

## Algorithms Lab

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### Exercise – Real Estate Market

In *Algoland* the housing market is booming. Property prices are skyrocketing and *ALGO* (the *All Land Governing Organization*) decided to sell some of their sites to the highest bidder. They publicly announced all the  $M$  pieces of land that they want to sell and  $N$  potential buyers submitted their bids. Every buyer is interested in buying at most one piece of land and submitted a bid for all of the  $M$  sites (but they might bid just one franc if they are really not interested in a piece and hope for a bargain).

You now want to maximize *ALGO*'s profit and have to decide who gets which piece of land. But be aware of the state legislations! Depending on which state of *Algoland* the sites lie, you might not be allowed to sell all of them. To avoid hoarding by big real estate brokers, each of the  $S$  states in *Algoland* recently passed a new law that specifies a maximum number of sites that *ALGO* is allowed to sell in that state.

**Input** The first line of the input contains the number of test cases  $T$ . Each of the  $T$  test cases is described as follows.

- It starts with a line that contains three integers  $N$   $M$   $S$ , separated by a space and such that  $1 \leq N \leq 100$ ,  $1 \leq M \leq 100$  and  $1 \leq S \leq M$ .  $N$  denotes the number of interested buyers,  $M$  the number of sites that *ALGO* owns and  $S$  the number of states in *Algoland*.
- The second line contains  $S$  space separated integers. These numbers  $l_1, \dots, l_S$  denote the limits on the number of sites that can be sold in state  $i$ . We have  $0 \leq l_i \leq N$  for all  $i$ .
- The third line contains  $M$  space separated integers. These numbers  $s_1, \dots, s_M$  denote to which state each site belongs to. Site  $j$  belongs to state  $s_j$ , so we have  $1 \leq s_j \leq S$  for all  $j$ .
- The remaining  $N$  lines of each test case contain the bids, one potential buyer per line. The  $i$ -th of these lines contains the bids of the  $i$ -th potential buyer for all the sites represented as  $M$  numbers  $b_{i,1}, \dots, b_{i,M}$ . We have  $1 \leq b_{i,j} \leq 100$  for all  $i$  and  $j$ .

**Output** For each test case output a line with two integers  $c$  and  $p$ , the optimum number of sites sold and the maximum profit.

**Points** There are five groups of test sets, worth 20 points each.

1. For the first group of test sets, you may assume that  $N = M$ ,  $S = 1$ ,  $l_1 = N$  and  $N \cdot M \leq 10^3$ .
2. For the second group of test sets, you may assume that  $S = 1$ ,  $l_1 = N$  and  $N \cdot M \leq 10^3$ .
3. For the third group of test sets, you may assume that  $S = 1$  and  $N \cdot M \leq 10^3$ .
4. For the fourth group of test sets, you may assume that  $N \cdot M \leq 10^3$ .
5. For the fifth group of test sets there are no additional assumptions.

Corresponding sample test sets are contained in `testi.in/out`, for  $i \in \{1, 2, 3, 4, 5\}$ .

**Sample Input**

```
3
3 3 1
2
1 1 1
7 7 8
2 9 3
5 2 4
2 2 2
1 1
1 2
5 2
6 4
2 3 2
1 1
1 2 1
5 3 4
2 8 9
```

**Sample Output**

```
2 17
2 9
2 13
```