Tower of Rewot

October 2023
C++ — 2 SEC — 512 MB

Tina loves playing games. She loves playing them outdoors, indoors, and in-and-out-of-doors. Today, she is puzzling over the Tower of Rewot.

The Tower of Rewot is a wooden toy composed of 4 carved pegs and **n** circular discs. Each disc has a unique size from 1 to **n**; initially, all discs are stacked on a single starting peg in size order with the smallest at the top. To complete the puzzle, all the discs must one at a time be moved from the starting peg to the finishing peg. However, at no point can a larger disc be stacked on top of a smaller disc. A valid move takes the top disc from one peg and places it at the top of the stack on any other peg, without breaking the above condition. Tina, being extremely competitive, wants to solve the Tower of Rewot in the fewest number of moves.

The starting peg is labelled 1 and the target peg is labelled 4. Pegs 2 and 3 may also be used throughout the solution.

INPUT You will be given a single integer, **n**, denoting the number of discs in the Tower of Rewot.

$1 \leq \mathbf{n} \leq 200$

OUTPUT Output a single integer, t the smallest number of moves required to move all the discs from the starting peg to the finishing peg. This should be followed by t lines giving each move in your optimal solution. A move should be given as 2 integers, **s** and **f**, denoting that the top disc on peg **s** should be moved to peg **f**.

SAMPLE For example, suppose there are 4 discs in the Tower of Rewot. The smallest number of moves in which the puzzle can be completed is 9. One optimal solution is: $1 \rightarrow 4$, $1 \rightarrow 2$, $4 \rightarrow 2$, $1 \rightarrow 3$, $1 \rightarrow 4$, $3 \rightarrow 4$, $2 \rightarrow 3$, $2 \rightarrow 4$, $3 \rightarrow 4$.

INPUT	OUTPUT
5	13 1 3 1 4 1 2 4 2 3 2 1 3 1 4 3 4 2 1 2 3 2 4 3 4 1 4