

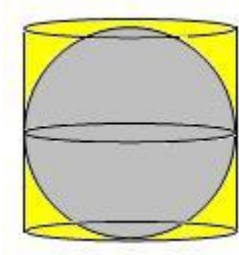
**Answer Question #47433 – Math – Geometry**

How to prove that, the volume formula of sphere is  $\frac{4}{3}\pi r^3$ ; without using integration?

**Solution**

We can find the volume of sphere by Archimedes formula.

Archimedes found after several experiments that the volume of a sphere and also its surface area is exactly  $\frac{2}{3}$ -rd of the volume and the surface area of a cylinder with the same outer dimensions.



Look at the above diagram.

Let  $r$  be the radius of the sphere. Since the over all dimensions of both the sphere and the cylinder are same, the height of the cylinder is  $2r$ .

Under this condition the volume of the cylinder is,

$$\text{Area of the base} \cdot \text{Height of the cylinder} = \pi r^2 \cdot 2r = 2\pi r^3.$$

Therefore, as per Archimedes formula the volume of the sphere is,

$$\frac{2}{3} \cdot 2\pi r^3 = \frac{4}{3}\pi r^3.$$