522 Schedule Problem

A project can be divided into several parts. Each part should be completed continuously. This means if a part should take 3 days, we should use a continuous 3 days to complete it. There are four types of constrains among these parts which are FAS, FAF, SAF and SAS. A constrain between parts is FAS if the second one should finish after the first one started. FAF is finish after finish, SAF is start after finish, and SAS is start after start. Assume there are enough people involved in the projects, which means we can do any number of parts concurrently. You are to write a program to give a schedule of a given project, which has the shortest time.

Input

The input file consists a sequences of projects, with an empty line indicates the of input.

Each project consists the following lines:

- the count number of parts(one line)
- times should be taken to complete these parts, each time occupies one line
- a list of `FAS`, `FAF`, `SAF` or `SAS` and two part number indicates a constrain of the two parts
- a line only contains a '`#`' indicate the end of a project

Output

Output should be a list of lines, each line includes a part number and the time it should start. Time should be a non-negative integer, and the start time of first part should be 0. If there is no answer for the problem, you should give a one-line output containing "`impossible`".

A blank line should appear following the output for each project.

Sample Input

```
3
2
3
4
SAF 1 2
FAF 2 3
#
3
1
1
1
SAF 1 2
SAF 2 3
SAF 3 1
#
```

Sample Output

```
Case 1:
1 0
2 2
3 1

Case 2:
impossible
```