A Gretchen at Her Spinning-Wheel

Gretchen [at her spinning-wheel, alone].
My peace is gone,
- My heart is sore -
I'll find it, ah, never,
No, nevermore!
When he is not near,
My grave is here;
My world is all
Turned into gall.

As Gretchen is deeply thinking of Faust, she turns her spinning-wheel constantly. Indeed, she turns the spinning-wheel after every x syllables. How many times did she turn the spinning wheel?

You may assume all single vowels (a, e, i, o, u, and y) and adjoining vowels are one syllable (e.g., "find" and "head" have one syllable). If "e" is at the end of a word and has no adjoining vowel, then it is silent (e.g., "peace" has one syllable). Here are some examples: "you" has one syllable, "only" has two syllables, and "hmm" has no syllables. You may also ignore all apostrophes (e.g., "I've" and "I'll" both have one syllable).

Input

The input starts with a line containing x, the number of syllables for each turn. Then it will contain a non-empty text passage. The passage ends when a line contains only the word `END` (all uppercase). All lines will have no more than 75 characters.

Output

A line containing the number of turns Gretchen made to her spinning-wheel. If the passage does not contain a multiple of x syllables, Gretchen will turn once more at the end. For example, if $x = 5$ and there are 100 syllables, she will turn 20 times; if there are 101 syllables, she will turn 21 times.

Sample Input

```
5
My peace is gone,
- My heart is sore -
I'll find it, ah, never,
No, nevermore!
When he is not near,
My grave is here;
My world is all
Turned into gall.
END
```

Sample Output

```
8
```

B Escape

Faust and Mephistopheles have gone into the dungeon to free Gretchen. After rushing past the guards at the gate and winding their way through the dungeons they arrive at Gretchen's cell. On the wall beside the cell is a detailed map of the dungeon, including all hallways and cells and the positions of every guard. Using this map, they must plot a path to return to the entrance and escape.

Input

Locations on the map are represented by integers. Intersections range from 1 to 5000, cells from 5001 to 10000, and the entrance/exit is 0.

The input starts with two numbers in a line: the number of intersections and number of cells. This is followed by a line containing Gretchen's cell number, G. Then comes the list of hallways that are not yet guarded (no guard at either end) as two integers on each line. The list ends with the pair "0 0".

Output

The output contains the list of locations to be visited by Faust and Mephistopheles during their escape, as one integer per line, starting with Gretchen's cell and ending with 0. There will always be at least one valid route, any of which will be accepted.

Sample Input

```
4 3
5002
0 1
1 2
2 3
2 4
3 4
4 0
1 5001
2 5001
2 5002
3 5002
3 5003
4 5003
0 0
```

Sample Output

```
5002
3
4
0
```

C Dungeon

Now that we have saved Faust and Mephistopheles (and Gretchen) from the dungeon, let us consider how they got them into the fix in the first place. Obviously, running into the dungeon with no plan could have gotten them stuck behind a wall of guards, so let us step back and plan both routes.

Faust and Mephistopheles visit the dungeon gift shop, and pick out a detailed map, including all hallways and cells and the positions of every posted guard. Using this map, they must plot a path to reach Gretchen's cell and free her.

But wait! They will have to rush past the guards at the entrance of the dungeon, so will be followed. Staying ahead of the guards is no problem, but there are enough entrance guards to post one at every intersection and cell behind them.

Before starting the rescue, Fause and Mephistopheles will have to find a route they can take into the dungeon, past unguarded intersections and cells to Gretchen's cell, and then back to the entrance through a still-unguarded route. (The guards at the entrace are expected to chase them into the dungeon, so they will also use it as their exit)

Input

Locations on the map are represented by integers. Intersections range from 1 to 5000, cells from 5001 to 10000, and the entrance/exit is 0.

The input starts with two numbers in a line: the number of intersections and number of cells. This is followed by a line containing Gretchen's cell number, G. Then comes the list of hallways that are not yet guarded (no guard at either end) as two integers on each line. The list ends with the pair "0 0".

No more than 2000 intersections or cells will be reachable from the entrance. No more than 2000 unique paths from entrance to target will exists. No more than 2500 connections will be specified in the input.

Output

The output contains the list of locations to be visited by Faust and Mephistopheles during their rescue, as one integer per line, starting and ending with 0. There will always be at least one valid route, any of which will be accepted.

Sample Input

```
4 3
5002
0 1
1 2
2 3
2 4
3 4
4 0
1 5001
2 5001
2 5002
3 5002
3 5003
4 5003
0 0
```

Sample Output

```
0
1
2
5002
3
4
0
```

D Duel

Valentine	(steps forward)
	Whom are you luring here? I'll give it you!
	Accursed rat-catchers, your strains I'll end!
	First, to the devil the guitar I'll send!
	Then to the devil with the singer too!
Mephistopheles	The poor guitar! 'tis done for now.
Valentine	Your skull shall follow next, I trow!
Mephistopheles	(to Faust)
	Doctor, stand fast! your strength collect!
	Be prompt, and do as I direct.
	Out with your whisk, keep close, I pray,
	I'll parry I do you thrust away!

It appears that Faust has found a rather tougher crowd than initially expected. Unfortunately he is somewhat less than proficient with a sword, so Mephistopheles must guide the blade to avoid Faust's untimely demise.

The position of the tip of the sword can be described in terms of N, NE, E, SE, S, SW, W, NW and center, with North pointing up and East pointing to Faust's right. Moving the sword from the perimeter of the circle to the center or back requires C time units. Moving the sword 45 degrees around the perimeter of the circle requires S time units. If the sword moves along the perimeter of the circle in a continuous movement (does not reverse direction or visit the center) over more than 180 degrees, the cost of each step beyond 180 degrees is halved (round fractions up).

Input

Each input case consists of two lines. The first line contains two integers C and S ($1 \leq C, S \leq 100$) as discussed above. The end of input is indicated by C and S being provided as zero. The second line consists of N ($1 \leq N \leq 50$) directions, through which the sword must move in order. Each direction will be one of: N, NE, E, SE, S, SW, W, NW and C (for center), all separated by single spaces. No adjacent directions in the input will be identical.

Output

For each line of input print a single line containing the minimum cost to complete the pattern.

Sample Input

```
6 3
N E
4 3
N S
6 3
N E W
0 0
```

Sample Output

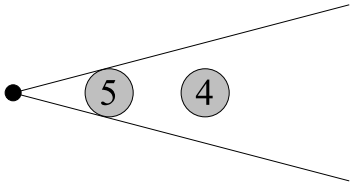
```
6
8
16
```

E The Hartz Mountains, District of Schierke

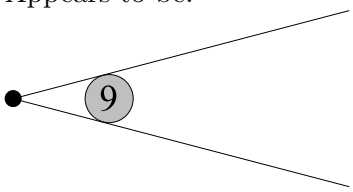
Mephistopheles How sadly, yonder, with belated glow
Rises the ruddy moon's imperfect round,
Shedding so faint a light, at every tread
One's sure to stumble 'gainst a rock or tree!
An Ignis Fatuus I must call instead.
Yonder one burning merrily, I see.
Holla! my friend! may I request your light?
Why should you flare away so uselessly?
Be kind enough to show us up the height!

A number of Ignes Fatui (will-'o-the-wisps) are scattered through the mountains around Faust and Mephistopheles. To avoid an accident Mephistopheles glances around and summons the one which appears brightest. This would seem easy, but if multiple Ignes Fatui overlap from his perspective it becomes less trivial. If Ignes Fatui overlap completely from Mephistopheles's viewpoint, their visible brightnesses are summed and appear to originate entirely from the nearest. If a group appear to touch or overlap partially their brightnesses will all seem equal, thought they will remain distinct.

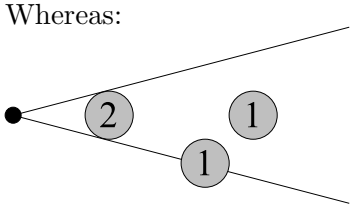
For example:



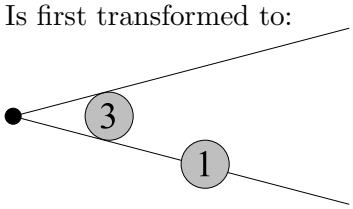
Appears to be:



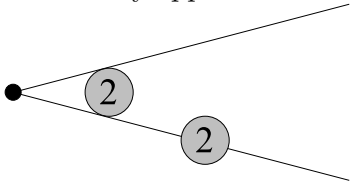
Whereas:



Is first transformed to:



And finally appears to be:



Input

The first line of the input consists of a single number T ($1 \leq T \leq 100$) which specifies the number of cases to follow.

Each case begins with a line containing a single number I ($1 \leq I \leq 1000$) which specifies the number of Ignes Fatui. This is followed by I lines containing X and Y integer coordinates of each ($-1000 \leq X \leq +1000$, $-1000 \leq Y \leq +1000$) in meters relative to Mephistopheles (who stands at 0,0) and the integer brightness ($1 \leq B \leq 1000$).

Each Ignis Fatuus can be represented as a circle with a one metre diameter. No Ignis Fatuus will be placed within one metre of the origin. Input cases will be chosen such that rounding error less than 10^-4 does not present a problem.

Output

For each case, print a single line containing the X and Y coordinates and visible brightness (rounded to two decimal places) of the selected Ignis Fatuus. In the event of a tie choose the one which lies closest to Mephistopheles. If a tie is still present, choose the one which appears first in a scan from the positive X axis toward the positive Y axis and around.

Sample Input

This input contains the relationships shown in the five diagrams above.

```
5
2
2 0 5
4 0 4
1
2 0 9
3
2 0 2
4 1 1
6 0 1
2
2 0 3
4 1 1
2
2 0 2
4 1 2
```

Sample Output

```
2 0 9.00
2 0 9.00
2 0 2.00
2 0 2.00
2 0 2.00
```

F Before The Gate

Artisans	Why choose ye that direction, pray?
Others	To the hunting-lodge we're on our way.
The First	We towards the mill are strolling on.
A Mechanic	A walk to Wasserhof were best.
A Second	The road is not a pleasant one.
The Others	What will you do?
A Third	I'll join the rest.
A Fourth	Let's up to Burghof, there you'll find good cheer, The prettiest maidens and the best of beer, And brawls of a prime sort.
A Fifth	You scapegrace! How; Your skin still itching for a row? Thither I will not go, I loathe the place.

Confused yet? With all the proposals, refusals and agreements most of the onlookers probably were. The guard atop the gate, often being asked to locate a wayward acquaintance, can fortunately see where each person is and infer who they are talking to.

At the start of each conversation a person will provide the name of a proposed destination for the afternoon. Their location at that time becomes the center of the conversation. When a person voices agreement or disagreement they are referring to the conversation with the center nearest to their position at that moment.

People may change their minds, in which case their intended destination is the last destination name they proposed or accepted and have not since refused.

Input

Each case starts with a single number on a line ($1 \leq N \leq 200$), indicating the number of statements to follow. The end of input is indicated by a case with zero statements.

Each statement contains the name of the speaker, their integral X and Y coordinates ($-1000 \leq X, Y \leq +1000$), and their speech. The name will consist of between one and twenty lower-case letters. Their speech will be a destination name, "AGREE" or "DISAGREE". A destination name consists of between one and fifty lower-case letters, hyphens and spaces which are contained (i.e. not at the beginning or end of the name).

No more than 25 distinct destinations will be proposed in a single case. All responders will be nearer to one conversation center than any other by at least 0.005 units. The first sentence will always be an intended destination.

Output

For each case, print the number of people for whom a destination can be determined, followed by the names in lexicographic order with their destinations.

Sample Input

```
3
alice 0 0 london
bob -1 1 AGREE
charlie 1 0 DISAGREE
4
alice 0 0 london
bob 10 0 new york
charlie 7 0 AGREE
charlie 2 0 DISAGREE
0
```

Sample Output

```
2
alice london
bob london
3
alice london
bob new york
charlie new york
```