

## Scratching the Surface Area

### Purpose

Students will find the surface area of rectangular solids by measuring and comparing the faces of a box.

### Materials

*For the teacher:* blank piece of paper, prism-shaped box, chalk, chalkboard

*For each group of 2 or 3 students:* 2-3 prism-shaped boxes (e.g., tissue boxes, shoe boxes, etc.), package of sticky notepaper, scissors, inch ruler, paper, pen or pencil, paper clips

### Activity

#### A. Introduction

1. Hold up the piece of paper and ask students how they would find the area of the piece of paper. Trace around the paper on the chalkboard and measure the edges to find the area.
2. Hold up the box and ask students how they would find the area of the box. Hold one face of the box against the chalkboard and trace around it. Measure the edges and find the area of that face.
3. Ask students if that will actually find the area. Point out the other faces of the box for the students to consider. Define *surface area* as the sum of the areas of the faces of a three-dimensional object.
4. Discuss ways that students would find surface area.

#### B. Group Activity

1. Divide the class into groups of two or three students. Distribute the materials listed above to each group.
2. Demonstrate how to take apart the boxes so that they open flat. Instruct students to cut off any flaps that are used for ease of construction of the box but are not part of the surface area. Show a flap on the demonstration box and cut it off. Cut off the rest of the flaps and take apart your box as students work on theirs.
3. Instruct students to cut along folded edges so that the faces of the boxes are separated. Demonstrate with your box.
4. Have students find the area of each of the faces, write the area down, and mark the faces that have been measured with a sticky note. When all faces have been measured, have students add the areas to find the surface area of the box.

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### EXTENDING THE ACTIVITY



Go on a walking tour of the community and discuss various examples of surface area. Have students discuss how to find the surface area of the examples and why it might be necessary to know it.

### MEETING INDIVIDUAL NEEDS



For students who finish quickly, have them find the surface area of a pyramid and other shapes that may include faces that are parallelograms or trapezoids.

**Standards Links**  
**5.3.2, 5.4.8**

**Activity (continued)** 

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5. Instruct students to take apart one of their other boxes in the same manner.
6. Have students match congruent faces and use paper clips to keep them together.
7. Explain that since the congruent faces have the same area, it is not necessary to measure both faces. Tell them to find the area of one of each of the congruent faces and double that to find the surface area. (Note: Some boxes may have four or six congruent sides. Make adjustments accordingly.)
8. Have the groups find the surface area of the last box on their own.

**Questions for Review** 

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**Basic Concepts and Processes**

During the group activity, ask students the following questions while referring to one of the boxes their group was given:

-  Show me what parts of the box you will need to measure to find the surface area.
  -  Why did you choose those parts to measure?
  -  How is finding the surface area of a three-dimensional object different from finding the area of a two-dimensional object?
  -  Which faces of the box are congruent?
  -  When might you need to know the surface area of an object?  
[Answer: to paint or cover an object – not to fill the object]
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