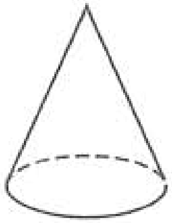
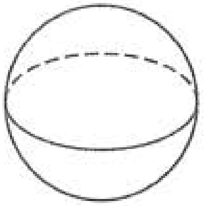


CONE

Have the students note the base of the cylinder and cone are equal. Have them fill the cone and pour the contents into the cylinder.Ask students:

Are the volumes equal? How many more times do you think you will have to fill the cone and pour it into the cylinder to fill the cylinder. Therefore the volume of the cone is 1/3 that of the cylinder.

$$V_{cone} = 1/3\ (\pi\ r^2h)$$



SPHERE

Have students guess the relationship of the sphere and the cylinder. Do they think the volume are equal? will they have to fill the sphere three times to fill the cylinder? Have them check.

They should find that filling the sphere once is not enough to fill the cylinder and filling the sphere twice is to much too fill the cylinder. Ask if they can think of any other way to determine the volume of the sphere. Try their suggestions. If no one suggests using the cone, you should suggest it.

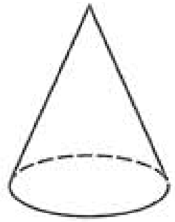
Filling the cone twice and pouring it into the sphere should fill the sphere. Therefore, the volume of the sphere is twice that of the cone.

$$V_{sphere} = 2/3\ (\pi\ r^2h)$$

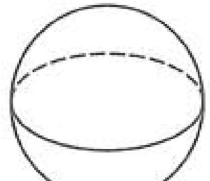
Clear Plastic Volume Set

LER 0240

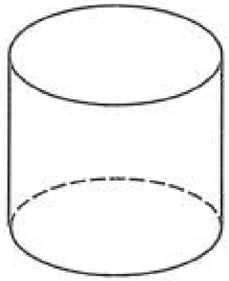
The Clear Plastic Volume Set contains six 3-dimensional pieces They are:



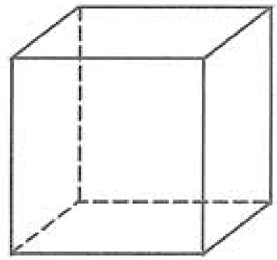
A CONE



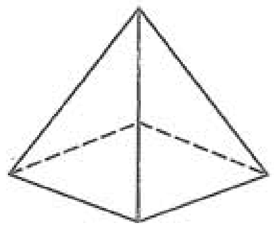
A SPHERE



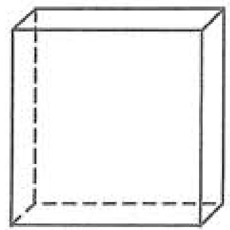
A CYLINDER



A CUBE



A SQUARE PYRAMID



A RECTANGULAR PRISM

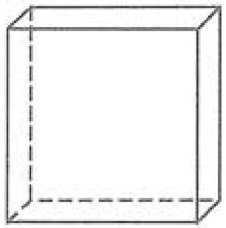
Volume

While the purpose of this set is to examine volume relationship, the solids can also be used to help students identify various 3-dimensional geometric solids, their faces, edges and vertices.

Except for the sphere, these pieces have one face missing so they can be filled and the volumes can be determined and compared and compared. (The sphere has a hole in it to allow for easy filling.)

Before examining the relationship of various volumes, students need to understand the meaning of volume and be able to determine the volume of rectangular prisms and cylinders.

> ***Note:** While the following activities can be done trough a demonstration method, it is more effective to have students complete the activities themselves.*



RECTANGULAR PRISM

To determine the volume of a rectangular prism:

Have students think of the way the area of a rectangle is determined. They should know that we can multiply the length of the rectangle times the width of the rectangle to determine its area.

Have students draw a rectangle that is 4 centimeters by 3 centimeters. Have students cover the rectangle with plastic centimeter cubes, or by drawing the number of one centimeter squares it contains. How many cubes (squares) did they use to cover the rectangle?

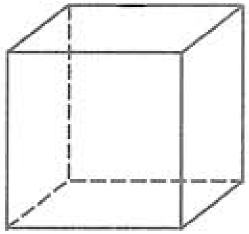
Have them build another layer of centimeter cubes on top of the first layer. How many cubes did they use now? (If students are drawing centimeter squares in the rectangles, have two children work together and lay one student's drawing on top of the others'.)

Build a third layer, and a fourth layer. How many cubes were used altogether when each layer was added? How many cubes were used in each layer?

Ask students to guess how many cubes would be needed if a fifth layer were added. Have them add the layer to check their answers. Repeat this exercise with a different size rectangle.

Work with students to develop the formula for the volume of a rectangular prism.

$$V_{\text{rectangle}} = l \times w \times h$$



CUBE

Ask students to guess what will happen it the base is a square.

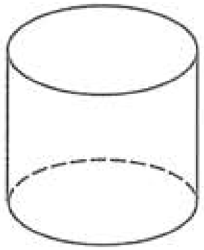
Do a few problems with a square base and different heights. Define a cube as a rectangular prism where the length, width, and height are the same. Have students build a few cubes and determine the volume using centimeter cubes. Reinforce the concept that a cube is a special rectangular prism and its volume can be found by using the same formula.

$$V_{\text{cube}} = l \times w \times h$$

Work with students to develop the formula for the volume of a cube,

$$V_{\text{cube}} = S \times S \times S \qquad \text{or} \qquad V_{\text{cube}} = S^3$$

where "s" represents the length of a side.

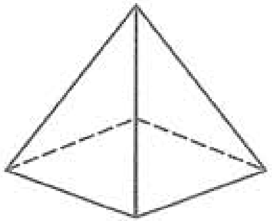


CYLINDER

Show students the volume of the cylinder is found the same way - computing the area of the base and multiplying it by the height.

$$V_{\text{cylinder}} = \pi r^2 h$$

Comparing Volumes



SQUARE PYRAMID

Have students note that the base of the cube and the square pyramid are equal. Have them fill the square pyramid with a liquid (sand will also work) and pour it into the cube, Ask students:

Are the volumes equal? How many more times do you think you will hsve to fill the square pyramid and pour it into the cube to fill the cube? Have them check their guess.

Students should find it takes three fills of the square pyramid to fill the cude. Therefore the volume of the square pyramid is 1/3 that of the cube.

$$V_{\text{square pyramid}} = 1/3(l \times w \times h)$$

or

$$V_{\text{square pyramid}} = 1/3\ s^3$$

The relationship between the cylinder, the cone and sphere can be found the same way.