

Lateral Surface Area, Total Surface Area, Sphere Area Prism Volume, Pyramid Volume, Sphere Volume

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(A) Distinguish between *perimeter*, *area*, and *volume*. (B) Review circle attribute schema. (C) Review *polygon*.

A geometric solid can be a polyhedron with sides that are polygons, or a non-polyhedron with at least one side a non-polygon, such as a cylinder.

Polyhedrons are either prisms (lateral sides parallel) or pyramids (all lateral sides meeting at a single point), or pieces thereof. Some pieces (frustums) have had pyramid tops sliced off with the slice parallel to the base. Others are just a mess, like a lump of coal.

Non-polyhedron solids worth studying have curved surfaces.

- The cylinder is the cousin of the prism, because the sides go “straight up” -- which is as hard to define as “between.”
- The cone is the cousin of the pyramid, because its lateral side gathers at a point.
- A sphere is the surface of a ball; the sphere is only the shell of a ball; the sphere plus its interior is a ball.

Some non-polyhedron solids are not of interest to mathematicians, unless they study chaos, like an old wad of gum.

In outline form:

- A. Polyhedrons: faces are polygons.
 1. Prisms
 2. Pyramids
 - (3. Frustums and lumps of coal)
- B. Non-polyhedrons
 1. Cylinders
 2. Cones
 3. Spheres
 - (4. Old wads of gum)

Lateral Surface Area = area of the sides, not including the bases.

Total Surface Area = area of the sides plus the base or bases.

Sphere Area = area of four circles of the same radius.

Prism Volume = base area $\times$ height

Pyramid Volume = one-third base area $\times$ height

Sphere Volume = sum of pyramids: one-third $(4\pi r^2 \times r) = \frac{4}{3}\pi r^3$

Principles and Formulas for Surface Area and Volume

<u>Area</u>	Linear	<u>Lateral Surface Area</u>	<u>Total Surface Area</u>	Volume
(various formulas)		Base <i>Perimeter</i> × Height (rectangle)	Lateral Surface Area + Base Area(s)	prism or cylinder: Base <u>Area</u> × Height
A —	R D P=C — — —	cylinder: can label (rectangle)	cylinder: Dilbert head (rectangle + circles)	pyramid or cone: $\frac{BA \times H}{3}$
		cone: πrL where L = slant height	cone: $\pi rL + \pi r^2$ sphere: $4\pi r^2$	sphere: $\frac{4}{3}\pi r^3$