

Filling Boxes

- Materials: Each group of students will need:
- 1-inch cubes
 - 1-centimeter cubes (The units cubes in Base 10 sets are 1-cm cubes.)
 - Small boxes in a variety of sizes

Procedure:

Part 1

1. Give each group some 1-inch cubes and 1 small box.
2. Have groups estimate the number of 1-inch cubes it will take to fill their box and record their estimate.
3. Have groups fill one layer of the box with 1-inch cubes.
4. Ask groups if, based on the number of cubes in one layer, they would like to change their estimate. If they do revise their estimate, have them record the new estimate beside their original one.
5. Have groups completely fill (as close as possible) their box with the 1-inch cubes.
6. Have students compare the number of cubes it took to fill the box with their estimates.
 - If the cubes didn't completely fill some of the boxes, have the class decide whether the actual volume of those boxes would have been a little more or a little less than the number of cubes.
 - If the cubes overfilled some of the boxes (i.e., the top layer was slightly higher than the top edges of the box), have the class decide whether the actual volume of those boxes would have been a little more or a little less than the number of cubes.
7. Explain that the number of cubes it took to fill the box represents the volume of the box in cubic inches.

Part 2

1. Give each group some 1-centimeter cubes and the same small box.
2. Have groups estimate the number of 1-centimeter cubes it will take to fill their box and record their estimate.
3. Have groups fill one layer of the box with 1-centimeter cubes.
4. Ask groups if, based on the number of cubes in one layer, they would like to change their estimate. If they do revise their estimate, have them record the new estimate beside their original one.
5. Have groups completely fill (as close as possible) their box with the 1-centimeter cubes.

6. Have students compare the number of cubes it took to fill the box with their estimates.
 - If the cubes didn't completely fill some of the boxes, have the class decide whether the actual volume of those boxes would have been a little more or a little less than the number of cubes.
 - If the cubes overfilled some of the boxes (i.e., the top layer was slightly higher than the top edges of the box), have the class decide whether the actual volume of those boxes would have been a little more or a little less than the number of cubes.
7. Explain that the number of cubes it took to fill the box represents the volume of the box in cubic centimeters.

Part 3

1. Ask student groups whether or not the size (volume) of their box changed. (Here you are stressing the concept of conservation of volume: The size of the box (volume) did NOT change. The number representing the volume changed because the size of the measurement unit changed.)
2. Through class discussion help students come to an understanding that the volume of the box did not change. The reason there was a change in the number of units (cubes) it took to fill the box was because the size of the units (cubes) changed. Since the unit was smaller in Part 2, it took more of them to fill the box.
3. Ask groups to think about filling their box with cubic decimeters.
 - Would the volume of the box change? (no)
 - Would the number of units it took to fill the box change? (yes)
 - Would it take more units or fewer units to fill the box? (fewer)
 - Why? (The size of the unit increased so it would take fewer of them to fill the box.)