

Mentoring Assignment

The Problem

The Adolescent Shelter is a charitable institution which runs a program to support troubled adolescents via the help of mature volunteers. The program aims to pair an adolescent with a volunteer to provide the adolescent with the best possible mentoring and to provide the volunteer with a rewarding experience. Towards that goal, each volunteer and each adolescent is required to perform a personality-profiling test. A test reports a score for each of the **N** different personality traits. The scores can be in the range of 1 to 3000 inclusive. The test scores are presented as a report in the following form:

PersonCategory <name> s1, s2, s3, ... sN

where PersonCategory is either Adolescent or Volunteer, and each s_i ($1 \leq i \leq N$) is an integer value in the range of one (1) to three thousand (3000), inclusive.

The Adolescent Shelter decided to assign weights to indicate the importance of each personality trait. The weights (w_1, w_2, \dots, w_N) used for adolescents are different from those weights (v_1, v_2, \dots, v_N) used for volunteers. The function:

$$f_1 = (A, V) = (w_1 (A_{s1} - V_{s1})^2 + w_2 (A_{s2} - V_{s2})^2 + \dots + w_N (A_{sN} - V_{sN})^2$$

is used to assign a numerical value to the quality of mentoring an adolescent A receives from volunteer V, and the function:

$$f_2 = (A, V) = (v_1 (A_{s1} - V_{s1})^2 + v_2 (A_{s2} - V_{s2})^2 + \dots + v_N (A_{sN} - V_{sN})^2$$

is used to assign a numerical value to the quality of experience volunteer V gets from mentoring adolescent A. A smaller value of **f1** indicates a higher quality of adolescent mentoring and a smaller value of **f2** indicates a higher quality of volunteer experience.

Assuming the names in each category are unique, your task is to write a program to prescribe a pairing of adolescents with volunteers such that no pair would be a better fit with each other than the pairing that your program prescribed for them. That is, no pair of an adolescent **X** and a volunteer **Y** has both values of **f1(X, Y)** and **f2(X, Y)** smaller than the values prescribed by your program for both of them.

The Input

Input consists of multiple situations. Each situation starts with two integers on a separate line. The first integer **N** ($1 \leq N \leq 100$) represents the number of personality traits to be used, and the second integer **P** ($1 \leq P \leq 1000$) represents the number of adolescents and also the number of volunteers. The last situation is followed by a line containing two zeros that indicates the end of input data and should not be processed as a valid situation.

The second line contains **N** integers that describe the weights to be used for adolescents. Consecutive integers are separated by a single blank space, and each integer has a value of one (1) and ten (10) inclusive.

The third line contains **N** integers that describe the weights to be used for volunteers. Consecutive integers are separated by a single blank space, and each integer has a value of one (1) and ten (10) inclusive.

The following **2P** lines describe the reports of **2P** personality tests. Each such line starts with the PersonCategory followed, after a blank space, by a string with no white spaces that represents the name followed, after a blank space, by **N** integers. The **k***th* integer ($1 \leq k \leq N$) has a value in the range of one (1) to three thousand (3000) that represents the score for the **k***th* trait. The scores are separated by a blank space.

The Output

For each situation, print the situation number (starting with 1, and using the format in the sample) on a separate line. The next **P** lines list the pairing of adolescents and volunteers (using the format in the sample) such that the adolescent names are listed in increasing lexicographic order.

Sample Input

```
2 3
1 1
1 1
Volunteer Smith 20 10
Adolescent Paul 20 30
Adolescent Peter 30 30
Volunteer Kevin 20 40
Volunteer Peter 50 10
Adolescent John 10 20
0 0 1
```

Sample Output

```
Situation 1:
Adolescent John Volunteer Smith
Adolescent Paul Volunteer Kevin
Adolescent Peter Volunteer Peter
```