# $11^{th}$ South African Regional ACM Collegiate Programming Contest

Sponsored by IBM

10 October 2009

## Problem 2 - Blue Balloon Scoreboard

### Problem Description

Every year, the Association for Confusing Mnemonics (ACM) runs a puzzle-solving competition. They borrowed the rules from the International Collegiate Programming Challenge, but simplified the rules about breaking ties. Like the ICPC, the contest runs for 300 minutes (5 hours).

Teams may keep submitting solutions until they get a problem right. Each submission is given a submission time, which is the number of minutes from the start of the contest until the submission. Submission times are rounded to whole minutes, so they are integer values between 0 and 300 inclusive.

Teams are ranked first by the number of problems solved. Where teams have solved the same number of problems, they are ranked by total time. The time consumed for a solved problem is the submission time of the correct submission, plus twenty penalty minutes for each incorrect submission on that problem. The total time is the sum of the time consumed for each solved problem; there is no time consumed for problems that are never solved. If there is still a tie, the judges allocate the order of the tied teams randomly.

There is an electronic scoreboard that runs during the contest, and shows the current problems solved, failed attempts, and total time consumed for each team. To keep the final results secret until the presentation of awards, the scoreboard is frozen partway through the contest. Submissions whose time (after rounding) is strictly less than $S$ are reflected on the scoreboard, while submissions whose time (after rounding) is greater than or equal to $S$ are not shown.

At the presentation ceremony, the top $T$ teams are awarded prizes, and in each case, the number of problems solved and the total time is announced. For all the other teams, only the number of problems solved is announced.

Many teams would like to be able to claim to have beaten their traditional rivals, but it may not be obvious from the final standings whether this is the case. Your task is to examine the information from the frozen scoreboard and the announced final results, and answer queries of the form "might team A have beaten team B?"

## Input

The input consists of up to 30 test cases. Each input case starts with a single line containing the integers $P$, $N$, $T$ and $S$, separated by single spaces. There are $P$ ($1 \leq P \leq 10$) problems, $N$ ($2 \leq N \leq 100$) teams, $T$ ($1 \leq T \leq N$) teams that win prizes, and $S$ ($0 < S < 300$) is as described above.

The following $N$ lines in the test case describe the teams, one per line. Each line contains $P+4$ fields, separated by one or more spaces. The fields are:

- the name of the team (1–20 upper-case English letters);
- the final number of problems solved;
- the final total time for teams in the top $T$, $-1$ for all other teams;
- the total time shown on the frozen scoreboard; and
- $P$ fields, one per problem, describing the frozen scoreboard. Each field is either $-1$ to indicate that a problem has been solved, or a non-negative integer $A$ to indicate that the problem has been unsuccessfully attempted $A$ times.

The information is guaranteed to be consistent. For example, the final number of problems solved will never be less than the number on the frozen scoreboard. While there is no limit on the number of times a problem may be attempted, the input file will not contain any number larger than 10 000.

The first $T$ teams listed are the $T$ teams awarded prizes, in the order they placed (the winning team appearing first, then the second-place team etc). The remaining teams are listed in arbitrary order.

The remainder of the test case consists of query lines. Each query line consists of two distinct team names, separated by a space. The test case is terminated by a line containing two dashes separated by a space, "`- -`". Each test case contains between 2 and 100 queries, inclusive.

The end of input is indicated by a line containing a single zero.

## Output

Begin each test case with a line "`Case` $X$`:`", where $X$ is the test case number (counting from 1). Then for each query of the form "$A$ $B$", output "`YES`" if it is possible that team $A$ beat team $B$, otherwise "`NO`". Output a blank line after each test case.

Note that the output is case-sensitive.

### Sample Input

```
4 5 2 240
ATEAM 4 289 289 -1 -1 -1 -1
TEAMB 4 450 150 -1  0 -1 -1
TEAMC 0  -1   0  2  0  1  0
TEAMD 2  -1  50 -1  1  1  1
TEAME 2  -1 310  1 -1  0 -1
ATEAM TEAMB
TEAMB TEAMC
TEAMD TEAMB
TEAMD TEAME
TEAME TEAMD
- -
3 3 1 290
WINNER 2 402  50  1  0 -1
SECOND 2  -1 405 -1  0 -1
THIRD  2  -1 100 -1  0  0
SECOND THIRD
THIRD SECOND
- -
0
```

### Sample Output

```
Case 1:
YES
YES
NO
YES
YES

Case 2:
YES
NO
```

### Time Limit

5 seconds