

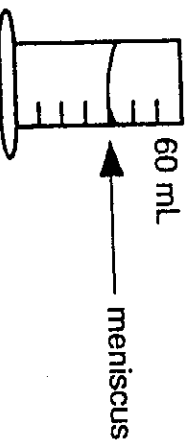
Date: _____ Names: _____

METRIC MEASUREMENT (VOLUME)

INTRODUCTION: The volume of a cube can be calculated by multiplying its length times its width times its height. How could you figure out the volume of a rock that has broken and chipped edges? How could you figure out the volume of a bag of marbles without doing a lot of math?

OBJECTIVE: In this activity, we will learn how to read the volume of a liquid in a graduated cylinder measuring milliliters (mL) by reading the meniscus of the liquid (see diagram below). When most liquids are placed in tall, narrow containers, they tend to creep up the walls of the container a little due to capillary action. This results in the surface of the liquid appearing to be curved. The bottom of this curve is known as the **MENISCUS**, and it best represents the actual volume of liquid in the cylinder. We will also learn how to measure the volume of odd-shaped objects.

Graduated cylinder:



PROCEDURE:

1. Pour the colored liquid from the beaker at your lab station into the graduated cylinder.
2. Sit the graduated cylinder flat on the countertop.
3. Bend over so that the water level is at eye level and look for the meniscus.
4. Record the number of milliliters of liquid (to the nearest one-half mL) in the chart on the next page. This step will be done before each object is lowered into the liquid. Since this prepares us to measure the first object, record the liquid volume in the first box under "Beginning Volume" (second column).
5. Once a starting liquid volume has been measured, gently lower an object into the liquid. The amount that the water rises (amount of water displaced) is equal to the volume of the object.
6. Read the new volume at the meniscus and record it in the chart under "Volume of Liquid & Object" for that object (first column).
7. To calculate the volume of the object alone, subtract the "Beginning Volume" from the "Volume of Liquid & Object" (column 2 from column 1).
8. Repeat the above steps for each of the remaining objects.

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OBJECT	VOLUME OF LIQUID & OBJECT	-	BEGINNING VOLUME (LIQUID)	=	VOLUME OF OBJECT
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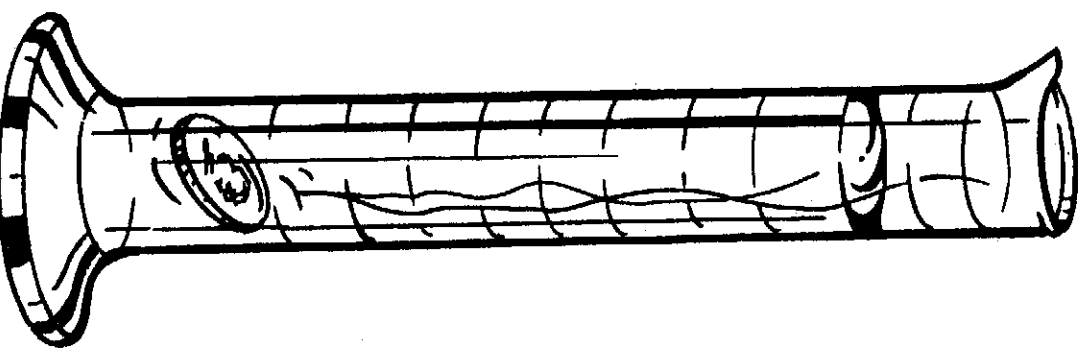
Nail					
Screw					
Penny					
Rock					

QUESTIONS:

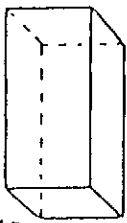
1. Why is it necessary to recheck the starting volume of liquid before each object is put in?

2. What kind of error would result if you read the liquid volume where the liquid touches the wall of the cylinder rather than at the meniscus?

3. How does this "measuring volume by difference" method compare with measuring volume using math for these odd-shaped objects?

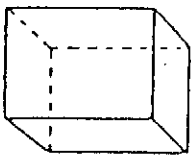


To determine the *volume measure* (V) of a rectangular solid, find the product of the measure of its *length* (l), the measure of its *width* (w), and the measure of its *height* (h).



$$\begin{aligned}
 V &= l \times w \times h \\
 &= 8 \times 5 \times 4 \\
 &= 40 \times 4 \\
 &= 160
 \end{aligned}$$

The volume is 160 cubic meters.

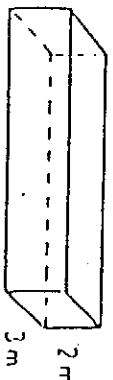


$$\begin{aligned}
 V &= l \times w \times h \\
 &= 6 \times 4 \times 7.5 \\
 &= 24 \times 7.5 \\
 &= 180
 \end{aligned}$$

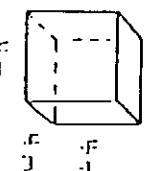
The volume is 180 cubic centimeters.

Find the volume of each rectangular solid below.

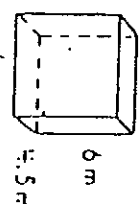
1. a



b



c

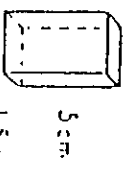


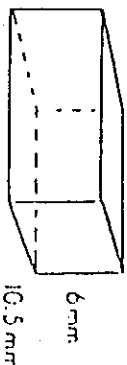
_____ cubic
meters

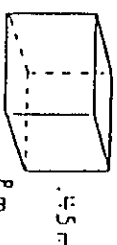
_____ cubic
meters

_____ cubic
meters

2.







_____ cubic
centimeters

_____ cubic
millimeters

_____ cubic
meter

Find the volume of each rectangular solid described below.

	length	width	height	volume
3.	7 m	6 m	5 m	_____ cubic meters
4.	9.2 cm	4.5 cm	3 cm	_____ cubic centimeters
5.	8.5 mm	8.5 mm	8.5 mm	_____ cubic millimeters
6.	7.2 cm	6.2 cm	5.2 cm	_____ cubic centimeters



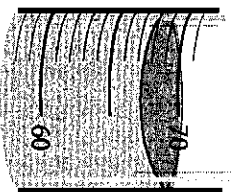
Measurement Skill

Measuring Liquid Volume

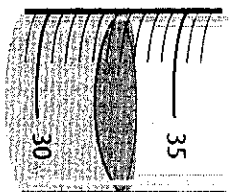
Not all graduated cylinders have the same scale.

Read the volume of liquid in each of the graduated cylinders below.

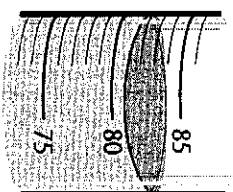
1. _____



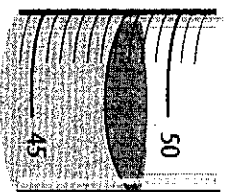
2. _____



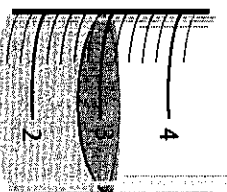
3. _____



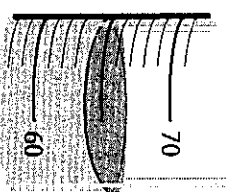
4. _____



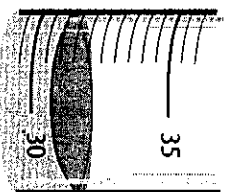
5. _____



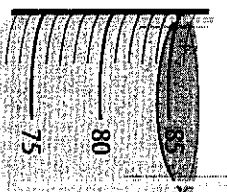
6. _____



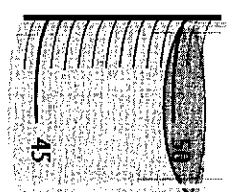
7. _____



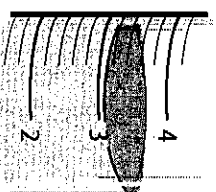
8. _____



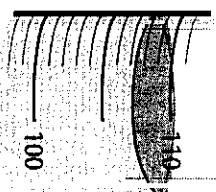
9. _____



10. _____



11. _____



12. _____

