Two Robots

HackerRank

You have a warehouse with M containers filled with an infinite number of candies. The containers are arranged in a single row, equally spaced to be 1 meter apart. You also have 2 robots that can pick up 1 piece of candy and transport it between any two containers.

The robots take instructions in the form of *queries* consisting of two integers, M_a and M_b, respectively. To execute a query, a robot travels to container M_a, picks up 1 candy, transports it to container M_b, and then stops at M_b until it receives another query.

Calculate the *minimum total distance* the robots must travel to execute N queries *in order*.

Note: You choose which robot executes each query.

Input Format

The first line contains a single integer, T (the number of test cases); each of the T test cases is described over $N + 1$ lines.

The first line of a test case has two space-separated integers, M (the number of containers) and N (the number of queries).
The N subsequent lines each contain two space-separated integers, M_a and M_b, respectively; each line N_i describes the i^{th} query.

Constraints

- $1 \leq T \leq 50$
- $1 < M \leq 1000$
- $1 \leq N \leq 1000$
- $1 \leq a, b \leq M$
- $M_a \neq M_b$

Output Format

On a new line for each test case, print an integer denoting the *minimum total distance* that the robots must travel to execute the queries in order.

Sample Input

```
3
5 4
1 5
3 2
4 1
2 4
4 2
1 2
4 3
10 3
2 4
```

```
5 4
9 8
```

Sample Output

```
11
2
5
```

Explanation

In this explanation, we refer to the two robots as R_1 and R_2, each container i as M_i, and the total distance traveled for each query j as D_j.

Note: For the first query a robot executes, there is no travel distance. For each subsequent query that robot executes, it must travel from the location where it completed its last query.

Test Case 0:
The minimum distance traveled is 11:

- Robot: R_1
  $M_1 \rightarrow M_5$
  $D_0 = |\,1 - 5\,| = 4$ meters.
- Robot: R_2
  $M_3 \rightarrow M_2$
  $D_1 = |\,3 - 2\,| = 1$ meter.
- Robot: R_1
  $M_5 \rightarrow M_4 \rightarrow M_1$
  $D_2 = |\,5 - 4\,| + |\,4 - 1\,| = 1 + 3 = 4$ meters.
- Robot: R_2
  $M_2 \rightarrow M_2 \rightarrow M_4$
  $D_3 = |\,2 - 2\,| + |\,2 - 4\,| = 0 + 2 = 2$ meters.

Sum the distances traveled ($D_0 + D_1 + D_2 + D_3 = 4 + 1 + 4 + 2 = 11$) and print the result on a new line.

Test Case 1:

- Robot: R_1
  $M_1 \rightarrow M_2$
  $D_0 = |\,1 - 2\,| = 1$ meters.
- Robot: R_2
  $M_4 \rightarrow M_3$
  $D_1 = |\,4 - 3\,| = 1$ meters.

Sum the distances traveled ($D_0 + D_1 = 1 + 1 = 2$) and print the result on a new line.

Test Case 2:

- Robot: R_1
  $M_2 \to M_4$
  $D_0 = |\, 2 - 4 \,| = 2$ meters.

- Robot: R_1
  $M_4 \to M_5 \to M_4$
  $D_1 = |\, 4 - 5 \,| + |\, 5 - 4 \,| = 1 + 1 = 2$ meters.

- Robot: R_2
  $M_9 \to M_8$
  $D_2 = |\, 9 - 8 \,| = 1$ meters.

Sum the distances traveled ($D_0 + D_1 + D_2 = 2 + 2 + 1 = 5$) and print the result on a new line.