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Grade Level/Subject: 8th Math

Topic: Traffic Jam

Objectives (P.A.S.S.): Standard 2.2a - Use the rules of exponents, including interger exponents, to solve problems.

Introduction:

Here's the problem:

There are seven stepping stones and six people. On the three left-hand stones, facing the center, stand three of the people. The other three people stand on the three right-hand stones, also facing the center. The center stone is not occupied.

The CHALLENGE! - Exchanging Places

Everyone must move so that the people origionally standing on the right-hand stepping stones are on the left-hand stepping stones and so that those origionally standing on the left-hand stepping stones are on the right-had stones, with the center again upoccupied.

Instructional process: The Rules:

1. After each move, each person must be standing on a stepping stone.
2. If you start on the left, you may move only to the right. If you start on the right, you may move only to the left.
3. You may "jump" another person if the stone on the other side is empty. You may not "jump" more than one person.
4. Only one person may move at a time.

Large movement experience:

Each group of six students is given seven sheets of paper to use as stepping stones. Areas of the room are assigned to each group, and the activity begins. Allow enough time for the groups to try to find the minimum number of moves necessary to complete the task.

Simulating the activity:

Once the activity has been experienced as large movement, students will use what they have learned to try it on a smaller scale. Each group is given six small objects (plastic figures, poker chips, etc.) with which to simulate the activity. As groups try to find the fewest number of moves necessary to complete the exchange of places, the teacher circulates among them to monitor the activity.

Closure: At this point, students have investigated the problem using large manipulatives (their bodies) and small manipulatives (plastic figures). Some students will discover the minimum number of moves for six people. Other students will not master the activity, but will gain a better understanding of the task.

Assessment: Have the students sit down and think in terms of a pattern:

1. What if only two people and three spaces are involved?
How many moves are needed for the two people to exchange positions?
2. What if four people and five spaces are involved?
How many moves are needed for four people to exchange positions?
3. What about six people?
4. What about eight people?
5. What about 10 people?
6. Can you find a pattern for any number of people?

Students can first make a data table using the information gathered so far. Columns might be made for just the "number of pairs", the "number of people" and the first three entries for the "minimum number of moves".

Number of pairs	Number of People	Min. number of moves
1	2	3
2	4	8
3	6	15
4	8	
5	10	
6	12	

Ask students: What pattern do you see? Are any relationships evident among the numbers in any of the three columns? Consider just the first and third column. What if we let "n" equal the number of pairs? Can we generate any of the numbers in the "minimum number of moves" column?

Does $1 \times 1 + 2 \times 1 = 3$?

Does $2 \times 2 + 2 \times 2 = 8$?

Does $3 \times 3 + 2 \times 3 = 15$?

Using the formula you developed ask the students to complete the table and write an equation to represent their findings.

Modifications/Accommodations: ELL students could be grouped with bi-lingual students in order to better understand the activity.

Reflection: N/A (I have been on maternity leave since August 17 and have not taught any lessons this school year.)