



Problem H

Mentoring Assignment

The ACM, which is a charitable society for men, 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 are inclusive of one to a hundred. The report has the following form: PersonCategory <name> s_1 s_2 s_3 ... s_N , 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 one hundred (100), inclusive.

The ACM decided to assign weights to indicate the importance of each 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 f_1 indicates a higher quality of adolescent mentoring and a smaller value of f_2 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 $f_1(X, Y)$ and $f_2(X, Y)$ smaller than the values prescribed by your program for both of them.

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 one hundred (100) that represents the score for the k th trait. The scores are separated by a blank space.

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	Output for the 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	Situation 1: Adolescent John Volunteer Smith Adolescent Paul Volunteer Kevin Adolescent Peter Volunteer Peter