What is the volume of a semi-spherical sink? How much sheet metal do I need to make a barrel?

Technology Integrated Mathematics
Class Notes
Solid Figures: Cylinders and Spheres (Section 9.3)

We turn our attention to spheres and cylinders. Once again, we are interested in their volumes and surface areas. Let's get some definitions and formulas.

Definitions: **Cylinder**: A solid object with two identical circular bases. A **right cylinder** is one where the curved side walls are perpendicular to the bases.
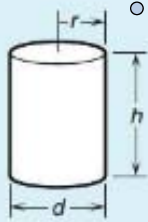
Its **altitude** is the perpendicular distance between the bases. When the **radius, diameter,** or **circumference** of a cylinder is mentioned, these refer to the circular bases.

Cylinders

Lateral surface area

$$L = Ch \quad \text{or} \quad L = 2\pi rh = \pi dh$$

Volume

$$V = \pi r^2 h \quad \text{or} \quad V = \tfrac{1}{4}\pi d^2 h \approx 0.7854 d^2 h$$
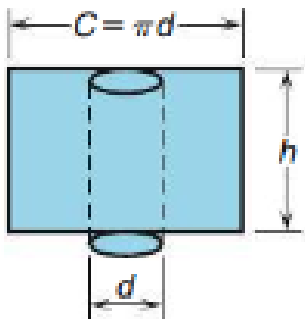
where C is the circumference of the base, r is the radius of the base, d is the diameter of the base, and h is the altitude of the cylinder.

*Lots of variables to keep track of!*

Total surface area: $T = 2\pi r^2 + 2\pi rh = 2\pi r(r + h)$

This is a helpful picture of a cylinder the book gives us.

It might help to visualize a cylinder as cut open and laid out flat.

expl 1: Find the volume, lateral surface area, and total surface area for this cylinder. Use the π button on the calculator for more accuracy. (Do *not* round π to 3.14.) Round to the nearest hundred and include units.

46.2 cm

85.4 cm
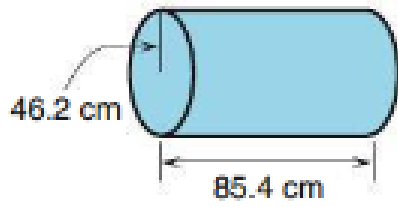
Definitions: Sphere: The 3-D surface whose points are all equidistant from a single point (called the **center**). On a piece of paper, this is a circle. In 3-D space, this is a **sphere**. (As with a circle, the sphere technically does *not* include the space within the sphere. Although, often we find the volume contained within.)

The **radius** is the distance from the center to the surface of the sphere itself. The **diameter** is the straight-line distance across the sphere through the center.

Sphere

Surface area

$A = 4\pi r^2$ or $A = \pi d^2$

Volume

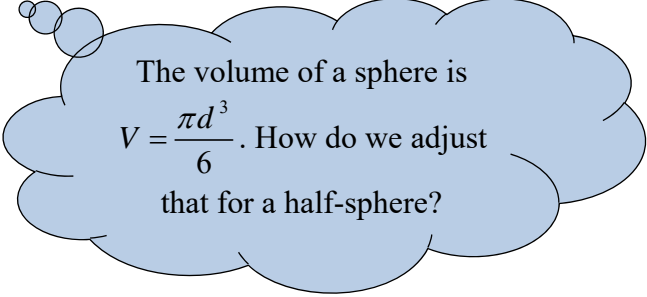$V = \dfrac{4\pi r^3}{3}$ or $V = \dfrac{\pi d^3}{6}$

The formulas are given in terms of radius *or* diameter.

expl 2: Find the volume and surface area for this sphere. Use the π button on the calculator for more accuracy. (Do *not* round π to 3.14.) Round to the nearest *hundredth* and include units.

Diameter
= 1.5"

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expl 3: A bathroom sink has the shape of a half-sphere. It has an inside diameter of 16 inches. How many gallons of water will it hold? Round to the nearest gallon. Recall that 1 gallon is equivalent to 231 cubic inches. Include units.

The volume of a sphere is $V = \dfrac{\pi d^3}{6}$. How do we adjust that for a half-sphere?