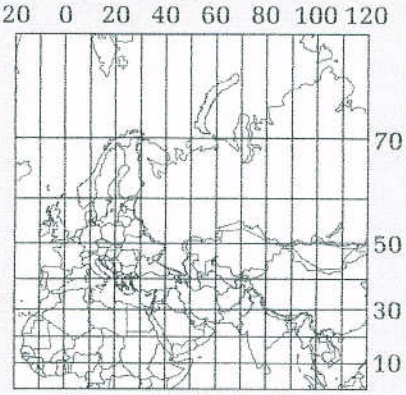
3-7 Analyzing Misleading Graphs

FOCUS

Recognize when graphs do not give an accurate picture of a data set.

For many years, Mercator projection maps were widely used. In a Mercator projection, the surface of the Earth is shown as a rectangle, with the meridians as parallel straight lines spaced at equal intervals. The lines of latitude are parallel lines intersecting the meridians at right angles, but spaced further apart as their distance from the equator increases. Areas on such maps become increasingly distorted, with land masses becoming elongated, toward the poles.



Mercator's Projection

UNDERSTANDING THE MAIN IDEAS

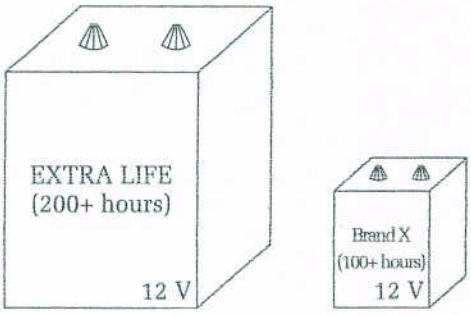
Analyzing graphs

There are a number of ways in which graphs can be distorted, either intentionally or unintentionally.

- They can be distorted by starting either the vertical or the horizontal scale at some point other than zero.
- They can be distorted by using intervals on the scales that are not evenly spaced.
- They can be distorted by using inappropriate area or volume models.
- They can be distorted by using percentages when actual quantities would be more appropriate, or vice versa.

Sample

Use the graph shown below.



EXTRA LIFE batteries last twice as long as ordinary batteries!

a. How do the number of hours of use claimed for the Extra Life battery compare with the number of hours claimed for the Brand X battery?

b. The length, width, and height of the "bar" for the Extra Life battery are each twice as great as the corresponding measure of the "bar" for the Brand X battery. How do the volumes of the two "bars" representing the batteries compare?

c. Why does the graph give a misleading impression of the comparative life span of the two brands of batteries?

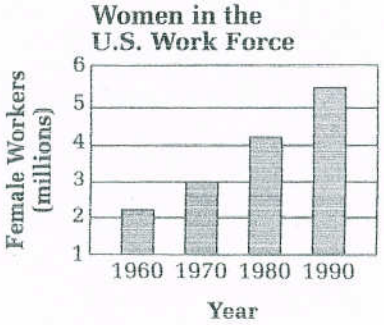
Sample Response

a. The number of hours for the Extra Life battery is twice the number of hours given for the Brand X battery.

b. Let l = the length of the Brand X "bar," let w = the width, and let h = the height. Then the length, width, and height of the Extra Life "bar" would be $2l$, $2w$, and $2h$, respectively. So the volume of the "bar" for the Brand X battery is lwh and the volume of the "bar" for the Extra Life battery is $(2l)(2w)(2h) = 8lwh$. Therefore, the volume of the "bar" for the Extra Life battery is 8 times the volume of the "bar" for the Brand X battery.

c. The graph is misleading because it gives the impression that the Extra Life battery will last 8 times as long, not twice as long, as the Brand X battery.

For Exercises 1–3, use the graphs below.



1. **a.** In the graph at the left, which bar is twice as long as the bar for 1960?
   b. In the graph at the right, which bar is twice as long as the bar for 1960?
   c. In which year was the number of women employed about twice as great as the number employed in 1960?
2. Which graph gives an accurate representation of the data? Why is the other graph misleading?
3. ***Writing*** Explain why proponents of governmental funding of day-care centers might choose the graph on the right to support their position for increased funding.
4. ***Open-ended*** Find an example, or make up an example of your own, of a graph that misleads in order to support a specific point of view.

Review PREVIEW

What type of graph is a good choice for displaying each data set? Why? *(Section 3-6)*

5. the heights of high jumps in a regional track and field meet
6. a person's daily caloric intake for a month
7. the ages of students enrolling in high school

Write each number in scientific notation. *(Section 2-3)*

8. 945,000 **9.** 6,400,000 **10.** 0.025 **11.** 0.00033

Plot each point on a coordinate plane. *(Toolbox Skill 21)*

12. (3, −2) **13.** (−3, 2) **14.** (0, −1) **15.** (−1, 0)