ECE30018 Problem Solving Studio, Fall 2023

C4. Tower of Hanoi

| Submission due: 1:00 PM, 4 Oct Wed

Tower of Hanoi

The Tower of Hanoi is a game to play with 3 rods (rod 1, rod 2, and rod 3) and n disks of different sizes (disk 1 disk 2, ..., disk n). Disk i is lager than disk j if only if $i > j$. The game starts with the disks distributed upon three rods. A disk can be stacked upon another disk in a rod if the former is smaller than the latter. Thus, the disks in each rod are stacked in the ascending order of their sizes, that is, the top-most one is the smallest one in the rod.

The goal of the game is to place all disks in a certain rod (destination rod) with the minimum number of disk moves. The game player is allowed to move one disk at a time, from rod to rod if the aforementioned condition is satisfied.

Note that this game is a generalized version of the traditional Tower of Hanoi game which starts with all disks stacked in one rod. It is known that, in the traditional game, the minimum number of disk moves is 2^n -1 for n disks.

Write a program that reads the initial state of the game and then finds the minimum number of disk moves to finish the game.

Requirements

Input

- The first line from the standard input has two numbers n and k. n stands for the number of disks where $1 \le n \le 50$. k represents the destination rod where $1 \le k \le 3$.
- The second to forth lines represent how initially the disks are stacked over three rods. Each line starts with n_i, the number of the disks in rod $i, 1 \le i \le 3$ followed by n_i integers that represent the disks initially stacked from bottom to top in rod i.

Output

- Write the number of the minimum disks moves to the standard output. Your program must generate the result within 0.5 second.

Examples of test cases

Input 1	Output 1	Input 2	Output 2
4 2 2 4 3 1 2 1 1	13	4 3 4 4 3 2 1 0 0	15

C4 Teams

Team No.	Members
401	오인혁, 이신원
402	이준명, 이원빈
403	박세찬, 최혜림
404	백건하, 유건민
405	백하현, 전혜림
406	최정겸, 강하림
407	나보림, 소병찬
408	최소미, 박민지