# **Cutting Boards**



Chinese Version Russian Version

Alice gives Bob a board composed of  $m \times n$  wooden squares and asks him to find the minimum cost of breaking the board back down into individual  $1 \times 1$  pieces. To break the board down, Bob must make cuts along its horizontal and vertical lines.

To reduce the board to squares,  $x_{n-1}$  vertical cuts must be made at locations  $x_1, x_2, \ldots, x_{n-2}, x_{n-1}$  and  $y_{m-1}$  horizontal cuts must be made at locations  $y_1, y_2, \ldots, y_{m-2}, y_{m-1}$ . Each cut along some  $x_i$  (or  $y_j$ ) has a cost,  $c_{x_i}$  (or  $c_{y_j}$ ). The total cost of a cut is  $n \times c$ , where n is the number of already-cut segments that the cut passes through.

The cost of cutting the whole board down into  $1 \times 1$  squares is the sum of the cost of each successive cut. Recall that the cost of a cut is multiplied by the number of already-cut segments it crosses through.

Can you help Bob find the minimum cost?

## **Input Format**

The first line contains a single integer, q, denoting the number of queries. The  $3 \cdot q$  subsequent lines describe each query over 3 lines according to the following format:

- 1. The first line has two positive space-separated integers, m and n, detailing the respective height (y) and width (x) of the board.
- 2. The second line has m-1 space-separated integers listing the cost,  $c_{y_j}$ , of cutting a segment of the board at each respective location from  $y_1, y_2, \ldots, y_{m-2}, y_{m-1}$ .
- 3. The third line has n-1 space-separated integers listing the cost,  $c_{x_i}$ , of cutting a segment of the board at each respective location from  $x_1, x_2, \ldots, x_{n-2}, x_{n-1}$ .

**Note:** If we were to superimpose the  $m \times n$  board on a 2D graph,  $x_0$ ,  $x_n$ ,  $y_0$ , and  $y_n$  would all be edges of the board and thus not valid cut lines.

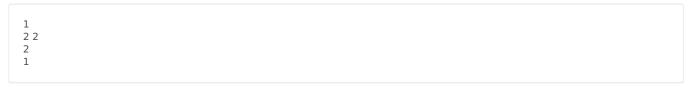
#### **Constraints**

- $1 \le q \le 20$
- $2 \le m, n \le 1000000$
- $0 \le c_{x_i}, c_{y_i} \le 10^9$

## **Output Format**

For each of the q queries, find the minimum cost (minCost) of cutting the board into  $1 \times 1$  squares and print the value of  $minCost \% (10^9 + 7)$ .

### Sample Input 0



## Sample Output 0

#### **Explanation 0**

We have a  $2\times 2$  board, with cut costs  $c_{y_1}=2$  and  $c_{x_1}=1$ . Our first cut is horizontal at  $y_1$ , because that is the line with the highest cost (2). Our second cut is vertical, at  $x_1$ . Our first cut has a totalCost of 2, because we are making a cut with cost  $c_{y_1}=2$  across 1 segment (the uncut board). The second cut also has a totalCost of 2, because we are making a cut of cost  $c_{x_1}=1$  across 2 segments. Thus, our answer is  $minCost=((2\times 1)+(1\times 2))\%$   $(10^9+7)=4$ .

## Sample Input 1

```
1
64
21314
412
```

## Sample Output 1

42

## **Explanation 1**

Our sequence of cuts is:  $y_5$ ,  $x_1$ ,  $y_3$ ,  $y_1$ ,  $x_3$ ,  $y_2$ ,  $y_4$  and  $x_2$ .

Cut 1: Horizontal with cost  $c_{y_5}=4$  across 1 segment.  $totalCost=4\times 1=4$  .

Cut 2: Vertical with cost  $c_{x_1}=4$  across 2 segments.  $totalCost=4\times 2=8$  .

Cut 3: Horizontal with cost  $c_{y_3}=3$  across 2 segments. totalCost=3 imes 2=6 .

Cut 4: Horizontal with cost  $c_{y_1}=2$  across 2 segments. totalCost=2 imes 2=4 .

Cut 5: Vertical with cost  $c_{x_3}=2$  across 4 segments.  $totalCost=2\times 4=8$  .

Cut 6: Horizontal with cost  $c_{y_2}=1$  across 3 segments. totalCost=1 imes 3=3 .

Cut 7: Horizontal with cost  $c_{y_4} = 1$  across 3 segments. totalCost = 1 imes 3 = 3 .

Cut 8: Vertical with cost  $c_{x_2}=1$  across 6 segments.  $totalCost=1\times 6=6$  .

When we sum the totalCost for all minimum cuts, we get 4+8+6+4+8+3+3+6=42. We then print the value of 42%  $(10^9+7)$ .