Problem 8: Bay Area's Revolutionary Train
4+2+2=8 Points

Problem ID: `subway`
Rank: `2+2+3`

***Bounty: A Limited Edition BART 50th anniversary Clipper Card** for the first team to solve any test set for this problem and fill out this Google Form!*

Introduction

The setup of this problem is very similar to `crosstown`! Key changes in `subway` are highlighted.

The year is 2048 and the BART (Bay Area Rapid Transit) has completed its long-awaited Silicon Valley Extension! They've also acquired Caltrain, creating the very first circular train line in the Bay Area! Despite only one train car working, CALICO's Biggest Railfan excitedly rushes to film the occasion, but realizes he can't get any clear footage due to nonstop passenger flow at every single station. How long will it be until traffic finally clears up?

Problem Statement

There is a circular subway loop with $\mathbf{M}$ stations numbered 1 to $\mathbf{M}$. There are $\mathbf{N}$ passengers numbered 1 to $\mathbf{N}$ spread across these stations. Each passenger begins at their starting station $\mathbf{S}_1, \mathbf{S}_2, \ldots, \mathbf{S}_\mathbf{N}$, and needs to go to their ending station $\mathbf{E}_1, \mathbf{E}_2, \ldots, \mathbf{E}_\mathbf{N}$. To get there, they board a single subway that goes around the loop that can carry at most $\mathbf{K}$ passengers.

The stations are arranged clockwise on a circle by their numbers in ascending order. The subway begins at station 1 and travels clockwise, stopping at each station along the way. After stopping at station $\mathbf{M}$, it loops back to station 1.

At each station (including the initial station 1), passengers already on the subway whose $\mathbf{E}_i$ is the current station will exit the subway as they have arrived at their ending station. Then, passengers whose $\mathbf{S}_i$ is the current station will enter the subway in order of ascending passenger number i (smaller passenger numbers enter first) until there are no more passengers at the station or the number of passengers on the subway reaches the maximum of $\mathbf{K}$. Then, the subway travels to the next station.

Each station is 1 mile apart. Find the total distance in miles the subway must travel until all passengers have arrived at their ending station.

Input Format

The first line of the input contains a single integer $\mathbf{T}$ denoting the number of test cases that follow. For each test case:

- The first line contains three space-separated integers $\mathbf{N}$ $\mathbf{M}$ $\mathbf{K}$ denoting the number of passengers, the number of stations, and the maximum number of passengers the subway can carry.
- The second line contains $\mathbf{N}$ space-separated integers $\mathbf{S}_1$ $\mathbf{S}_2$ $\ldots$ $\mathbf{S}_\mathbf{N}$, denoting the starting station for each passenger in ascending order of passenger numbers.
- The third line contains $\mathbf{N}$ space-separated integers $\mathbf{E}_1$ $\mathbf{E}_2$ $\ldots$, $\mathbf{E}_\mathbf{N}$, denoting the ending station for each passenger in ascending order of passenger numbers.

Output Format

For each test case, output a single line containing an integer denoting the distance the subway must travel before all passengers arrive at their ending station.

*Careful! For the **second bonus test set only**, if you are a Java or C/C++ programmer, be aware that the int variable type may be too small to contain the final answer! Java programmers can use variable types long or float instead, and likewise long long or float for C/C++.*

Constraints

$1 \leq \mathbf{T} \leq 100$
$1 \leq \mathbf{S}_i, \mathbf{E}_i \leq \mathbf{M}$
$\mathbf{S}_i \neq \mathbf{E}_i$

Main Test Set

$1 \leq \mathbf{N}, \mathbf{K} \leq 10$
$2 \leq \mathbf{M} \leq 10$

Bonus Test Set 1

$1 \leq \mathbf{N}, \mathbf{K} \leq 250$
$2 \leq \mathbf{M} \leq 10^4$

Bonus Test Set 2

$1 \leq \mathbf{N}, \mathbf{K} \leq 10^5$
$2 \leq \mathbf{M} \leq 10^9$
The sum of $\mathbf{N}$ across all test cases in a test file does not exceed 10^5.

Sample Test Cases

Sample Input Download

```
6
1 6 1
3
5
2 6 2
1 4
5 6
2 6 1
1 4
5 6
2 8 2
2 3
6 5
4 5 2
1 3 3 5
4 5 1 2
7 7 1
1 1 1 1 1 1 1
7 7 7 7 7 7 7
```

Sample Output Download

```
4
5
11
5
10
48
```

Sample Explanations

For test case #1, we have a single passenger starting at station 3 who wants to get to station 5. The subway starts at station 1, then travels to station 2, then station 3. The passenger gets on at station 3. Then, the subway travels to station 4, then station 5. The passenger gets off at station 5, and all passengers have now arrived. The total distance traveled was 4 miles.

For test case #2, the subway picks up a passenger at station 1, picks up another passenger at station 4, drops off a passenger at station 5, and drops off another passenger at station 6, for a total of 5 miles.

For test case #3, the subway picks up a passenger at station 1, stops at station 4 but is unable to pick up another passenger because the maximum number of passengers has been reached, drops off the passenger at station 5, then loops around to pick up and drop off the last passenger, for a total of 11 miles.

For test case #5, there are multiple passengers starting at station 3. We start with the sole passenger at station 1 boarding the train. When we get to station 3, the subway only has one seat left. The passenger that gets on is the one with $\mathbf{E}_i = 5$ because their passenger number is smaller than the other passenger. The second passenger in line waits for the subway to loop around. A timeline of events is shown below.