There are so many submissions during this contest. Coach Pang can not determine which team is the winner. Could you help him to print the score board?

As we all know, the contest executes by the teams submit codes for some problems. Simply, we assume there are three kinds of results for every submission.

- YES: the code was right. The team solved the problem.
- ERROR: Sorry, the code was not right. The team didn’t solve the problem.
- NO: Sorry, the code was not right. The team didn’t solve the problem.

**ERROR**

There was something wrong. The team didn’t solve the problem but won’t get any penalty.

**NO**

Sorry, the code was not right. The team didn’t solve the problem.

**YES**

Yeah, AC. The team solved the problem.

To make the contest more exciting, we set a time called frozen time. If one team doesn’t solve one of the problems before the frozen time and also in at least one submission on this problem after or exactly at the frozen time, this problem of this team is called frozen. For different teams, the frozen problems will be different. For the frozen problems, the score board will only show how many submissions the team has submitted but won’t show the result of the submissions.

The team who solves more problems will place higher.

### Penalty

The team who gets less penalty time will place higher. Only solved problems will give penalty time. Every solved problem will give $T - 20k$ penalty time. $T$ is the time of the first YES, $X$ is the number of submissions.

### Last Solved

The team who solved their last problem earlier will place higher. If there is a tie, we consider their second last problems, then their third last problems, etc.

### Name

The team whose name comes later in lexicographical order will place higher.

At the end of the contest, the score board will be unfrozen. First, choose the team which has frozen problems with the lowest rank. Then choose one frozen problem of this team. If the team has multiple frozen problems, we choose their first frozen problem in alphabetical order. Then show the result of the problem, recalibrate the rank, change the score board and make the problem unfrozen for this team.

Repeat this procedure until no teams have frozen problems. Then we get the final score board.

Please help Coach Pang to print the initial score board, the final score board and the process of the unfreeze procedure.

### Input

The first line contains an integer $C$, which indicates the number of test cases.

For each test case, the first line will have four integers $n$, $m$, $T$ and $x$ ($1 \leq n \leq 50000$) is the number of submissions. $m$ ($1 \leq m \leq 26$) is the number of problems. $T$ ($1 \leq T \leq 10000$) is the total time of the contest. $x$ ($1 \leq x \leq T$) is the frozen time.

The following $m$ lines are in the form `Name Problem Penalty A B C ...

Name` is the team’s name which only contains letters and digits with at most 20 characters.

Problem is the identifier of the problem which is a capital letter from `A` to the $m$-th letter. There is a submission time which greater than or equal to 0 and less than $T$. Result is one string which equal `YES`, `ERROR` or `NO`.

Every team will have at least one submission. If one team has multiple submissions at the same time, we consider the Error which come before Rs and Rs come before YESs.

### Output

For each test case, first print `Case #x:`, where $x$ is the case number start from 1.

Then print the initial score board (before the unfreeze procedure) ordered by the rank. For every test case, you must have a special line in the format of `Rank Solved Penalty A B C ...

Rank` is the team’s rank. `Solved` is the number of solved problems. `Penalty` is the team’s penalty time. A B C ... is the condition of every problem is the format below:

- `-x` is the problem is unsolved. x is the number of Rs before the first Y. If $x = 0$, print `- instead of `0/`
- `+x` is the problem is solved but not solved. x is the number of Rs. If $x = 0$, print `+ instead of `0/`
- `/x` is the problem is frozen but not solved. x is the number of Rs. If $x = 0$, print `/ instead of `0/`
- `-y+` is the problem is unsolved but solved. x is the number of Rs before the first Y. y is the number of submissions after or exact at the frozen time. If $x = 0$, print `/0/y` instead of `/0/y`. After the initial score board, print the process of the unfreeze procedure. During the unfreeze procedure, every time one team unfrees one frozen problem and causes the change of its rank, print `Name1 Name2 Solved Penalty`. Suppose this team is team A. Name1 is the name of team A. Name2 is the name of the team which is overtaken by team A with the highest rank. Solved is the new number of the solved problems of team A. Penalty is the new penalty time of team A.

Finally print the final score board (after the unfreeze procedure) as the same format as the initial score board. See the example to get more details.

### Sample Input

```
1
20 1230 240
Epic 12 YES
Epic 14 NO
Rivercrab E 26 YES
Tworelli B 88 NO
A 120 YES
Rivercrab I 150 NO
Tworelli C 180 NO
C 180 YES
Tworelli C 180 NO
Rivercrab F 226 YES
Tworelli C 230 NO
Rivercrab L 241 YES
F 246 YES
C 260 YES
Rivercrab I 289 YES
Epic I 287 YES
Rivercrab I 289 YES
Tworelli M 299 YES
M 299 YES
Rivercrab I 299 YES
M 299 YES
Tworelli M 299 YES
```

### Sample Output

```
Case #1:
Epic 1 332 +1 +0/0/1/0/1 ...
Rivercrab 2 251 ...
Tworelli 3 270 -1 ...
M 0 0 ...
M 299 Tworelli 2 298 ...
Tworelli M 2 511 ...
Rivercrab M 3 597 ...
M 4 1196 ...
M 4 1196 ...
M 4 1196 ...
M 4 1196 ...
M 4 1196 ...
M 4 1196 ...
Tworelli 4 2 511 -1 ...
```