Measuring Volume

Imagine you are the head chef at a large restaurant that serves hundreds of people every day. One of your soup recipes calls for exactly 4 gallons of water, but you only have a 3-gallon bucket and a 5-gallon bucket. You need to use the two buckets to measure the correct amount of water.

- You can fill the buckets and pour them out as many times as you need to.
- You cannot mark the water level in either bucket.
- You cannot estimate how much water is in each bucket.

1. List the steps you take to measure out exactly 4 gallons of water for your recipe.

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Now try another problem. You have a 9-gallon bucket, a 4-gallon bucket, and a 2-gallon bucket.

2. List the steps you take in order to have 1 gallon of water in the 4-gallon bucket and 1 gallon of water in the 2-gallon bucket. What steps did you follow?

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Area and Volume

Look at the figures below.

Use the figures to complete the table.

<table>
<thead>
<tr>
<th></th>
<th>Length of One Side (units)</th>
<th>Area of One Side (square units)</th>
<th>Volume (cubic units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure A</td>
<td>2</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Figure B</td>
<td>4</td>
<td>16</td>
<td>64</td>
</tr>
<tr>
<td>Figure C</td>
<td>8</td>
<td>64</td>
<td>512</td>
</tr>
</tbody>
</table>

1. Write a rule that describes how the area of a square is affected when you double the length of each side.

   **Sample answer:** When you multiply each side by 2, the area increases by a factor of 4.

2. Write a rule that describes how the volume of a cube is affected when you double the length of each side.

   **Sample answer:** When you multiply each side of a cube by 2, the volume increases by a factor of 8.

3. **Connect It** How does the volume of a solid figure change if only one dimension is multiplied by 2? Explain your answer.

   **Sample answer:** The volume would increase by a factor of 2. For each additional dimension you multiply by 2, the volume would increase by an additional factor of 2.