Problem PD
Quarantine Policy

Time limit: 3 seconds
Memory limit: 1024 megabytes

Problem Description

The 2019 novel coronavirus, COVID-19, can be transmitted between humans through water droplets and close contact. The transmission is especially easy and fast in relatively crowded or confined spaces, such as airplanes or trains. If someone is infected with COVID-19, then passengers occupying the adjacent seats will be infected easily.

To prevent the spread of the virus, we can take precautions, such as washing hands regularly and avoiding touching our eyes, nose, or mouth, to avoid infection. In addition, governments have also implemented special measures such as isolation and quarantine for this purpose. For instance, when someone on an airplane caught the coronavirus, the person will need to be isolated. Moreover, persons occupying the seats adjacent to the infected person will need to be quarantined. Precisely, there are two types of adjacent seats. One is directly adjacent, that is the seat is in the front, rear, left, or right of the virus seat. The other one is diagonally adjacent, that is the seat is in the front-left, front-right, rear-left, or rear-right of the virus seat. In the quarantine policy, someone whose seat is directly adjacent will be quarantined for d_1 days, and someone whose seat is diagonally adjacent will be quarantined for d_2 days. If there is more than one infected person adjacent to some seat, the number of days of quarantine will not be accumulated.

Please write a program to output which seats whose occupying persons need to be quarantined, and the number of days of quarantine. If a seat whose occupying person needs to be quarantined for different days, output the maximum of such days.

Input Format

The input contains several test cases. The first line stands for the number of test cases t. For each test case, the first line contains four integers n, m, d_1, d_2 ($0 < n, m \leq 100$, $1 \leq d_2 \leq d_1 < 10$), which stands for that there are n lines and m columns of the airplane, and a seat will be quarantined d_1 days if the seat is adjacent to the virus seat directly (i.e., front, rear, left, right), and a seat will be quarantined d_2 days if it is adjacent to the virus seat in the diagonal directions (front-left, front-right, rear-left, rear-right). The next n lines contain exactly m characters and represent the seats on the airplane.

Each healthy seat is represented by a '.' character and each virus seat is represented by a 'V' character.

Output Format

For each airplane, first print the following message in a line alone:

Airplane #z:

where z stands for the label of the airplane (starting with 1). The next n lines replace each '.' character in the input seats by the corresponding number of days to quarantine for that seat.

Technical Specification

- $1 \leq t \leq 1000$.
- $0 < n, m \leq 100$.
- $1 \leq d_2 \leq d_1 < 10$.

Sample Input 1

```
2
4 4 7 3
.V..
....
..V.
....
2 2 1 1
V.
..
```

Sample Output 1

```
Airplane #1:
7V70
3773
07V7
0373
Airplane #2:
V1
11
```