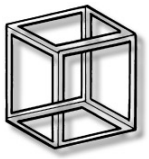


Puzzle Corner

Junk's Puzzles

by Dave Youngs

This month the *Puzzle Corner* and *Maximizing Math* activities are designed to be done in tandem since they are based on the same set of puzzles. Because the *Puzzle Corner* activity introduces the puzzles, it should be done first. Once students have gained some experience with the puzzles and can solve them without too much difficulty, they are ready for the *Maximizing Math* activity, in which they explore the mathematics embedded in one of the puzzles.

I would like to thank Toshi Junk Kato, a puzzle creator and active member of the international puzzle community, for the inspiration for this month's activities. Richard Thiessen, the President of AIMS, met Junk—as he is known in the puzzle community—at the annual International Puzzle Party a few years ago. Recently, Richard showed me one of Junk's wonderful sliding block puzzles. After playing with this puzzle for awhile, I realized that while it might be appropriate for middle school and high school students, it was too difficult for elementary students. However, by modifying the puzzle I was able to come up with several simpler versions that are suitable for students in grades four to six. (I did this by changing the numbers of blocks used and the ending positions of those blocks.) Interestingly, these easier versions were as rich in mathematics as Junk's original puzzle. For those who want to try it, Junk's puzzle appears as the ultimate challenge at the end of the third student sheet.

In *Junk's Puzzles*, students work on a series of puzzles that get progressively harder. The task in each puzzle is to get the blocks from the left to the upper right side of the frames provided. Initially, all students should worry about is solving the puzzles. As they gain confidence at each level, they can try to switch the blocks using the minimum number of moves. For counting purposes, a move is one complete motion of a single block. The minimum number of moves for each puzzle forms a nice mathematical pattern that will be explored in the subsequent *Maximizing Math* activity.

The sliding blocks used for this puzzle have a cross section of one square centimeter and are seven, six, five, four, and three centimeters long. Either Cuisenaire® rods or sets of interlocking centicubes (AIMS catalog number 1920) are perfect manipulatives for the puzzles. If these manipulatives are not available, the rectangular pieces at the bottom of the first student page can be cut out and used instead. If this page is copied onto card stock, the pieces will be easier to manipulate.

I hope that you and your students enjoy these puzzles. The solutions appear in the *Maximizing Math* activity in this issue, but please try the puzzles yourself before looking at the solutions. This will give you a good idea of how the puzzles work and what your students will encounter when they do the activity. We will have another puzzle for you in the next issue of *AIMS*®. If you have any questions or comments, you can send me an email (dyoungs@fresno.edu) or write to me in care of AIMS.

Last Month's Puzzle

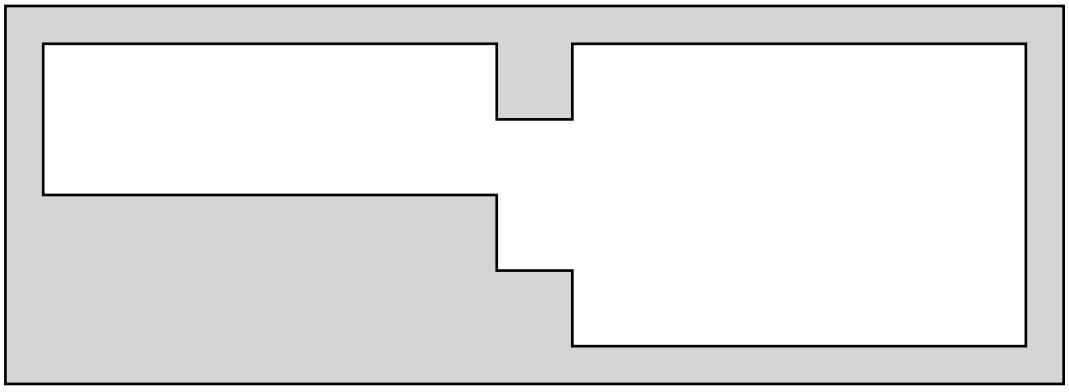
The *Puzzle Corner* last month presented a series of trick questions for students to answer. The questions and their solutions are given here.

1. *You have two coins that are worth 30 cents. One of the coins is not a nickel. What are the two coins?*
   You have a nickel and a quarter. The quarter is not a nickel.
2. *Juan had 35 grapes in his lunch pail. He ate all but nine. How many did he have left?*
   He had nine grapes left.
3. *Nicki has eight identical blue socks and eight identical green socks all mixed up in her sock drawer. If she reaches in without looking, what is the minimum number she must pull out to get a matching pair?*
   Three. If she pulls out three socks the possibilities are: three blue, two blue and one green, one blue and two green, or three green. No matter what, she will have a matching pair.
4. *How much dirt is in a hole that is one meter deep, two meters wide, and five meters long?*
   None. Holes don't have dirt in them.
5. *A truck can haul 2 tons of rocks at a time. How many trips will it take to haul 5 tons?*
   Three trips. You cannot make half a trip.

Jack's PUZZLES

In each of the following sliding block puzzles, the challenge is to move the blocks from the left side of the frame to the top right. Blocks need to be moved one at a time and have to stay in the white area within the boundaries of the frame. Blocks must remain horizontal as they slide left, right, up, and down. The bottom block (A) in each puzzle is 7 cm long. Each additional block (B – E) is 1 cm shorter.

To see how these puzzles work, do the following example. Place blocks A and B on the left side of the frame below. Slide block A to the right and down (move 1). Slide block B down, to the right, and then up (move 2). Slide block A up, completing the switch (move 3).



If you don't have sliding blocks, cut out the rectangles below and use them instead.

A

B

C

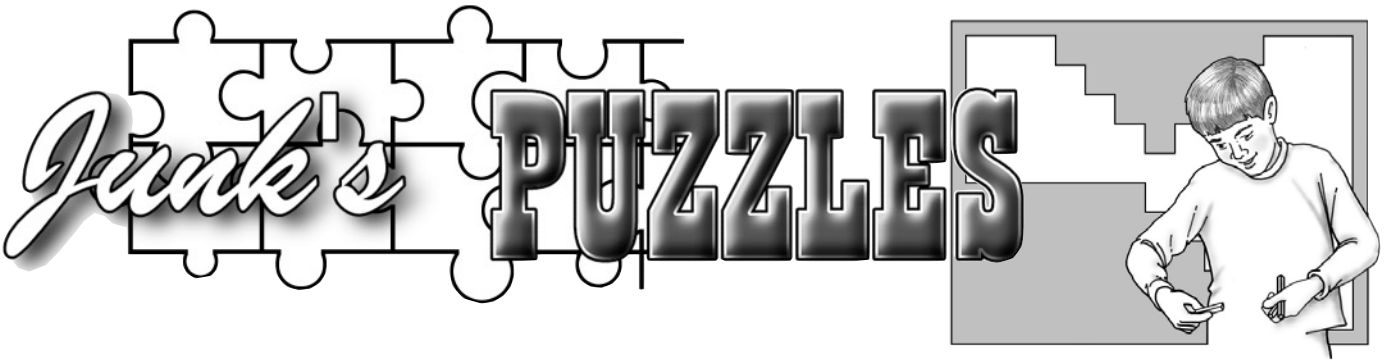
D

E

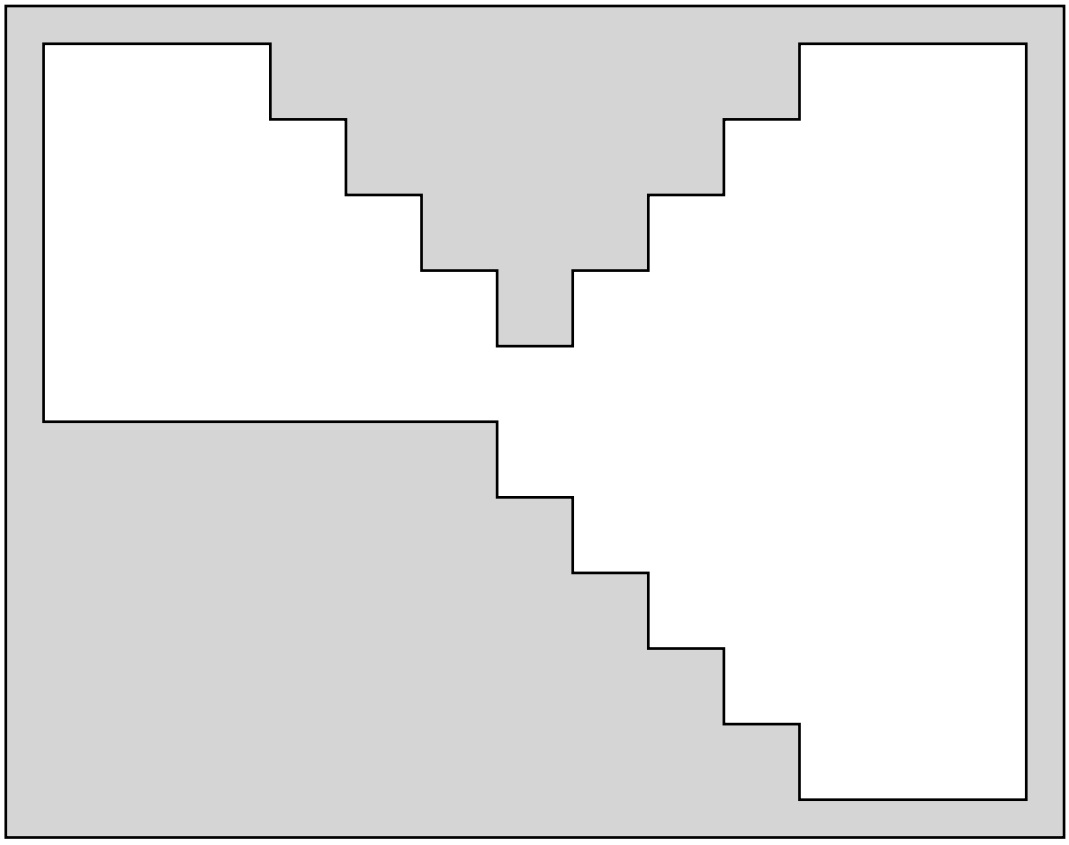
Junk's PUZZLES

Puzzle 1: Place blocks A, B, and C in the left side of the frame below. Move the blocks in the same way you did in the practice puzzle. Get them to switch to the top right side of the frame.

Puzzle 2: Place blocks A, B, C, and D in the left side of the frame below. Switch the blocks to the top right side of the frame by moving them one at a time.



Puzzle 3: Place blocks A, B, C, D, and E in the left side of the frame. Switch the blocks to the top right side by moving them one at a time.



Ultimate challenge: Using the frame above, get the blocks to switch from the left side to the bottom right.