Seanyelle Yagi and Melfried Olson

How Many Ways?

"Math by the Month" activities are designed to engage students to think as mathematicians do. Students may work on the activities individually or in small groups, or the whole class may use these as problems of the week. Because no solutions are suggested, students will look to themselves for mathematical justification, thereby developing the confidence to validate their work.

This month's activities revolve around counting. Children at almost any age are able to explore and solve counting problems by drawing pictures or diagrams or using physical materials. The questions posed this month will help students see the broader context of counting and perhaps generate and answer their own counting problems. ▲

WEEKLY ACTIVITIES

HOW MANY WAYS? K–2

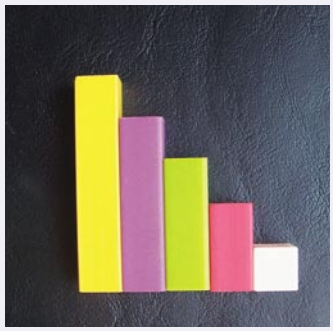
MAY 2007

7

Stacking cubes. Suppose you have a pile of cubes of two different colors, red and blue. If you use these cubes to build stacks that are two cubes tall, how many stacks of different color combinations can you make? How many stacks of different color combinations could you make if you were asked to make stacks three cubes tall? If you were asked to make stacks five cubes tall? What patterns do you notice?

14

As long as a purple rod. Jacey and Macy were working with Cuisenaire rods. They made a train consisting of two rods, one red and one green, that together are the same length as the yellow rod. Then Macy put out a purple rod and challenged Jacey to make trains of all the different combinations that would equal the length of a purple rod. How many possible trains could Jacey make? When he was finished, Jacey placed a yellow rod in front of Macy and challenged her to make all the possible trains of different combinations of rods that would equal the length of a yellow rod. How many possible trains could Macy make?



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21

Toys on vacation. Naes is going on a family vacation and wants to take along some toys to play with during the trip. She has 4 favorite toys, but her mother says she can take only 2 toys along. How many different combinations of toys will Naes have to choose from? If Naes had 5 favorite toys, how many options would she have?

28

Summing to ten. Alycia and Layla were finding different ways to make a specific sum with two addends that are counting numbers. For example, they knew that 3 + 7 and 7 + 3 both add to 10. Using digits other than 3 and 7, how many sums should Alycia and Layla find that add to 10? That add to 15? That add to 22? That add to 99?

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Edited by **Kristen Forrest**, *kristen.forrest@anoka.k12.mn.us,* **Denise Schnabel**, *denise.schnabel@anoka.k12.mn.us, and* **Margaret E. Williams**, *margaret.williams@anoka.k12.mn.us, teachers at Riverview Specialty School for Math and Environmental Science, Brooklyn Park, MN 55444. Readers are encouraged to submit problems to be considered for future "Math by the Month" columns to Margaret Williams. Receipt of problems will not be acknowledged; however, problems selected for publication will be credited to the author.*

WEEKLY ACTIVITIES

HOW MANY WAYS? 3–4

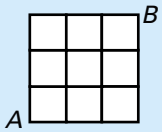
MAY 2007

7 **Soccer tournament.** Eight teams are competing in a soccer tournament. In the tournament, each of the 8 teams will play each other team exactly once. How many games will be played in the tournament? How many games would be played if there were 10 teams in the tournament?

14 **Musical notes.** A musician uses three fingers to operate three valves on a trumpet. For example, he can push down the first two valves using his first two fingers, or he can make a different sound using the first and third fingers to press down the first and third valves. If the musician always places the same finger on the same valve when playing the instrument, in how many different ways can the musician use his fingers to push down the valves?

21 **Making postage.** Mak found more than 50 3-cent and 5-cent stamps in a desk. His uncle needed 87¢ worth of postage to mail a package and asked Mak if he could use some of these stamps. How many different combinations of the stamps could Mak give his uncle to make exactly 87¢ of postage?

28 **Honolulu city streets.** Some of the streets in Honolulu are laid out in a rectangular grid. Alison is at corner *A* and wants to meet Lem at corner *B*, a trip of exactly six blocks. If she always moves north or east, how many possible paths could Alison take?

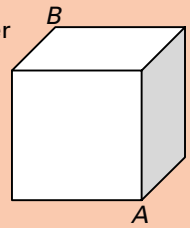


WEEKLY ACTIVITIES

HOW MANY WAYS? 5–6

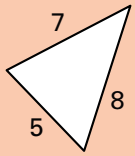
MAY 2007

7 **Corner to corner.** A squirrel feeder is made in the shape of a cube. A squirrel at corner *A* of the feeder wants to get to corner *B*. Because of the feeder's construction, the squirrel must travel along the edges of the cube. How many different paths, each the total length of three edges, are possible?



14 **Chess matches.** Sixteen students are scheduled to play in a chess tournament to determine a champion. Matches are always between two players, and when a person loses a match, that person is eliminated from the tournament. How many matches need to be played until a champion is determined? If there were 32 students in the tournament, how many matches would need to be played?

21 **Sticky triangles.** Neelie and Sivart received a small construction set from their parents. They emptied the box and found sticks of various lengths: 2 inches, 5 inches, 7 inches, and 8 inches. When Neelie and Sivart connected some of the sticks, they realized that they could make triangles. For example, they found they could make a triangle with one 5-inch, one 7-inch, and one 8-inch stick. How many different triangles are possible with the sticks of these four lengths?



28 **Fewest moves.** One of the games at the mathematics carnival consists of a game board with four cubes on the left side and four spheres on the right side. The goal of the game is to exchange the pieces—that is, move the cubes to the right side and the spheres to the left side—under the following conditions: You can move a sphere or a cube only to an adjacent empty space or "jump" one piece to an empty space. You win the game if you can exchange the pieces in fewer moves than your opponent. Devise a strategy to win the game. What is the least number of moves you can make to exchange the pieces and be guaranteed that you will not lose?

If you would like to solve another problem like this, look up the Tower of Hanoi puzzle (www.figurethis.org). Another similar problem is the Traffic Jam problem, which you can explore through an interactive applet at nctm.org/onmath (Fall 2002) in the article "Developing Algebraic Thinking" by Suzanne Alejandre.