Dear Family,

The next unit in your child's mathematics class this year is ***Filling and Wrapping: Three-Dimensional Measurement***. Its focus is volume (filling) and surface area (wrapping) of objects, especially rectangular prisms, cylinders, cones, and spheres. In addition, students extend their understanding of similarity and scale factors to three-dimensional figures.

UNIT GOALS

Students develop strategies for measuring the surface area and volume. Their strategies are discussed and used to formulate rules for finding the surface area and volume of rectangular prisms and cylinders. They also investigate other solids—including cones and spheres—to develop volume relationships.

Ideas from previous units will be revisited and extended in this unit. For example, from the *Stretching and Shrinking* unit, the connection of how changing the scale of a box affects its surface area and volume will be studied.

HELPING WITH HOMEWORK

You can help with homework and encourage sound mathematical habits as your child studies this unit by asking questions such as:

- Which measures of an object are involved—volume or surface area?
- What method should I use to determine these measures?
- What strategies or formulas might help?

In your child's notebook, you can find worked-out examples from problems done in class, notes on the mathematics of the unit, and descriptions of the vocabulary words.

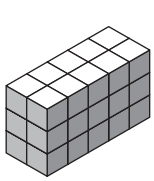
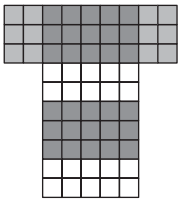
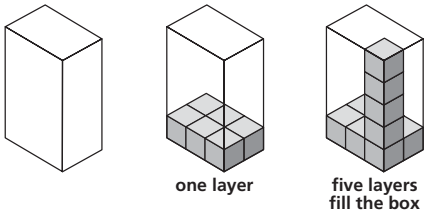
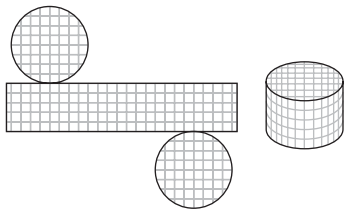
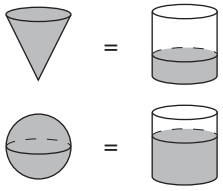
HAVING CONVERSATIONS ABOUT THE MATHEMATICS IN *FILLING AND WRAPPING*

You can help your child with his or her work for this unit in several ways:

- Ask your child about the different ways the class has explored to find the surface area and volume of various shapes.
- Look at your child's mathematics notebook. You may want to review the section where your child is recording definitions for new words that he or she is encountering in the unit.
- Have your child pick a question that was interesting to him or her and explain it to you.

A few important mathematical ideas that your child will learn in *Filling and Wrapping* are given on the back. As always, if you have any questions or concerns about this unit or your child's progress in class, please feel free to call.

Sincerely,

Important Concepts	Examples
Surface Area of Rectangular Prisms To find the surface area of a box (prism), determine the total area needed to wrap the container. Nets can represent boxes. The area of the net is the surface area of the box. Surface area is the sum of the areas of the faces. Surface Area = (area of the front × 2) + (area of the side × 2) + (area of the top × 2) or Surface Area = (area of the front + area of the side + area of the top) × 2 = $(w \times h + w \times \ell + \ell \times h) \times 2$.	  There are two of each of these faces of the prism: 2 cm by 3 cm (area is 6 sq. cm.); 2 cm by 5 cm (area is 10 sq. cm.); 3 cm by 5 cm (area is 15 sq. cm.). Surface area = 62 sq. cm.
Volume of Rectangular Prisms To find the volume of a rectangular box, count the number of layers of unit cubes it takes to fill the container. The number of unit cubes in one layer is equal to the area of the base. The volume (the total number of unit cubes) of a rectangular prism is the area of its base (the number of unit cubes in the first layer) multiplied by its height (the total number of layers). Volume = Area of the base × height = $Bh = \ell wh$.	 one layer five layers fill the box 2 × 3 = 6 cubes on the area of the base 5 stacks of cubes in the height Volume = 6 × 5 = 30 cubic units
Volume of Prisms The volume of any prism is the area of its base multiplied by its height. Volume = Area of the base × height = Bh.	 Rectangular Prism Triangular Prism Pentagonal Prism
Surface Area of Cylinders The surface area of the cylinder is the area of the rectangle that forms the lateral surface ($2\pi rh$) plus the areas of the two circular ends ($2\pi r^2$) where r = radius and h = height. Surface Area = $2\pi r^2 + 2\pi rh$.	 Use 3.14 for π. $r = 4$ $h = 5$ $2(\pi 4^2) + 2\pi 4(5) \approx$ 100.48 + 125.6 = 226.08 square units
Volume of Cylinders The volume of a cylinder is the number of unit cubes in one layer (the area of the circular base) multiplied by the number of layers (the height) needed to fill the cylinder. The area of the base (πr^2) is multiplied by the height to find the volume. Volume = $Bh = \pi r^2 h$	$r = 1.5$ $h = 7$ Area of the base ≈ 3.14 × 2.25 = 7.065 Volume ≈ 7.065 × 7 = 49.455 cubic units
Volume of Cones and Spheres When all three have the same radius and the same height, 1 cone fills $\frac{1}{3}$ of a cylinder, and 1 sphere fills $\frac{2}{3}$ of a cylinder. Cone Volume = $\frac{1}{3}$ volume of the cylinder = $\frac{1}{3}\pi r^2 h$ Sphere Volume = $\frac{2}{3}$ volume of the cylinder = $\frac{2}{3}\pi r^2 h$	Volume of the cylinder = 628 cm^3.  Volume of the cone is approximately 209 cm^3. Volume of the sphere is approximately 419 cm^3.

On the **CMP Parent Web Site,** you can learn more about the mathematical goals of each unit, see an illustrated vocabulary list, and examine solutions of selected ACE problems.
http://PHSchool.com/cmp2parents