Getting Into Solids

P R I S M S

Exploring Surface Area & Volume

INTRODUCTION

Prior to **Getting Into Solids**, the solids were just that — solid. The lateral faces were made of plastic that tightly enclosed each solid. It was impossible to get inside the model to identify the height, apothem, radius, central angle measure, and the right triangles needed to find missing lengths.

Leeanne Branham, from Fresno Pacific University, best identified the problem with solids in the March 1998 issue of CMC ComMuniCator. In the article "Getting Into Pyramids" Leeanne wrote, (referring to the solid lateral face models) "but one drawback that these models all share was that I couldn't get inside them." Her article was designed, with worksheets, to assist students in solving surface area and volume problems by redrawing the parts of a figure on one-dimensional paper. I identified with her frustration as well as observed the frustration level of my own students. This inspired me to design the three-dimensional open models, **Getting Into Solids — Pyramids** and **Getting Into Solids — Prisms**. These new models literally allow the learner to "get inside" the solid.

The Getting Into Solids — Prisms models allow students to:

A. Identify the different parts of the regular prisms and right cylinders by colors.
1. Brass rod – height
2. Green string – lateral edge, height
3. Etched green line on the base – radius
4. Etched red line on the base – apothem
5. Etched blue line on the base – base edge

B. Attach numbers to the model for ease of visualization.
1. Write on the plexiglass base with overhead markers
2. Attach stick-on notes — with unit measure — on the height

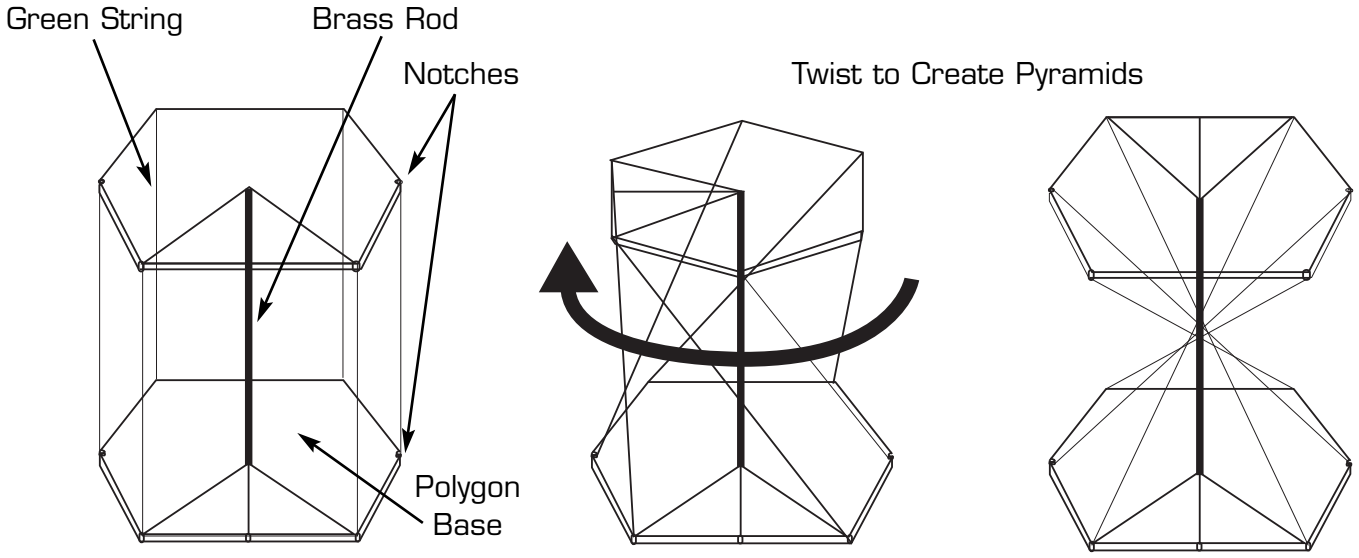
C. Employ all learning styles.
1. Visual
2. Auditory (when guided by the teacher or students teaching others in groups)
3. Kinesthetic/Tactical

Section One of this book contains reproducible worksheets for finding the surface area and volume of regular prisms and right cylinders. Each model has three worksheets. The first worksheet includes dimensions. The second worksheet serves as an answer key for the first worksheet. Finally, the third worksheet is blank so that the instructor or student can assign dimensions to any illustration — specific from a classroom textbook. The worksheets in this section are intended to guide students through a frequently long and difficult process. Helping students to organize their mathematical steps provides students with immediate success and, as a result, promotes a positive experience for finding surface area and volume.

Section Two of this book (beginning on page 22) also contains reproducible worksheets for finding the surface area and volume of regular prisms and right cylinders. This section is less structured than section one. It is designed for students to take on the challenge of organizing their thought process in a logical order. Students will need to show multiple mathematical steps to yield the desired result. With prior work in section one, students are easily able to make this transition. Students may find it more difficult, but many will show extreme growth in their organizational skills. Section two utilizes concepts from the book **Getting Into Solids – Pyramids**. Students will need to know how to calculate the volume of a pyramid and the volume of a cone. Brass rods are provided to build and display each of the six prism models at one time. A shorter brass rod is included to allow the construction of a 16 cm x 16 cm x 16 cm cube, or to change the height of any of the other models.

Easy to assemble instructions: (see diagram below)

1. Screw the brass rod into polygon center (representing height).
2. Screw a congruent polygon on the opposite side of the brass rod.
3. Slide the end of the green string (representing lateral edge, height) into the notch of each base. The string should be perpendicular to the bases.
4. Repeat Step 3 for all green strings, alternating from side to side.
5. Stick-on notes can be attached to the green string, with unit measure (representing lateral edge, height).
6. Turning one of the prism bases 180° will create symetrical pyramid models. Use twist ties, string, or tape to retain the desired shape.



Vocabulary for Regular Prisms and Right Cylinders

L.A. = lateral area	**P = perimeter of base**	**r = radius**
S.A. = surface area	**B = area of base**	**h = height**
V = volume	**π = pi**	

Formulas for Regular Prisms and Right Cylinders

Regular Prisms	**Right Cylinders**
L.A. = P h	**L.A. = 2 π r h**
S.A. = L.A. + 2 B	**S.A. = L.A. + 2 B**
S.A. = P h + 2 B	**S.A. = 2 π r h + 2 π r^2**
V = B h	**V = B h**
	V = π r^2 h

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