Example 3

continued…

Determine the volume of the new, larger pyramid using the scale factor.

$$\text{Volume of the enlargement} = \text{volume of the original} \times (\text{scale factor})^3$$
$$V_{\text{enlargement}} = 64 \times (\sqrt{2})^3$$
$$V_{\text{enlargement}} \doteq 181.02 \text{ m}^3$$

The volume of the enlarged pyramid will be approximately 181.02 m^3.

Practice Run

1. The volume of an object is 512 ft^3. The object is then reduced to 75% of its original size. What is the volume of the new object?

2. The area of the base of the Jack in the Box toy shown below is 25 in^2 and the height of the box is 6 inches. The miniaturized key chain version of the same Jack in the Box is $\frac{1}{3}$ the size of the original.

   Determine the volume of the miniaturized version.

3. What is the scale factor if a baseball of volume 12.31 in^3 is enlarged to the size of a softball of volume 29.18 in^3?

Check your answers.

1. The volume of an object is 512 ft^3. The object is then reduced to 75% of its original size. What is the volume of the new object?

$k = \frac{\text{reduction \%}}{\text{original \%}}$

$k = \frac{75}{100}$

$k = \frac{3}{4}$

Volume of the reduction = volume of the original $\times$ (scale factor)^3

V of the reduction $= 512 \times \left(\frac{3}{4}\right)^3$

V of the reduction $= 216\ ft^3$

2. The area of the base of the Jack in the Box toy shown below is 25 in^2 and the height of the box is 6 inches. The miniaturized key chain version of the same Jack in the Box is $\frac{1}{3}$ the size of the original.

Determine the volume of the miniaturized version.

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The miniature version is $\frac{1}{3}$ the size of the original. As such, the scale factor is $\frac{1}{3}$.

Determine the volume of the original prism.

V = area of base $\times$ height

$V = Bh$

$V = (25\ in^2)(6\ in)$

$V = 150\ in^3$

Determine the volume of the miniature.

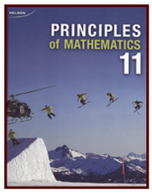
$$\text{Volume of new object} = \text{volume of original object} \times (\text{scale factor})^3$$
$$V = 150 \times \left(\frac{1}{3}\right)^3$$
$$V = 150 \times \left(\frac{1}{27}\right)$$
$$V \doteq 5.6 \text{ in}^3$$

The volume of the miniature is approximately 5.6 in^3.

3. What is the scale factor if a baseball of volume 12.31 in^3 is enlarged to the size of a softball of volume 29.18 in^3?

$$k^3 = \frac{\text{scale volume}}{\text{original volume}}$$
$$k^3 = \frac{29.18}{12.31}$$
$$\sqrt[3]{k^3} = \sqrt[3]{\frac{29.18}{12.31}}$$
$$k \doteq 1.33$$

The scale factor is 1.33.



For further information about volume and scale factor see pp. 496 to 498 of *Principles of Mathematics 11*.

Using proportionality and scale factors, many problems involving scale diagrams and models of two-dimensional shapes and three-dimensional objects can be solved. Scale diagrams and models are often used in construction, for example, and as such, the ability to work with these concepts correctly is extremely important.