



PROBLEM 6 – RANKINGS

Consider a tournament in which each team plays the same number of games, but does not necessarily play all the opposing teams the same number of times. For every team, every game can end in a win, a draw or a loss. Tournament points are accumulated in two ways: (a) for wins and draws (there are no points for a loss) and (b) for gaining bonus points during games.

During a game, a team can accumulate a final score based on three different events (A , B and C), each with its own value. The final score for a game is the sum of the event values obtained, i.e., the number of A 's accumulated times the value for an A , plus the number of B 's accumulated times the value for a B , plus the number of C 's accumulated times the value for a C .

A team gains 1 tournament bonus point if it scores J or more A events in a game, regardless of the final outcome of the game. Furthermore, a team gains 1 tournament bonus point if they lose a game by no more than a final score difference of K .

The governing board, which is responsible for choosing the points for a win or draw, the values for events A , B , and C , the number J , and the value K , decided to investigate the effect of changing those parameters on the team rankings.

Your task is to determine the highest possible ranking for each team (so that as few as possible teams do strictly better), by changing the values of the above parameters, subject to the following constraints:

- a win must be worth between 2 and 5 points,
- a draw must be worth at least 1 and be worth (strictly) less than a win,
- the values for A , B and C are in the range 1 to 5,
- J is in the range 1 to 5,
- K is in the range 1 to 10.
- All quoted ranges include both endpoints.

INPUT FORMAT

Input for this problem consists of a sequence of one or more scenarios. Each scenario describes a tournament.

- The first line of a scenario contains two integers, n , m , $1 \leq n \leq 20$, $1 \leq m \leq 20$, separated by a single space, where n is the number of teams and m the number of games for each team.



- o Each of the following lines of the scenario describe a game in the following format, with items separated by single spaces:

$T_1 A_1 B_1 C_1 T_2 A_2 B_2 C_2$

- o $T_i, i=1,2$, are team labels, which are sequences of 1 to 20 characters, each character being either a lower-case letter, a digit, or a minus sign (-).
- o $A_i, B_i, C_i, i=1,2$ are the number of events of type A, B, C , respectively, accumulated by team i . A_i, B_i and C_i are integers from 0 to at most 9.

The input will be terminated by a line consisting of two zeros (0), separated by a single space. This line should not be processed.

SAMPLE INPUT:

```
2 2
a-team 1 1 1 b-team 0 3 0
b-team 0 0 3 a-team 1 1 1
3 2
bob 1 1 1 fred 0 1 1
fred 2 1 0 jane 0 1 0
jane 0 2 0 bob 0 2 0
0 0
```

OUTPUT FORMAT

For each scenario, output the scenario number, starting with 1, on a single line. Follow that by one line for each team, sorted by team name. For each team, output the team name, followed by a single space, followed by its best possible ranking.

SAMPLE OUTPUT:

```
1
a-team 1
b-team 1
2
bob 1
fred 1
jane 3
```