

Problem C

Distribution Distance

Time limit: 3 seconds

Randomized computation is an important technique in Computer Science. However, true randomness is impossible because of the finiteness of the currently available computational models. What we can have is pseudo-randomness. Bob is interested in designing pseudo-random number generator, which outputs the so-called “random numbers” ranging from 1 to N . Recently, he designs two methods to generate the pseudo-random numbers. He wants to know how close are these two methods, and experiments for M times. Let $c_{i,j}$ be the number of times that the integer j appears in the experiments with method i , for $i = 1, 2$ and $j = 1, \dots, N$. That is, $\langle c_{1,1}, \dots, c_{1,N} \rangle$ is the statistics of method 1, and $\langle c_{2,1}, \dots, c_{2,N} \rangle$ is for method 2. Note $\sum_{j=1}^N c_{i,j} = M$, for $i = 1, 2$. Let $[N]$ denote the set $\{1, \dots, N\}$. Given the two statistics, we want to determine the value

$$\max_{A \subseteq [N]} \left| \sum_{j \in A} c_{1,j} - \sum_{j \in A} c_{2,j} \right|,$$

which is the so-called *distribution distance*.

For example, let $N = 6, M = 10$ and two sequences be $\langle 2, 1, 1, 3, 0, 3 \rangle$ and $\langle 1, 0, 1, 4, 1, 3 \rangle$. Then the answer is 2 for $A = \{1, 2\}$ or $\{1, 2, 6\}$. Note that it is possible to have more than one subset to achieve the maximum value. Your task is to write a program to help Bob find the distance between the two statistics.

Technical Specification

1. $1 < N < 100$
2. $1 < M < 10,000$

Input File Format

The first line of the input gives the number of test cases, T (< 10). Each test case has three lines. For each case, the first line consists of two positive integers N, M indicating the range of pseudo-random number and the number of experiments made, respectively. Each of the next two lines contains N non-negative integers: $c_{i,1} \ c_{i,2} \dots c_{i,N}$, separated by space(s) and with the sum M , indicating the statistics of experiments.

Output Format

For each test case, output one line that contains the value of distribution distance.

Sample Input

```
2
6 10
2 1 1 3 0 3
1 0 1 4 1 3
10 7
1 1 1 0 0 1 1 1 1 0
0 0 0 4 2 0 1 0 0 0
```

Sample Output for the Sample Input

```
2
6
```