Problem H
Cycle Home

Christopher owns an e-bike (electric bicycle) and pretty much loves to wander around the city with it. An e-bike is just like a normal bicycle with an additional motor and battery which can be used for propulsion, i.e. you can choose between manually pedaling the e-bike or using the motor to move.

The area in which Christopher lives can be represented in an $N \times N$ grid. Each cell is one of the following.

- `S` – Christopher's current position.
- `T` – Christopher's goal (his home); has an uphill slope.
- `*` – a blocked cell (cannot pass through).
- `0` – a cell with an uphill slope.
- `1` – a cell with a downhill slope.

Christopher wants to go home, and while doing it, he has a policy to never visit a cell that has been visited before.

Before moving, Christopher checked his e-bike and realized that it only has B unit of remaining power. He also calculated that he has only S unit of stamina left (how he calculated it is a mystery for us).

From any cell, (r, c), Christopher can move to any of its 4 adjacent cells: $(r+1, c)$, $(r-1, c)$, $(r, c+1)$, $(r, c-1)$, given the target cell is still within the $N \times N$ grid, is not blocked, and he has not been in that cell before.

Christopher has two options to move from any one cell to any of its adjacent cells with the following constraints.

- Manual pedal. This will cost him 1 unit of stamina and can only be done if his stamina is larger than 0.
- Using motor. This will cost his e-bike 1 unit of power and can only be done if his e-bike power is larger than 0.

Additionally, if Christopher manually pedals his e-bike while going to a cell which has a downslope hill, then his e-bike's battery will also charge (increase) for 1 unit of power as long as it does not go beyond its maximum capacity of M. Manually pedaling on a downhill slope while the battery is at its maximum capacity will do nothing to the battery.

Christopher's goal is his home. Can he cycle his e-bike home? In other words, is there a way for Christopher to cycle from his position to his home while his stamina and e-bike's battery allow (do not go lower than 0).

Input

Input begins with an integer T ($1 \leq T \leq 10$) representing the number of cases.

Each case begins with four integers N S B M ($1 \leq N \leq 100$; $0 \leq S \leq 100$; $0 \leq B \leq M \leq 100$) representing the grid size, Christopher's initial stamina, his e-bike's battery current power, and his e-bike's battery maximum power capacity, respectively. The next N lines, each contains N characters representing the grid. Each character in the grid is one of the following: `S`, `T`, `*`, `0`, `1`, which meaning has been described above. You are guaranteed that there exist exactly one `S` and one `T` in the given grid.

Output

For each case, output in a line "`Case #X: Y`" (without quotes) where `X` is the case number (starts from 1) and `Y` is the output for the respective case. `Y` is "`YES`" (without quotes) if Christopher can go home, otherwise, `Y` is "`NO`" (without quotes).

Sample Input #1

```
3
5 2 3 3
S0*10
011**
*0010
0100*
T*101
3 2 0 100
S00
000
00T
3 2 0 100
S11
111
11T
```

Sample Output #1

```
Case #1: YES
Case #2: NO
Case #3: YES
```

Explanation for the sample input/output #1

Let the tuple $\langle r, c, s, b \rangle$ represents the row (r) and column (c) of Christopher's position while s is his current stamina and b is his e-bike's current power, respectively.

For the 1^{st} case: $\langle 1, 1, 2, 3 \rangle \rightarrow$ using motor, $\langle 2, 1, 2, 2 \rangle \rightarrow$ manual pedal, $\langle 2, 2, 1, 3 \rangle \rightarrow$ using motor, $\langle 3, 2, 1, 2 \rangle \rightarrow$ manual pedal, $\langle 4, 2, 0, 3 \rangle \rightarrow$ using motor, $\langle 4, 1, 0, 2 \rangle \rightarrow$ using motor, $\langle 5, 1, 0, 1 \rangle$.

For the 2^{nd} case: Christopher only has 2 units of stamina and 0 unit of e-bike's battery while all the cells are uphill (there's no way to charge the e-bike's battery) and the goal is at least 4 cells away from his position.

For the 3^{rd} case: $\langle 1, 1, 2, 0 \rangle \rightarrow$ manual pedal, $\langle 1, 2, 1, 1 \rangle \rightarrow$ manual pedal, $\langle 1, 3, 0, 2 \rangle \rightarrow$ using motor, $\langle 2, 3, 0, 1 \rangle \rightarrow$ using motor, $\langle 3, 3, 0, 0 \rangle$.