

Problem 3: Bay Area's Railway Traversal

3 Points

Problem ID: `crosstown`

Rank: 1

Bounty: A CALICO Edition (Unofficial) BART [Clipper Card](#) for the first team to solve any test set for this problem and fill out this [Google Form](#)!

Introduction

`crosstown` and `subway` form a two-part series with a similar setup! Be sure to check both out!

The year is [2038](#) and the [BART \(Bay Area Rapid Transit\)](#) is nearing completion of its long-awaited [Silicon Valley Extension](#)! They've also acquired [Caltrain](#), and plan to create the [very first circular train line in the Bay Area](#)! Eager to see how things will be upon completion, [CALICO's Biggest Railfan](#) surveys members of the CALICO Team to CALICalculate some statistics. Which crosstown CALICommuters will be riding on the subway the longest?

Problem Statement

There is a circular subway loop with M stations numbered 1 to M . There are N passengers numbered 1 to N spread across these stations. Each passenger begins at their starting station S_1, S_2, \dots, S_N , and needs to go to their ending station E_1, E_2, \dots, E_N . To get there, they board a single subway that goes around the loop.

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 M , it loops back to station 1.

At each station (including the initial station 1), passengers already on the subway whose E_i is the current station will exit the subway as they have arrived at their ending station. Next, passengers whose S_i is the current station will enter the subway. Then, the subway travels to the next station.

Each station is 1 mile apart. Find the longest distance traveled by any passenger when getting from their starting station to their ending station.

*Note: Templates are available for this problem—and **all other problems in this contest**—in Python, Java, and C++! Find them in the [contest.zip provided at the start of the contest](#). Templates handle input and output for you, so you can just fill out a single function!*

Input Format

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

- The first line contains two space-separated integers N M denoting the number of passengers and the number of stations.
- The second line contains N space-separated integers S_1 S_2 \dots S_N , denoting the starting station for each passenger in ascending order of passenger numbers.
- The third line contains N space-separated integers E_1 E_2 \dots E_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 longest distance traveled by any passenger when getting from their starting station to their ending station, in miles.

Constraints

$$1 \leq T \leq 100$$

$$1 \leq S_i, E_i \leq M$$

$$S_i \neq E_i$$

$$1 \leq N \leq 10$$

$$2 \leq M \leq 10$$

Sample Test Cases

Sample Input

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

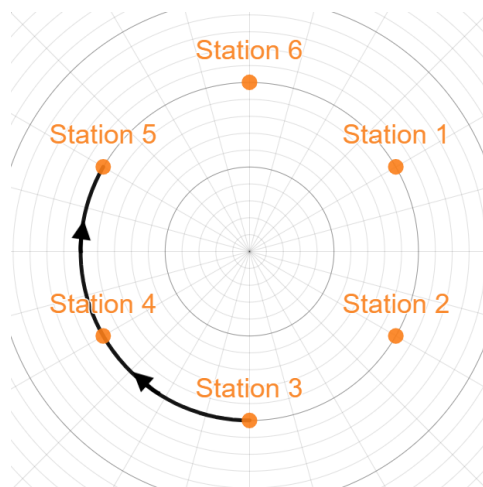
Sample Output

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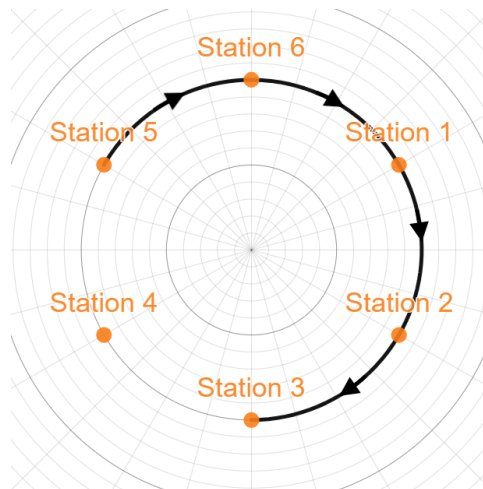
```
2
4
4
4
3
6
```

Sample Explanations

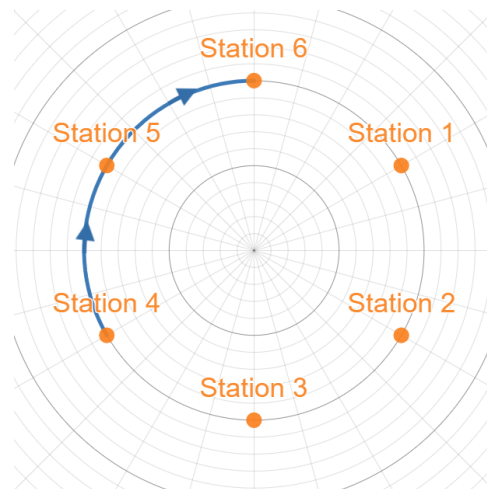
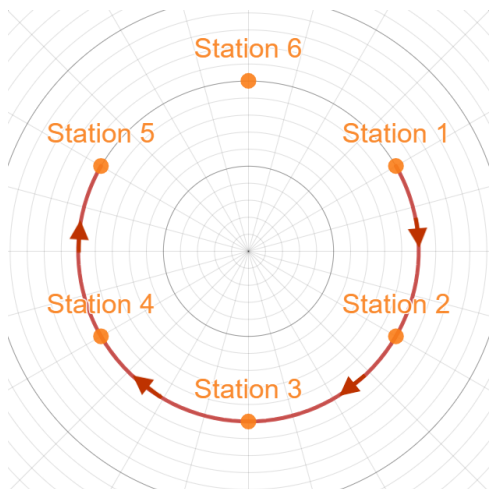
For test case #1, we have $N = 1$ passenger starting at station 3 who wants to get to station 5 in a loop with $M = 6$ stations. The subway travels to station 3, and the passenger enters. Then, the subway travels 2 miles to station 5, and the passenger exits. The passenger traveled 2 miles to get from their starting station to their ending station. Since there is only one passenger, the answer is 2. The path is illustrated below.



For test case #2, the situation is similar to test case #1 except the passenger starts at station 5 and ends at station 3. Since the subway is a loop, the passenger travels 4 miles in total: 5 → 6, 6 → 1, 1 → 2, and 2 → 3. Thus, the answer is 4. The path is illustrated below.



For test case #3, there are two passengers. The first passenger starts at station 1, ends at station 5, and travels 4 miles. The second passenger starts at station 4, ends at station 6, and travels 2 miles. Since the passenger who traveled 4 miles traveled further than the passenger who traveled 2 miles, the answer is 4. These two paths are illustrated below.



For test case #4, the passengers travel distances of 4 and 2. The longest is 4, so the answer is 4.

For test case #5, the passengers travel distances of 3, 2, 3, 2. The longest is 3, so the answer is 3.

For test case #6, all passengers have the same starting and ending stations and travel exactly 6 miles.