12 TAKS PREPARATION

TAKS Obj. 8
TEKS 8.10.B

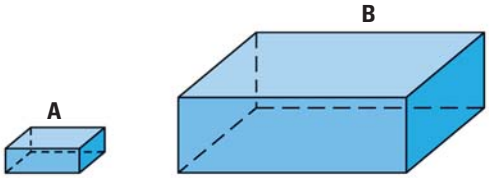
REVIEWING PROPORTIONAL CHANGE PROBLEMS INVOLVING SOLIDS

Some math problems require knowledge of how changing the dimensions of a three-dimensional solid proportionally affects the surface area and volume of the solid. Two solids with equal ratios of corresponding linear measures, such as heights or radii, are called *similar solids*. This common ratio is called the *scale factor* of one solid to the other solid. If two solids are similar with a scale factor of $a:b$, then the following is true:

- the ratio of the surface areas of the solids is $a^2:b^2$.
- the ratio of the volumes of the solids is $a^3:b^3$.

EXAMPLE

Solids A and B are similar rectangular prisms with a scale factor of 1 : 3. Find the volume of prism B given that the volume of prism A is 6 cubic feet.



Solution

STEP 1 **Write** the ratio of the volumes of the prisms. Because the scale factor of prism A to prism B is 1 : 3, the ratio of the volumes of the prisms is $1^3:3^3$, or 1 : 27.

STEP 2 **Calculate** the volume V of prism B by setting up and solving a proportion.

$$\frac{\text{Volume of A}}{\text{Volume of B}} = \frac{1}{27}$$ **Write proportion.**

$$\frac{6}{V} = \frac{1}{27}$$ **Substitute 6 for the volume of A.**

$$6 \cdot 27 = 1 \cdot V$$ **Cross products property**

$$162 = V$$ **Simplify.**

▶ The volume of prism B is 162 cubic feet.

CHECK Check your answer by calculating the ratio of the volumes using 162 for the volume of prism B.

$$\frac{\text{Volume of A}}{\text{Volume of B}} = \frac{6}{162} = \frac{1}{27} = \frac{1^3}{3^3}$$