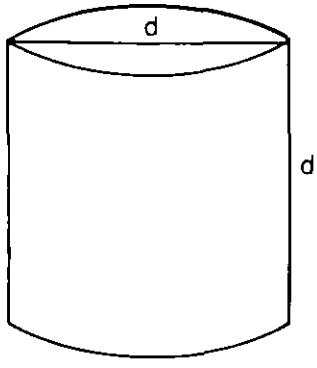
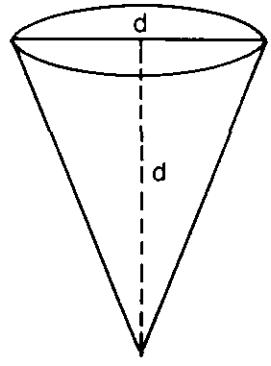
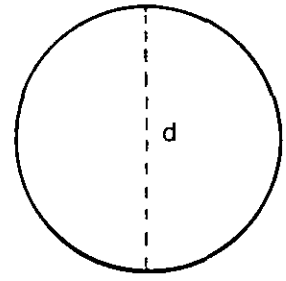
# 35.

# Volume of a Sphere




1. Place the sphere into the cylinder.
2. Use the cone to pour water to fill the cylinder.
3. The experiment shows that:

Volume of cylinder $= \pi r^2 h$

$= \pi r^2 \times 2r$

$= 2 \pi r^3$

Volume of cone $= \frac{1}{3} \pi r^2 h$

$= \frac{1}{3} \pi r^2 \times 2r$

$= \frac{2}{3} \pi r^3$

Therefore:
Volume of sphere = Volume of cylinder − Volume of cone

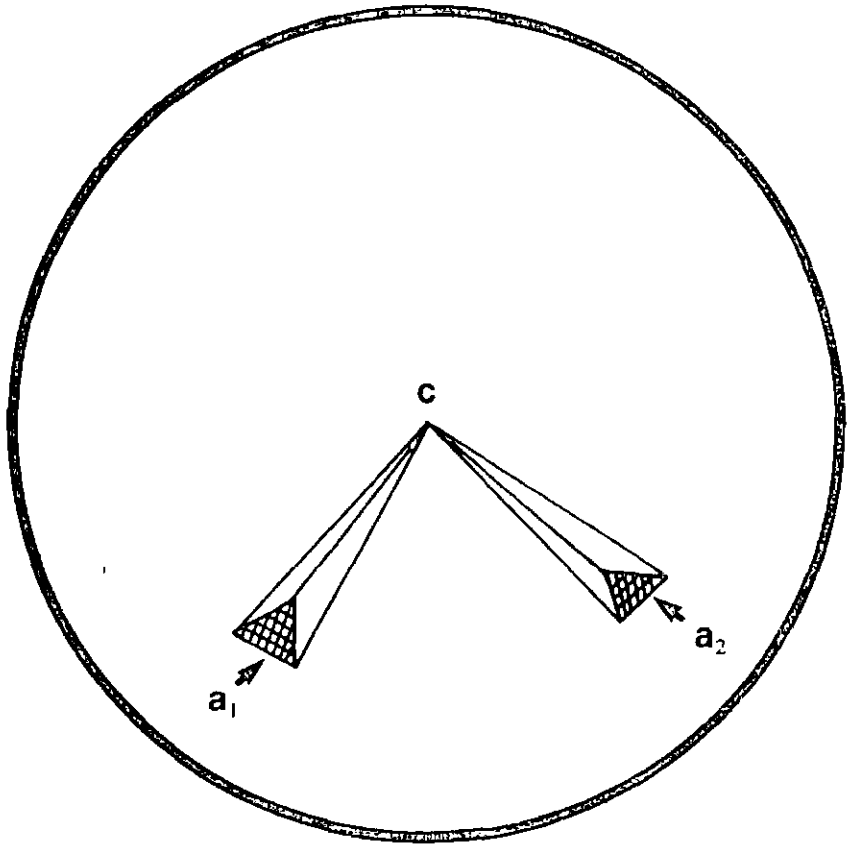
$= 2 \pi r^3 - \frac{2}{3} \pi r^3$

$= (2 - \frac{2}{3}) \pi r^3$

$= \frac{(6-2)}{3} \pi r^3$

$= \frac{4}{3} \pi r^3$

## Surface Area of a Sphere




Volume of pyramid = $\frac{1}{3}\ a_1 \times r$

If the sphere is made up of an infinite number of pyramids, then

$$\frac{1}{3} a_1 r + \frac{1}{3} a_2 r + \ldots = \frac{4}{3} \pi r^3$$

$$\frac{1}{3} r (a_1 + a_2 + a_3 + \ldots) = \frac{4}{3} \pi r^3$$

But $a_1 + a_2 + a_3 + \ldots$ is the surface area of sphere.

Then $\frac{1}{3}\ r\ (A) = \frac{4}{3} \pi r^3$

$$A = \frac{4}{3} \pi r^3 + \frac{1}{3} r$$

$$A = \frac{4}{3} \pi r^3 \times \frac{3}{r}$$

$$= 4 \pi r^2$$