How Many Trains?

Give each group *Snap Cubes®* in two colors. Begin by snapping one of each color *Snap Cube* together. Explain that this is a two-car train because it is made with just two *Snap Cubes*. Ask students to find other two-car trains. Students should find that they can make four different two-car trains with their *Snap Cubes*. For example, red-red, green-green, red-green, and green-red. Point out that in this activity, two trains having the same color cubes, but arranged in a different order, such as the red-green trains, count as two different trains. Have students trace the cubes to keep track of all of the trains they are making.

Now, have students find all the three-car trains (trains that are three cubes long) that can be made using no more than two colors. Students will need to keep a record as they work in order to have enough cubes to complete this activity.

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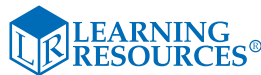
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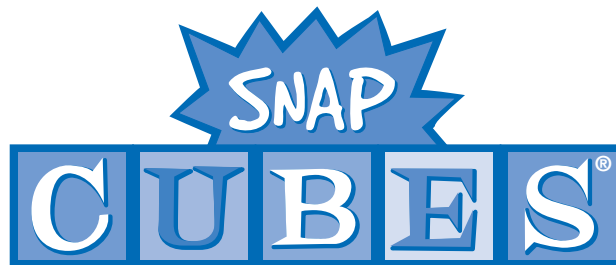
SNAP CUBES®

About Snap Cubes®

Snap Cubes are ¾-inch interlocking cubes that connect on every side. They come in sets of 100, 500, and 1000, each containing an equal amount of 10 different colors. A set of 100 cubes is sufficient for four to six students.

Activities with *Snap Cubes* are suitable for children in all grade levels. They help students learn about whole numbers (counting, more and less, place value, addition, subtraction), measurement, probability, graphing, and geometry. They are ideal for exploring rhythmic patterns as well as growth patterns, and for doing spatial reasoning tasks.

Free Exploration

Before using *Snap Cubes®* for formal activities, give students time to play with them. By giving them time for such tinkering, you'll find students more willing to use *Snap Cubes* during formal lessons later. After students have experimented with *Snap Cubes*, ask them to talk about them. They might want to show the class some of the figures they made and explain how they created them.

Race for a Yard

This activity is for pairs of children. They will need a yardstick, a die, and 100 *Snap Cubes*. Children take turns rolling the die, and snapping together the number of cubes it indicates. The goal is to be the first to make a train of cubes equal in length to a yardstick.

Cubes That Grow

Give each pair of students 100 cubes. Introduce the word "face" as another way to refer to a side. Point out that each *Snap Cube* has 6 sides or faces. Ask students to explain the meaning of "edges" and "vertices." If these words are unfamiliar to students, tell them the meanings and have them locate the 6 faces, 8 vertices, and 12 edges.

Identify one *Snap Cube* as a 1x1x1, and ask students to make a 2x2x2. Tell students that they are to build several cubes; one with two cubes on each side – 2x2x2; one with three cubes on each side – 3x3x3; and, one with four cubes on each side – 4x4x4. Post on the chalkboard or overhead two questions for students to answer:
• How many *Snap Cubes* are needed to build each cube?
• How many *Snap Cubes* are not visible from the outside?

Clarify by explaining that although all 8 *Snap Cubes* used to make the 2x2x2 cube can be seen, for larger cubes, some

Snap Cubes will be inside and not visible. Encourage students to continue making observations. Tell them, "Based on your investigations of these cubes, do you see a pattern? What can you predict for cubes larger than the ones you've built?"

Further Investigation

Present the following: "Suppose that I dipped the 2x2x2 cube into a bucket of special paint so that as soon as I removed the cube, it dried instantly. Then I took the cube apart. How many *Snap Cubes* would have all their faces painted? How many would have only three faces painted? Two painted? One? None?"

Once most students see that every *Snap Cube* would be painted on three sides, ask them what would happen if you dipped the 3x3x3 cube in the special paint. Allow students time to think about this in their groups and then report back to the class.

Explain that they are to continue the investigation for dipping larger cubes in this special paint, and record their findings on a chart. Suggest that they look for patterns and use them to make predictions. Ask students to write down the patterns they find. Groups that finish early should compare their written statements.

Creating Student Patterns

Give pairs of children a supply of *Snap Cubes*, crayons or markers, and *Snap Cube* recording sheets containing 12 or more ¾" squares, printed on sturdy cardboard. Ask each student to make a pattern with the *Snap Cubes* and record it by tracing the outlines on the recording sheet. Have partners exchange their work. Direct them to check that the *Snap Cube* pattern built matches the recording sheet and that it is labeled correctly. Have students discuss any disagreements and make corrections, if necessary.

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