

Lesson 9-4: Surface Area and Volume of Spheres

Hands-on Activity: *Volume of Sphere*

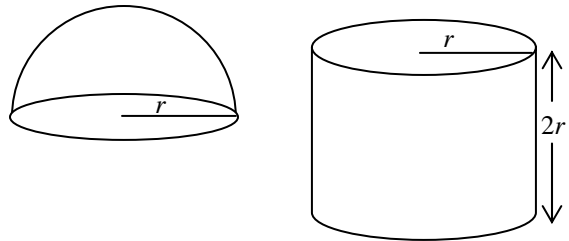


Objective:

Develop a formula for the volume of a sphere (the amount of space contained within the sphere). We will demonstrate the relationship between the volume of a hemisphere with diameter $2r$ and the volume of a cylinder with the same diameter ($2r$) and height $2r$.

Materials:

- A cylinder and a hemisphere with the same radius
- Sand
- A container for the sand



Procedure:

1. Fill the hemisphere with the sand.
2. Slowly pour the contents of the hemisphere into the cylinder. What fraction of the cylinder does the hemisphere appear to fill?
3. Fill the hemisphere again and pour the contents in the cylinder. What fraction of the cylinder do the two hemispheres (one sphere) appear to fill? If the radius of the cylinder is r and its height is $2r$, then what is the volume of the cylinder in terms of r ?

The volume of a sphere is whatever fraction of the cylinder was filled by two hemispheres.

Volume of cylinder

$$\text{Volume}_{\text{cylinder}} = \mathbf{BH}$$

$$= (\pi r^2)(2r)$$

$$= (2\pi r^3)$$

Fraction of cylinder filled by two hemispheres

$$\text{Volume}_{\text{sphere}} = \left(\frac{?}{?}\right) (\text{Volume}_{\text{cylinder}})$$

$$= \left(\frac{?}{?}\right) (2\pi r^3)$$

$$= \left(\frac{?}{?}\right) (\pi r^3)$$

What is the formula for the volume of a sphere with radius r ?