Warm-Up

Introduction to the Volume of a Sphere

Lesson Goals

- **Investigate a relationship between** [ ] and cylinder volumes.
- **Determine** the formula for the volume of a sphere.
- **Apply** the formula to find the volume of a sphere.
- **Use** either the radius or diameter measures.

Words to Know

*Fill in this table as you work through the lesson. You may also use the glossary to help you.*

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td>a line segment connecting any two points on a sphere and passing through the center</td>
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<tr>
<td>the measure of the amount of space occupied by a three-dimensional solid object</td>
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<td>to explain or show the similarities or differences between items or ideas</td>
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<tr>
<td>set of all points in space a given distance from a fixed point</td>
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<tr>
<td>a segment that extends from the center of a sphere to any point on the sphere</td>
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Volume of a Cylinder

What is the **volume** of this cylinder?

\[ V = Bh \]

\[ V = \pi (4^2)(9.5) \]

\[ V = \pi (16)(9.5) \]

\[ V = 150.8 \text{ in.}^3 \]
Introduction to the Volume of a Sphere

Parts of a Sphere

Examine the diagram of a sphere.

- Center
- Radius of a sphere
- Diameter of a sphere
- Great circle

Relating a Sphere to a Cylinder

Consider a sphere and a cylinder with the same radius and height.

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Comparing Spheres and Cylinders

**Compare** the volumes of a sphere and a cylinder with the same radius and height.

Even though the sphere and the cylinder have the same height and the same radius, the volume of the cylinder is still larger than the volume of the sphere.

\[ V_{\text{sphere}} = \frac{2}{3} \cdot \text{(Volume of cylinder)} \]
Instruction

Introduction to the Volume of a Sphere

Determining a Formula for the Volume of a Sphere

EXAMPLE

The volume of a cylinder is represented by the formula \( V = Bh \), where \( B \) is the area of the circular base and \( h \) is the height.

**Volume of a Sphere** = \( \frac{2}{3} \) (Volume of a Cylinder)

\[
V = \frac{2}{3} Bh
\]

\[
V = \frac{2}{3} \pi r^2
\]

\[
V = \left( \pi r^3 \right)
\]

The base area \( B = \pi r^2 \) and the height is the diameter:

\[
h = 2r
\]

Finding Volume When Given the Radius

EXAMPLE

The sphere has a 4 cm radius. What is the volume?

\[
V = \frac{4}{3} \pi r^3
\]

\[
V = \frac{4}{3} \pi (64)
\]

\[
V = \frac{3}{\pi} \text{ cm}^3
\]
Finding Volume When Given the Diameter

EXAMPLE

This sphere has a diameter of 1 cm. What is the volume?

\[ r = \frac{1}{2} \text{ cm} \]

\[ V = \frac{4}{3} \pi r^3 \]

\[ V = \frac{4}{3} \pi \left(\frac{1}{2}\right)^3 \]

\[ V = \frac{4}{3} \pi \left(\frac{1}{8}\right) \]

\[ V = \frac{4}{24} \pi \]

\[ V = \frac{\pi}{6} \text{ cm}^3 \]
Summary

Introduction to the Volume of a Sphere

Lesson Question

How can you find the volume of a sphere?

Answer

Use this space to write any questions or thoughts about this lesson.