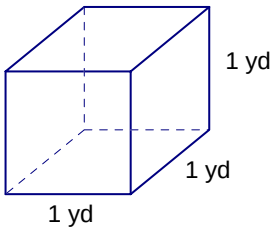
11.5 Volumes

In the last section, we measured the surface areas of some 3-d figures. In this section, we are going to look at the same figures and find their volumes - the amount that they would hold inside them.

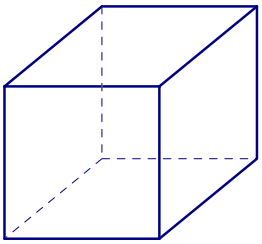
Measures of volume are 3-dimensional measurements - cubic measures.

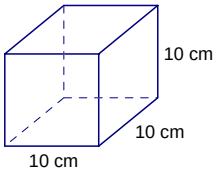
One cubic inch (1 in^3) is a cube that measures 1 inch on each edge, one cubic yard (1 yd^3) is a cube that measures one yard on each edge, and so on.

Convert 1 yd^3 to _____ ft^3



Convert 1 m^3 to _____ cm^3

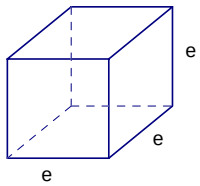
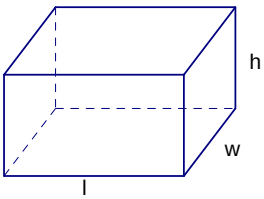
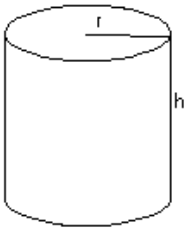
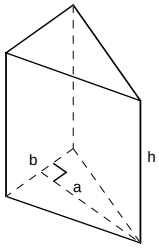




1000 cm^3 is equivalent to a cube that measures 10 cm on an edge:
Since 10 cm = 1 dm, this would also be equivalent to 1 dm^3.
This measurement, 1000 cm^3 = 1 dm^3 = **One Liter (1 L)**
In the metric system, cubic measures can be used for dry or liquid measures, but the liter is usually used for liquid measure. See figure 11-72 and Table 11-7 on pages 706 and 707.

VOLUMES OF RIGHT PRISMS AND RIGHT CYLINDERS

Basically, to calculate the areas of these types of figures, we find the area of their bases and then multiply that by their height.

CUBE	RIGHT RECT. PRISM	RIGHT CIRC. CYLINDER	RIGHT PRISM
			
Base Area: $B = e^2$	Base Area: $B = lw$	Base Area: $B = \pi r^2$	Base Area: $B = \frac{1}{2}ba$
Height = e	Height = h	Height = h	Height = h
Volume = e^3	**Volume = lwh**	**Volume = $\pi r^2 h$**	**Volume = Bh**
Ex: e = 6 in	Ex: l = 7ft, w = 2ft, h = 3ft	Ex: r = 3 cm, h = 10 cm	Ex:a = 6in, b = 4in, h = 9in
Volume:	Volume:	Volume:	Volume:

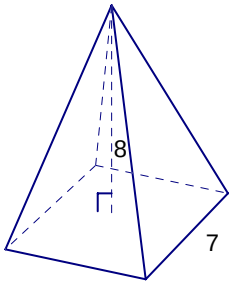
VOLUMES OF PYRAMIDS AND CONES

Figure 11-79 on page 805 shows the relationship between the volumes of:
1) a right prism and a right pyramid with congruent bases and heights, and
2) a right circular cylinder and a right circular cone with congruent bases and heights.

The pyramid holds exactly one-third as much as the prism and the cone holds exactly one-third as much as the cylinder.

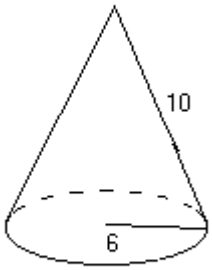
Volume of a Right Pyramid with Base area B and Height h: $\mathbf{V = \frac{1}{3}Bh}$

Example: Find the volume of this right square pyramid:



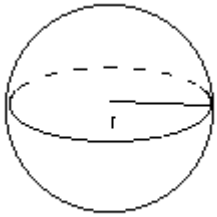
Volume of a Right Circular Cone with Radius r and Height h: $\mathbf{V = \frac{1}{3}\pi r^2 h}$

Example: Find the volume of this right circular cone:



VOLUME OF A SPHERE The formula for the volume of a sphere with radius r is:
$\mathbf{V = \frac{4}{3}\pi r^3}$

Example: Find the volume of this sphere, given that r = 3 ft:



Example: Find the volume of a grain silo if the radius of the base is 20 feet and the height from the ground to the top is 65 feet. (Note: the top of the silo is a hemisphere.)