

# 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

[Download](#)

```
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
```

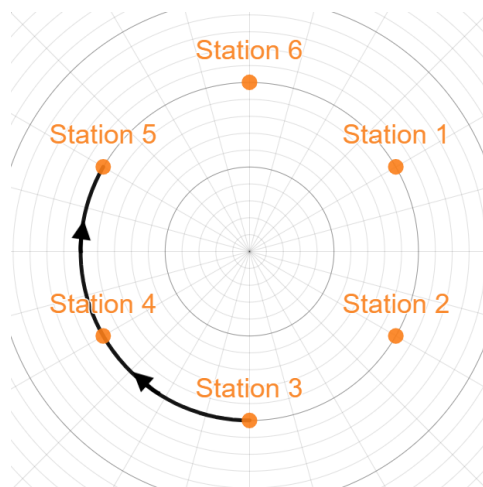
## Sample Output

[Download](#)

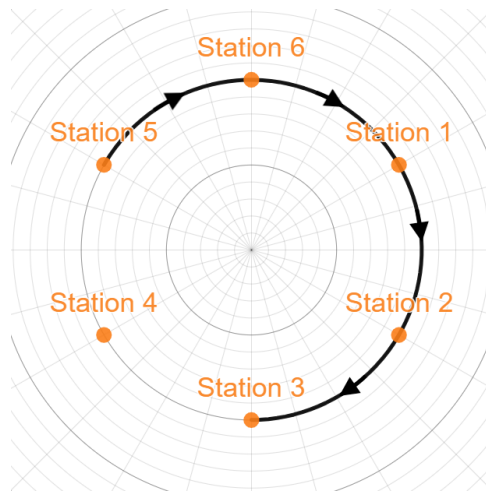
```
2
4
4
4
3
6
```

## Sample Explanations

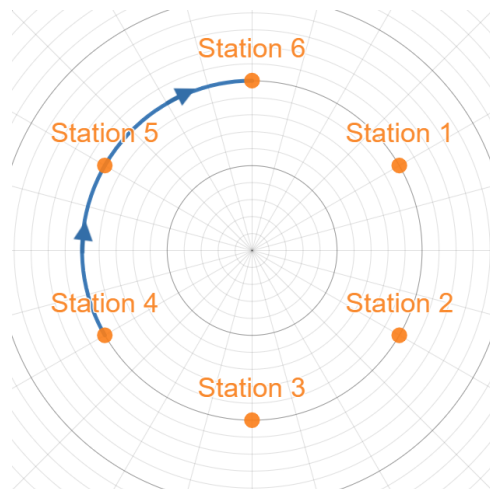
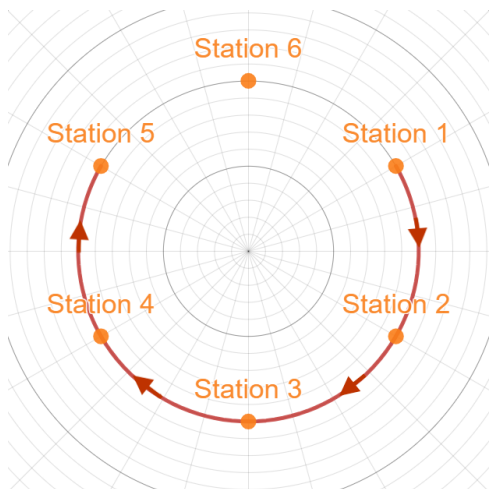
For test case #1, we have  $N = 1$  passenger starting at station 3 who wants to get to station 5 in a loop with  $M = 6$  stations. The subway travels to station 3, and the passenger enters. Then, the subway travels 2 miles to station 5, and the passenger exits. The passenger traveled 2 miles to get 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.

## 第 3 题：湾区铁路穿越

### 3 分

问题标识符号：crosstown

难度等级：1

**奖励：** 首个通过此问题任意测试集并填写[此表格](#)的团队可赢得[CALICO版（非官方）湾区捷运系统公交卡](#)！

## 问题背景

“crosstown” 和 “subway” 组成了一个两部曲系列，它们有相似的设定！两者的背景一定都要看哦！

2038年，[旧金山湾区捷运系统](#)期盼已久的硅谷轨交延伸段即将竣工！同时它收购了[加州专列](#)，计划建成湾区首条环形列车线路！CALICO的头号铁路粉丝迫不及待地想要见到这条线路运行后的情景，于是他对众多湾区居民进行了调查，以计算出一些统计数据。哪些需要在城市间通勤的人们将乘坐最长时间的地铁？

## 问题描述

一条环线地铁有  $M$  个站点，编号为 1 到  $M$ 。这些站点中共有  $N$  位乘客，编号为 1 到  $N$ 。每位乘客在各自的起始站  $S_1, S_2, \dots, S_N$  搭乘环线地铁列车前往其下车站点  $E_1, E_2, \dots, E_N$ 。

所有站点按序号升序顺时针排列。地铁列车从站点 1 出发，顺时针行驶，途经每个站点停车。在站点  $M$  停车后，列车返回站点 1 再次开始环形运行。

在每一个站点（包括起始站点 1），其  $E_i$  为当前站点的在列车上的乘客会下车。然后，其  $S_i$  为当前站点的乘客会上车。地铁接着开往下一站点。

每一站点间隔 1 英里。请找到任何乘客从起始站到达目的地站时所乘坐的最长距离。

**注意：** 该问题以及本次活动中的所有其他问题都有 Python, Java, 和 C++ 版本的模板！你可以在活动开始时提供的[contest.zip](#)文件中找到它们。模板会帮你处理输入输出格式，让你可以直接编写问题的解决答案！

## 输入格式

输入的第一行包含一个整数  $T$ ，表示测试用例的数量。

对于每一个测试用例：

- 第一行包括三个用空格隔开的整数  $N$   $M$ ，分别表示乘客数量和站点数量。
- 第二行包含  $N$  个用空格隔开的整数  $S_1, S_2, \dots, S_N$ ，表示按照乘客编号的升序，每位乘客的起始站点。
- 第三行包含  $N$  个用空格隔开的整数  $E_1, E_2, \dots, E_N$ ，表示按照乘客编号的升序，每位乘客的下车站点。

## 输出格式

对于每一个测试用例，单独输出一行，包含一个整数，表示任何乘客从起始站到目的站所乘坐的最长距离，以英里为单位。

## 数据范围

$$1 \leq T \leq 100$$

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

$$S_i \neq E_i$$

$$1 \leq N \leq 10$$

$$2 \leq M \leq 10$$

# 测试样例

## 主样例输入

[下载](#)

```
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
```

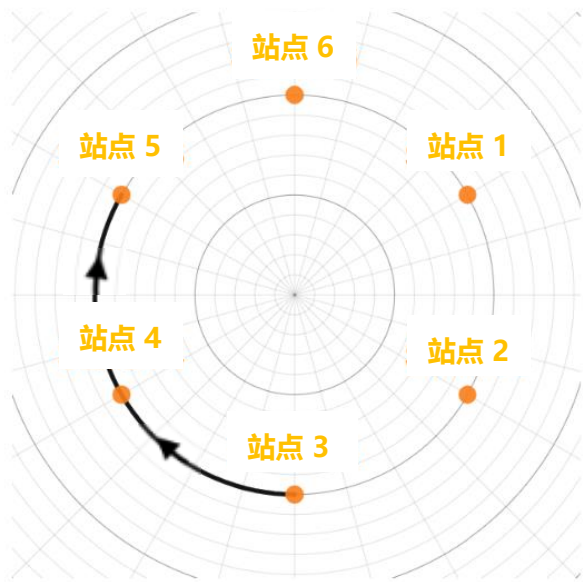
## 主样例输出

[下载](#)

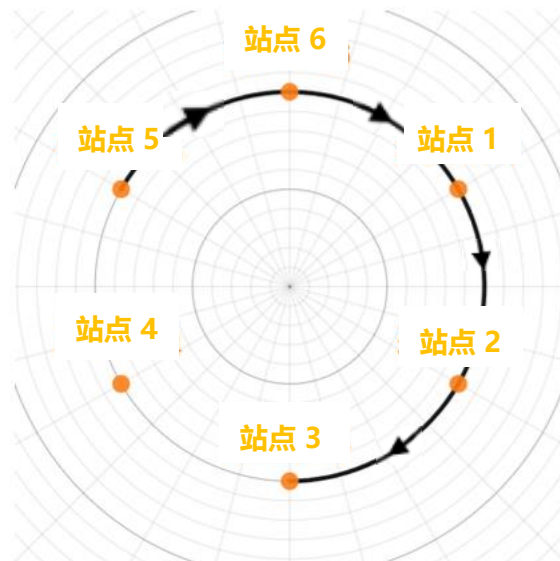
```
2
4
4
4
3
6
```

## 主样例解释

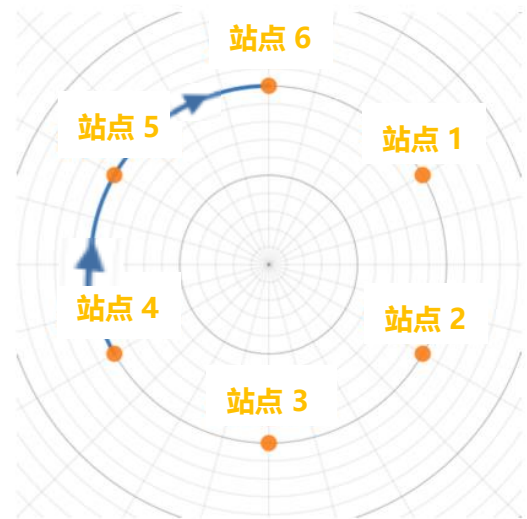
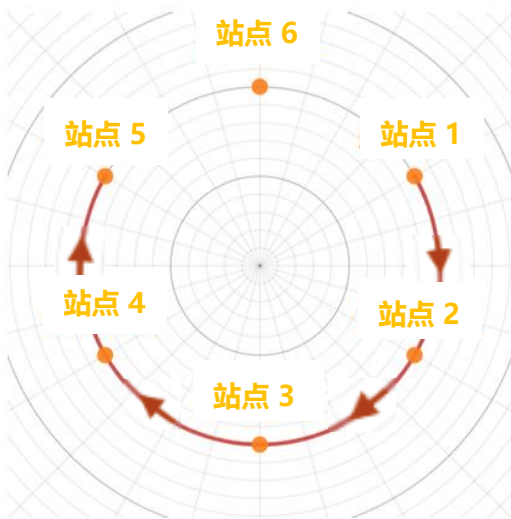
对于测试用例#1，这个环线地铁共有  $M = 6$  站，一位乘客想从地铁站点 3 上车，在站点 5 下车。列车到达站点 3 时，该乘客上车。随后，地铁行驶 2 英里，到达站点 5 时，该乘客下车。他从他的起始站到目的站一共乘坐了 2 英里。因为他是唯一的乘客，所以答案为 2 英里。行程如下图所示。



测试用例#2与#1相似，只是这位乘客是从站点 5 上车，在站点 3 下车。由于此地铁线路为一个环线，乘客总共乘坐了 4 英里：5 → 6，6 → 1，1 → 2 和 2 → 3。因此，答案为 4。行程如下图所示。



对于测试用例#3，有两位乘客。第一位乘客在地铁站点 1 上车，在站点 5 下车，乘坐了 4 英里。第二位乘客在站点 4 上车，在站点 6 下车，乘坐了 2 英里。因为第一位乘客乘坐的距离相比于第二位乘客更长，所以答案为 4。两位乘客的行程如下图所示。



对于测试用例#4，乘客们乘坐的距离分别为 4 和 2。最长的距离为 4，所以答案为 4。

对于测试用例#5，乘客们乘坐的距离分别为 3，2，3，2。最长的距离为 3，所以答案为 3。

对于测试用例#6，所有乘客们都有相同的起始和下车站点，都乘坐了 6 英里。