Mission: Raven Hill provides a place that enhances hands-on and lifelong learning for all ages by connecting science, history & the arts.

Volume of rocks & pebbles

In science, volume is defined as the space something takes up. So, the question is: When is a jar full? If you count the air that is in the jar, it is already full! But we can displace that air and fill it with other things. You will need a small jar, measuring cups and spoons, a big rock that fits in the jar, small pebbles that fill around the large rock in the jar, sand and water. With the measuring cups & spoons, you can measure the volume of the rock by how much water it displaces. If you measure the volume of the big rocks, small pebbles, sand and water, you will find that the volume is the same as if you fill the jar with water and measure that. Here's what to do. To measure the volume of a large rock, fill a glass measuring cup up to one half with water. Put your large rock in and measure the new water level. Subtract the original half cup volume of water and the difference is the volume or space that your rock takes up. I found the volume of my small pebbles by fitting in as many as I could around my big rock and then measuring their volume by displacement as I did with the large rock—filling the measuring cup to the half cup mark, adding the pebbles, recording the new water level and subtracting the original half cup of water. Once you know the volume of the large rock and pebbles, put them all in your jar Put the large rock in first and fill in around it with the small pebbles. The jar will look "fuller". But you can still see little spaces between the pebbles. If you add sand, the sand will fill in those spaces and take up more of the volume in the jar. Fill up a small ¼ measuring cup with sand and pour it in the jar around the rock & pebbles. Add another ¼ cup, if there is room or add tablespoons of sand (4 tablespoons equals ¼ cup). You might have to shake the jar gently to get the sand down to the bottom of the jar. With the sand, the jar looks pretty full. But, if you add water by the tablespoon, which has smaller particles (molecules) than the sand, the water takes up the spaces between the sand grains and so it takes up more of the volume or space in the jar! So the answer to the question is when is the jar full—it was full from the beginning, first with air, then with the rock, pebbles, sand and water. What's more to the point is what is filling the jar! Whether you fill it with air, water or rocks, pebbles, sand and water, the volume remains the same. First, I filled the jar with water to find the total volume. The total volume of my jar was 1 ¼ cups or 15/12 cups plus 3 tablespoons of water. The rock had a volume of 7/12 cup; the pebbles had a volume of 2/12 cup; the sand had a volume of 6/12 cup or 1/2 cup; and the water I added to fill in the remaining space in the jar was 3/12 cup or 3 tablespoons, which is the original volume of the water! Messy and fun! Clean up when you are done.

1 Supplies

2 Water volume

3 Displacement

4 Filled?

5 Adding sand

6 Now filled?

7 Add water

8 FILLED!