

Traffic Jam

(game originally found at mathforum.org)

How to Play the Game

There are 6 people standing on 7 stepping stones as drawn below.



The goal is to move to the position below: everyone has successfully navigated the traffic jam and can continue on their way.



People move according to the following rules:

1. You may only move from stone to stone, nowhere else.
2. If you began on the left, you may only move to the right. If you began on the right, you may only move to the left.
3. You may either move to an unoccupied stone directly in front of you, or you may jump at most one person in front of you to get to an unoccupied stone on the other side of the person.
4. Only one person can move at a time.

Lesson Plan

Begin by introducing the rules and then divide the class into groups of 6 or 7. If a group has 7 students, one student will be the director and record-keeper.

Give each group 7 pieces of paper to be stepping stones and have the students physically play this game, actually moving from paper to paper according to the rules above.

Their instructions are to solve the puzzle in as few moves as possible. They should keep track of these moves so that they can repeat them easily.

Once groups begin to solve it in the minimum number of moves (15), tell them they now need to do it as quickly as possible. Have someone time them and give all groups several chances to get their best time.

Introduce the big question to the students: If we had 100 people and 101 stepping stones, how long would it take them to complete the game? 1000 people and 1001 stepping stones? Gather some guesses on the board.

Allow students to play the game at their desks with coins or other objects in place of people and squares drawn on a piece of paper as stepping stones.

The task is to come up with a formula for the minimum number of moves. They should try with 2 objects and 3 stones, 4 objects and 5 stones, 8 objects and 9 stones,... and build a chart of their data.

In the end, with $2n$ objects, the number of moves should be n^2+2n . Once they've found this formula, start talking about your timed trials.

How long did it take with 6 people and 15 moves?

If you estimate 1 second per move (which is very fast!), how long would it take 100 people? 1000?