# Similar Solids
SOL G.14 (2009)

Practice

If two solids are similar, then they have the same shape but not necessarily the same size. Solids are similar whenever the following conditions are met:

☑ The bases are the same shape.
☑ The corresponding sides are proportional. The common ratio for the corresponding sides is called the **scale factor**.

NOTE: All circles are similar and all spheres are similar.

Example 1: Determine whether or not the rectangular prisms are similar. If so, state the scale factor of the first figure to the second figure.

42 m
31.2 m
10.8 m

10.5 m
7.8 m
2.7 m
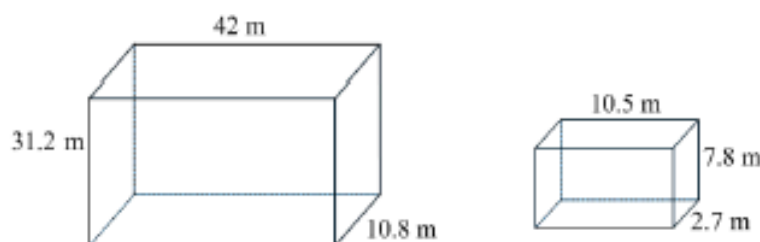
Lengths: $\dfrac{10.5}{31.2} = \dfrac{1}{4}$

Widths: $\dfrac{2.7}{10.8} = \dfrac{1}{4}$
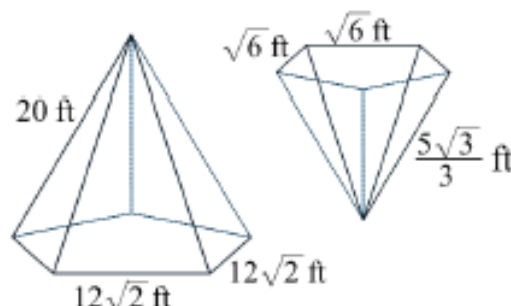
Heights: $\dfrac{7.8}{31.2} = \dfrac{1}{4}$

Similar; Scale Factor: $\dfrac{1}{4}$

1. Set up ratios for each dimension (length, width, and height). Since this second figure is smaller, ratios were set up so that the scale factor would be a number less than 1.
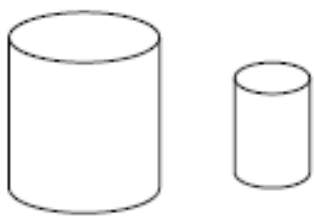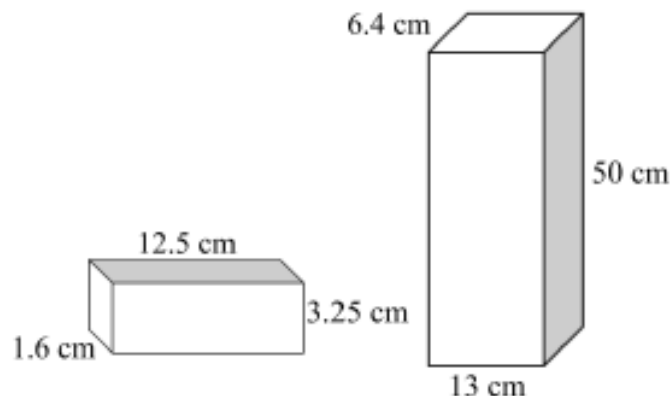2. These prisms are similar, because all dimensions share the same scale factor.

Determine whether or not each pair of solids is similar. If so, state the scale factor of the first figure to the second figure. Show *evidence* to support your answers!

1. Regular pentagonal pyramids

20 ft
$12\sqrt{2}$ ft

$\sqrt{6}$ ft $\sqrt{6}$ ft
$\dfrac{5\sqrt{3}}{3}$ ft
$12\sqrt{2}$ ft

2. Rectangular prisms

6.4 cm
50 cm
13 cm

12.5 cm
3.25 cm
1.6 cm

If the scale factor of two similar solids is $a : b$, then...	
The ratio of the perimeters of the bases is $a : b$.	
The ratio of the areas (base areas, lateral areas, and surface areas) is $a^2 : b^2$.	
The ratio of the volumes is $a^3 : b^3$.	

Example 2: Cone A is similar to Cone B with the volume of Cone A equal to 45Π. What is the volume of Cone B.

3.6 ft

9 ft
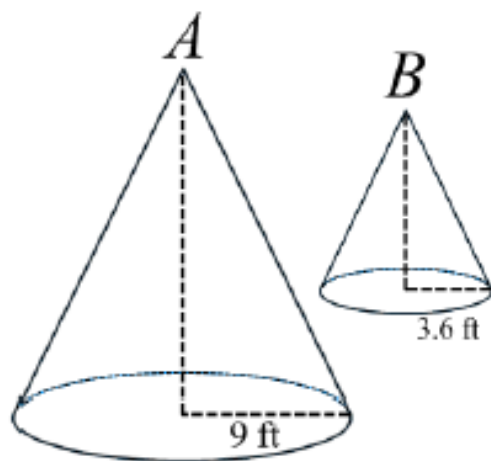
$$\frac{\text{Radius } A}{\text{Radius } B} = \frac{9}{3.6} = 2.5 = \frac{5}{2}$$

1. Find the scale ratio between the given radii.

Volume ratio: $\dfrac{5^3}{2^3} = \dfrac{125}{8}$

2. Cube the scale factor, because the ratio of the volumes of similar solids is $a^3 : b^3$.

$$\frac{125}{8} = \frac{45\pi}{b}$$
$$125b = 360\pi$$
$$b = \frac{360\pi}{125}$$
$$b = \frac{72\pi}{25} \text{ ft}^3$$

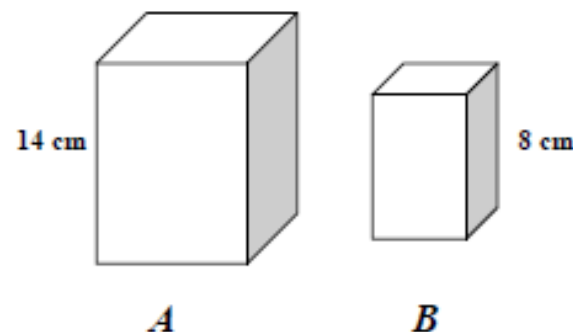3. Set up a proportion using the *cubed* scale factor as one ratio, and the known and unknown volumes as the second ratio.

4. Simplify and label.

3. Given: Prism A is similar to prism B with the surface area of prism A equal to 672 cm². Find the surface area of prism B.

14 cm   8 cm

A B

4. The oil drums shown below are similar cylinders. Find the surface area of the larger drum if the surface area of the smaller drum is 820π in³.

$V = 28,800\pi$ in³ $V = 3600\pi$ in³

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