7.2 Exponential Patterns

- Recognize and describe an exponential pattern.
- Use an exponential pattern to predict a future event.
- Compare exponential and logistic growth.

Recognizing an Exponential Pattern

A sequence of numbers has an **exponential pattern** when each successive number increases (or decreases) by the same percent. Here are some examples of exponential patterns you have already studied in this text.

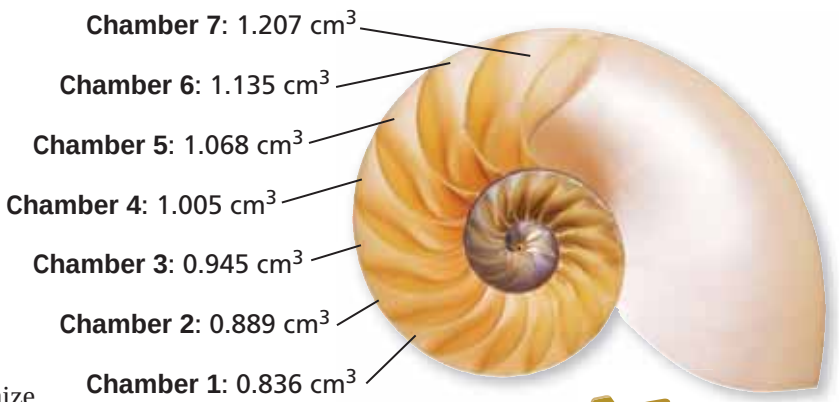
- Growth of a bacteria culture (Example 1, page 152)
- Growth of a mouse population during a mouse plague (Example 3, page 154)
- Decrease in the atmospheric pressure with increasing height (Example 2, page 175)
- Decrease in the amount of a drug in your bloodstream (Example 3, page 176)

Study Tip

Notice the difference between linear and exponential patterns. With linear patterns, successive numbers increase or decrease by the same *amount*. With exponential patterns, successive numbers increase or decrease by the same *percent*.

EXAMPLE 1 Recognizing an Exponential Pattern

Describe the pattern for the volumes of consecutive chambers in the shell of a chambered nautilus.



SOLUTION

It helps to organize the data in a table.

DATA

Chamber	1	2	3	4	5	6	7
Volume (cm^3)	0.836	0.889	0.945	1.005	1.068	1.135	1.207

Begin by checking the differences of consecutive volumes to conclude that the pattern is *not linear*. Then find the *ratios* of consecutive volumes.

$$\frac{0.889}{0.836} \approx 1.063 \qquad \frac{0.945}{0.889} \approx 1.063 \qquad \frac{1.005}{0.945} \approx 1.063$$

$$\frac{1.068}{1.005} \approx 1.063 \qquad \frac{1.135}{1.068} \approx 1.063 \qquad \frac{1.207}{1.135} \approx 1.063$$

The volume of each chamber is about 6.3% greater than the volume of the previous chamber. So, the pattern is exponential.

The exponential growth pattern of the chambers in a chambered nautilus was first recorded by the French philosopher René Descartes in 1638.

Checkpoint

Help at Math.andYOU.com

Use a spreadsheet to extend the pattern in Example 1 to 24 chambers. Then make a scatter plot of the data and describe the graph.