
 - Can you make a dot plot given a stem-and-leaf plot? Explain.
 - Can you make a stem-and-leaf plot given a dot plot? If so, make a stem-and-leaf plot of the data in the dot plot at right. If not, explain why not.



- Write About It** Compare histograms and dot plots.
 - How are they similar and how are they different?
 - What information can you get from each graph?
 - Can you make a dot plot given a histogram? Explain.
 - Can you make a histogram given a dot plot? If so, make a histogram of the data in the dot plot at right. If not, explain why not.



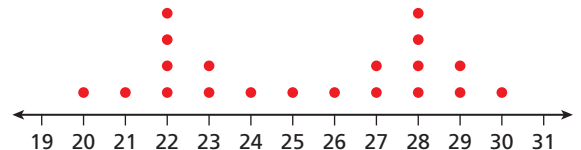
Biology



Even though identical twins share the same DNA, they are often of different heights. According to one study, the average height difference between identical twins is 1.7 cm.

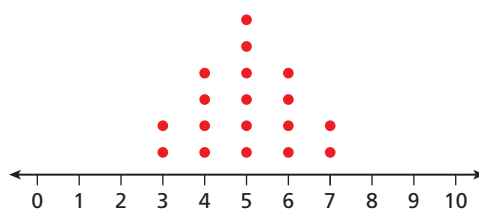
- Multi-Step** Gather data on the heights of people in your classroom. Separate the data for males from the data for females. Make two dot plots representing the data collected for each group. Compare the dot plots and the distributions of the data.

- The dot plot at right shows an example of a *bimodal distribution*. Why is this an appropriate name for this type of distribution?

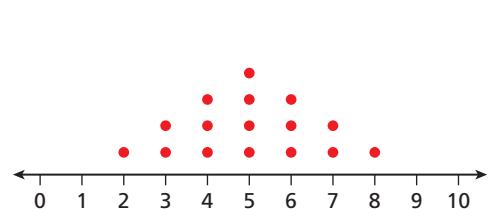


- Critical Thinking** Magdalene and Peter conducted the same experiment. Both of their data sets had the same mean. Both made dot plots of their data that showed symmetric distributions, but Peter's dot plot shows a greater range than Magdalene's dot plot. Identify which plot below belongs to Peter and which belongs to Magdalene. **A: Magdalene; B: Peter**

Dot Plot A



Dot Plot B





Use Technology to Make Graphs

You can use a spreadsheet program to create bar graphs, line graphs, and circle graphs. You can also use a graphing calculator to make a box-and-whisker plot.

Use with Data Distributions

Learn It Online
Lab Resources Online

Activity 1

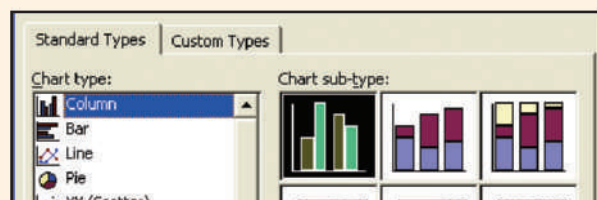
Many colors are used on the flags of the 50 United States. The table shows the number of flags that use each color. Use a spreadsheet program to make a bar graph to display the data.

Color	Black	Blue	Brown	Gold	Green	Purple	Red	White
Number	27	46	20	36	24	4	34	42

1 Enter the data from the table in the first two columns of the spreadsheet.

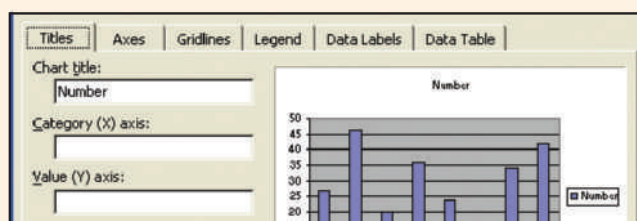
2 Select the cells containing the titles and the data.

Then click the Chart Wizard icon, . Click Column from the list on the left, and then choose the small picture of a vertical bar graph. Click Next.

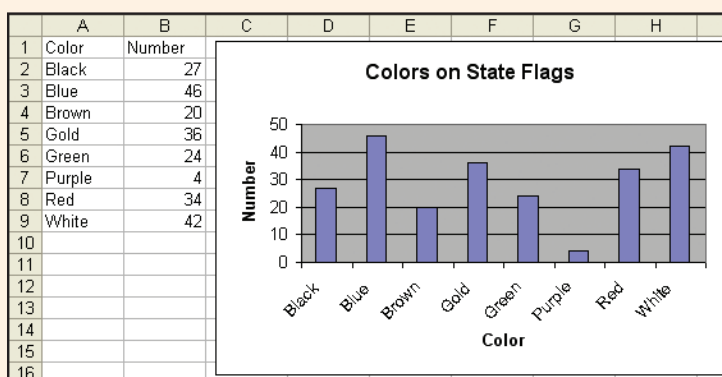


3 The next screen shows the range of cells used to make the graph. Click Next.

4 Give the chart a title and enter titles for the x -axis and y -axis. Click the Legend tab, and then click the box next to Show Legend to turn off the key. (A key is needed when making a double-bar graph.) Click Next.



5 Click Finish to place the chart in the spreadsheet.



Try This

- The table shows the average number of hours of sleep people at different ages get each night. Use a spreadsheet program to make a bar graph to display the data.

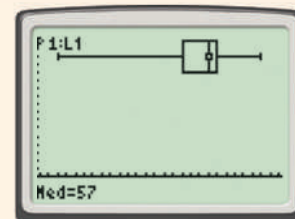
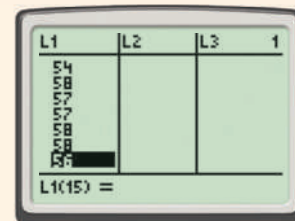
Age (yr)	3–9	10–13	14–18	19–30	31–45	46–50	51+
Sleep (h)	11	10	9	8	7.5	6	5.5

Activity 2

Adrienne is a waitress at a restaurant. The amounts Adrienne made in tips during her last 15 shifts are listed below. Use a graphing calculator to make a box-and-whisker plot to display the data. Give the minimum, first quartile, median, third quartile, and maximum values.

\$58, \$63, \$40, \$44, \$57, \$59, \$61, \$53, \$54, \$58, \$57, \$57, \$58, \$58, \$56

- To make a list of the data, press **STAT**, select **Edit**, and enter the values in List 1 (**L1**). Press **ENTER** after each value.
- To use the **STAT PLOT** editor to set up the box-and-whisker plot, press **2nd** **Y=**, and then **ENTER**.
Press **ENTER** to select **Plot 1**.
- Select **On**. Then use the arrow keys to choose the fifth type of graph, a box-and-whisker plot.
Xlist should be **L1** and **Freq** should be 1.
- Press **ZOOM** and select **9: ZoomStat** to see the graph in the statistics window.
- Use **TRACE** and the arrow keys to move the cursor along the graph to the five important values: minimum (**MinX**), first quartile (**Q1**), median (**MED**), third quartile (**Q3**), and maximum (**MaxX**).
minimum: 40
first quartile: 54
median: 57
third quartile: 58
maximum: 63



Try This

- The average length in inches of the ten longest bones in the human body are listed. Use a graphing calculator to make a box-and-whisker plot to display the data. What are the minimum, first quartile, median, third quartile, and maximum values of the data set?
19.88, 16.94, 15.94, 14.35, 11.10, 10.40, 9.45, 9.06, 7.28, 6.69