

Lesson 23: Making and Measuring Boxes

Let's use what we know about decimals to make and measure boxes.

23.1: Folding Paper Boxes

Your teacher will demonstrate how to make an open-top box by folding a sheet of paper. Your group will receive 3 or more sheets of square paper. Each person in your group will make 1 box. Before you begin folding:

- Record the side lengths of your papers, from the smallest to the largest.
 - Paper for Box 1: _____ cm
 - Paper for Box 2: _____ cm
 - Paper for Box 3: _____ cm
- Compare the side lengths of the square sheets of paper. Be prepared to explain how you know.
 - The side length of the paper for Box 2 is _____ times the side length of the paper for Box 1.
 - The side length of the paper for Box 3 is _____ times the side length of the paper for Box 1.
- Make some predictions about the measurements of the three boxes your group will make:
 - The surface area of Box 3 will be _____ as large as that of Box 1.
 - Box 2 will be _____ times as tall as Box 1.
 - Box 3 will be _____ times as tall as Box 1.

Now you are ready to fold your paper into a box!

23.2: Sizing Up Paper Boxes

Now that you have made your boxes, you will measure them and check your predictions about how their heights and surface areas compare.

1. a. Measure the length and height of each box to the nearest tenth of a centimeter. Record the measurements in the table.

| | side length of paper (cm) | length of box (cm) | height of box (cm) | surface area (sq cm) |
|-------|---------------------------|--------------------|--------------------|----------------------|
| Box 1 | | | | |
| Box 2 | | | | |
| Box 3 | | | | |

- b. Calculate the surface area of each box. Show your reasoning and decide on an appropriate level of precision for describing the surface area (Is it the nearest 10 square centimeters, nearest square centimeter, or something else?). Record your answers in the table.

2. To see how many times as large one measurement is when compared to another, we can compute their quotient. Divide each measurement of Box 2 by the corresponding measurement for Box 1 to complete the following statements.

- a. The length of Box 2 is _____ times the length of Box 1.
- b. The height of Box 2 is _____ times the height of Box 1.
- c. The surface area of Box 2 is _____ times the surface area of Box 1.

3. Find out how the dimensions of Box 3 compare to those of Box 1 by computing quotients of their lengths, heights, and surface areas. Show your reasoning.

- a. The length of Box 3 is _____ times the length of Box 1.
- b. The height of Box 3 is _____ times the height of Box 1.
- c. The surface area of Box 3 is _____ times the surface area of Box 1.

4. Record your results in the table.

| | side length of paper | length of box | height of box | surface area |
|-------------------------|----------------------|---------------|---------------|--------------|
| Box 2 compared to Box 1 | | | | |
| Box 3 compared to Box 1 | | | | |

5. Earlier, in the first activity, you made predictions about how the heights and surface areas of the two larger boxes would compare to those of the smallest box. Discuss with your group:

- How accurate were your predictions? Were they close to the results you found by performing calculations?

- Let's say you had another piece of square paper to make Box 4. If the side length of this paper is 4 times the side length of the paper for Box 1, predict how the length, height, and surface area of Box 4 would compare to those of Box 1. How did you make your prediction?