2018 ECNA Regional Practice Contest

Practice 2018

November 9

Problems

A   Are You Listening?
B   Harshad Numbers
C   An I for an Eye
D   Score!
E   So You Like Your Food Hot?
F   The Ups and Downs of Investing

Do not open before the contest has started.

International Collegiate Programming Contest
2018 East Central Regional PRACTICE Contest
Grand Valley State University
University of Cincinnati
University of Windsor
Youngstown State University
# November 9, 2018

<u>Rules:</u>

1. There are **six** problems to be completed in **90 minutes**.

2. All questions require you to read the test data from standard input and write results to standard output. You cannot use files for input or output. Additional input and output specifications can be found in the General Information Sheet.

3. When displaying results, follow the format in the Sample Output for each problem. Unless otherwise stated, all whitespace in the Sample Output consists of exactly one blank character.

4. The allowed programming languages are C, C++, Java, Python 2 and Python 3.

5. All programs will be re-compiled prior to testing with the judges' data.

6. Non-standard libraries cannot be used in your solutions. The Standard Template Library (STL) and C++ string libraries are allowed. The standard Java API is available, except for those packages that are deemed dangerous by contestant officials (e.g., that might generate a security violation).

7. Programs will be run against multiple input files, each file containing a single test case.

8. Programming style is not considered in this contest. You are free to code in whatever style you prefer. Documentation is not required.

9. All communication with the judges will be handled by the Kattis environment.

10. Judges' decisions are to be considered final. No cheating will be tolerated.

Problem A
Are You Listening?

You're a top government spy currently at a secret location behind enemy lines (ooooh....exciting!). You have a communication device that allows you to stay in contact with various other operatives that you work with. The broadcast range of the device is adjustable and ideally you would set it at its maximum value to be able to reach the largest number of operatives. Unfortunately, the enemy is not stupid and has a set of listening devices that can detect your signal. These listening devices each have a fixed range (which can vary from device to device), and in order to pinpoint your location the enemy must detect you on at least three of their listening devices. Therefore, you are safe as long as you set your broadcast range so that at most two listening devices can detect you. A listening device can detect you if your broadcast range and its listening range touch at more than one point.

An example situation is shown below. Your device and its broadcast area are shown in the grey circle, and four listening devices and their detecting areas are shown in the white circles. On the far left you have set your broadcast range so that none of the listening devices can detect you, but clearly you could increase your range. In the middle picture you've increased it so that two of the listening devices can detect you, but that's fine. In the right picture, you've increased your range too much since now three of the listening devices can detect you.
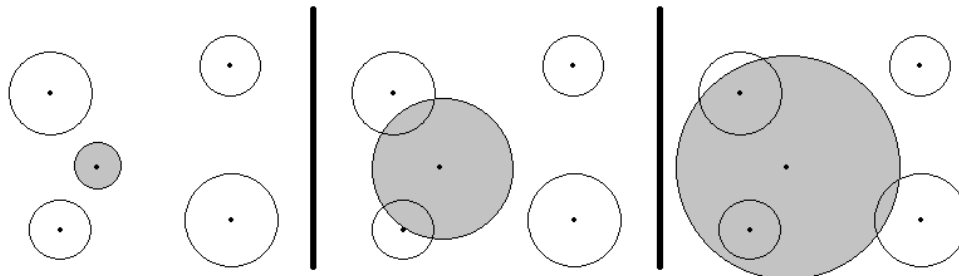
Given your location and the locations and detection ranges of a set of listening devices, determine the maximum broadcast range for your communication device. Note that this range may be 0 if the broadcast device it already within the range of three listening devices.

Input

Input starts with a line containing three integers cx cy n where (cx, cy) is your location and $3 \le n \le 100$ is the number of listening devices. The next n lines each contain three integers x y r, where (x, y) is the location of a listening device and $0 < r \le 1\,000$ is the radius of its listening area. All coordinates are between $-1\,000$ and $1\,000$. All $n + 1$ locations are distinct.

Output

Display the radius of the maximum broadcast area, rounding down to the nearest integer.

Sample Input 1

Sample Output 1

90 80 4	72
60 35 25	
50 140 35	
195 165 25	
195 40 40	

Problem B
Harshad Numbers

We're all familiar with harshad numbers. For this problem, you will ... what's that? You *aren't* familiar with harshad numbers? They're also known as Niven numbers – does that ring a bell?? Anything???

Well, it's a simple enough concept. A *harshad* number is a number which is evenly divisible by the sum of its digits. For example, 24 is a harshad number: the sum of its digits is $2 + 4 = 6$ and 24 is divisible by 6. 156 is also a harshad number, since $1 + 5 + 6 = 12$ and $156 = (12)(13)$. 157 is NOT a harshad number since it is not divisible by $1 + 5 + 7 = 13$.

OK, let's start over.

We're all familiar with harshad numbers. For this problem, you will be given a number n and must find the smallest harshad number $\geq n$.

Input

Input consists of a single line containing a positive integer $n \leq 1\,000\,000\,000$.

Output

Display the smallest harshad number greater than or equal to n.

Sample Input 1	Sample Output 1
24	24

Sample Input 2	Sample Output 2
25	27

Sample Input 3	Sample Output 3
987654321	987654330

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Problem C
An I for an Eye

Ken has been having trouble lately staying under the word limit in Twitter, so he's decided to write a little front-end program which will take in text and shorten it using a fixed set of abbreviations for commonly used letter sequences. Those abbreviations are shown in the table below:

The character ...	... substitutes for the letter sequence
@	at
&	and
1	one, won
2	to, too, two
4	for, four
b	bea, be, bee
c	sea, see
i	eye
o	oh, owe
r	are
u	you
y	why

Ken is about to start writing this program when he realizes that the extent of his computer knowledge is ... well ... using Twitter. He's looking for someone to help him – `r u th@ some1`?

Input

Input starts with a single integer n indicating the number of lines of text to process. Following this are n lines of text. Each line will contain only alphanumeric characters and spaces, and each line will have at least one non-space character. Each line has at most 200 characters.

Output

Display each line with the appropriate substitutions made. Substitutions should also be made inside words, e.g., the word `that` should be changed to `th@`. If two letter sequences overlap (like `at` and `to` in the word `baton`) just replace the first one (in this case resulting in `b@on`). If two letter sequences start at the same location (like `be` and `bee` in `been`) replace the longer one (in this case resulting in `bn`). If the letter sequence starts with an upper-case letter, then the abbreviation should also be in upper-case (if appropriate). Finally, no substituted letter should later be part of another substitution. For example, if the input is `oweh`, you would first replace the `owe` with an `o` to get `oh`. At this point you do NOT replace the `oh` with an `o` since the `oh` contains a substituted letter.

Sample Input 1

```
3
Oh say can you see
I do not understand why you are so cranky just because Karel won
Formation
```

Sample Output 1

```
O say can u c
I do not underst& y u r so cranky just bcause Krl 1
4m@ion
```

Problem D
Score!

Kathy is in charge of statistics for the girl's basketball team at her high school. She meticulously records each basket made and the time it occurred. Her record book for a game might begin as follows:

```
H  2 0:13
A  2 0:19
H  1 0:52
H  1 0:52
A  3 1:08
...
```

This indicates that

- the home team (H) scored a 2-point basket 13 seconds into the game

- the away team (A) scored a 2-point basket 6 seconds later

- the home team made two free throws (each worth 1 point) 52 seconds into the game (recall that the clock stops when a free throw is made)

- the away team made a three point basket 1 minute and 8 seconds into the game.

The coach is very impressed with all the statistics that Kathy keeps. Using these statistics, he would like to know how long each team was in the lead during the game. For example, if both teams went into an incredible shooting slump after the 1:08 mark in the game and no more baskets were made until the end of the game (32 minutes for a high school game) then the home team would have led for 22 seconds (from 0:13 to 0:19 and from 0:52 to 1:08) and the away team would have led for 30:52 (from 1:08 to 32:00).

Kathy is very proud of how impressed the coach is, but she's not looking forward to going through each game record to determine how long each team was in the lead. Can you help her?

Input

Input starts with a positive integer n indicating the number of scores in the game. Following this are n lines of the form `T p time` where `T` is either 'H' or 'A', p is the number of points scored (either $1, 2$ or 3) and `time` is the time the points were scored in either the form `m:ss` (if the time is less than 10 minutes) or `mm:ss`. All times are between 0:00 and 31:59 and given in non-decreasing order.

Output

Display three things: 1) either an 'H' or 'A' indicating which team won the game, 2) the length of time the home team was leading, and 3) the length of time the away team was leading. Use the form `m:ss` for any time less than 10 minutes and `mm:ss` otherwise. All games will have a winner.

Sample Input 1

```
5
H 2 0:13
A 2 0:19
H 1 0:52
H 1 0:52
A 3 1:08
```

Sample Output 1

```
A 0:22 30:52
```

Sample Input 2

```
1
H 1 16:00
```

Sample Output 2

```
H 16:00 0:00
```

Problem E
So You Like Your Food Hot?

Peter is co-owner of the incredibly successful Pete and Pat's Pitas and Pizzas and his sales are on fire! But unfortunately, so is his building, due to carelessly laid delivery boxes placed too close to Pete's famous wood burning pizza oven. After sifting though the remnants, one of the few things Pete is able to salvage is a ledger book, but the only thing he can make out on the charred pages is the profit he made during the last month. The insurance company would like to know how many pitas and how many pizzas Pete actually delivered over that period. Pete does recall how much profit he makes on each of these products, so he's pretty confident that he can determine how many of each were sold during the last month given the total profit. Well perhaps "confident" is not the exact word Peter is looking for – it's more like clueless. Can you help Pete out? I'm sure there are some discount coupons in it for you, or at least a really cheap price on a used pizza oven.

Input

Input consists of a single line containing 3 values p_t p_1 p_2, where $0 \leq p_t \leq 10\,000.00$ is the profit for the month and $0 < p_1, p_2 \leq 100.00$ are the profits Pete makes on a pita (p_1) and on a pizza (p_2). All values are in dollars and cents.

Output

Display two integers: the number of pitas sold and the number of pizzas sold so that the total profit equals the value given. If there is more than one combination of pitas and pizzas that give the specified profit, list them all, one combination per line, listing the combination with the smallest number of pitas first, then the combination with the second smallest number of pitas, and so on. If there are no combinations of pizza and pita sales that realize the profit, output none.

Sample Input 1

```
725.85 1.71 2.38
```

Sample Output 1

```
199 162
```

Sample Input 2

```
100.00 20.00 10.00
```

Sample Output 2

```
0 10
1 8
2 6
3 4
4 2
5 0
```

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Problem F
The Ups and Downs of Investing

Liam is heavily invested in the stock market, and has various theories that he uses to predict when the market will rise and when it will fall. Lately, things haven't been going too well – the only thing rising is his frustration and the only thing falling is his portfolio. He has decided that he needs more data to test his theories with. One characteristic of the market he is particularly interested in is the peaks and valleys of the price of particular stocks. Liam's definition of a peak is an increasing sequence of at least n consecutive stock prices ending on a *peak day*, and then a decreasing sequence of at least n consecutive stock prices starting on the peak day (where n depends on the particular stock). A valley is analogous: a decreasing sequence of at least m consecutive stock prices ending on a *valley day*, and then an increasing sequence of at least m consecutive stock prices starting on the valley day (where again m depends on the particular stock and may differ from n). For example, consider the two weeks of stock prices shown below:
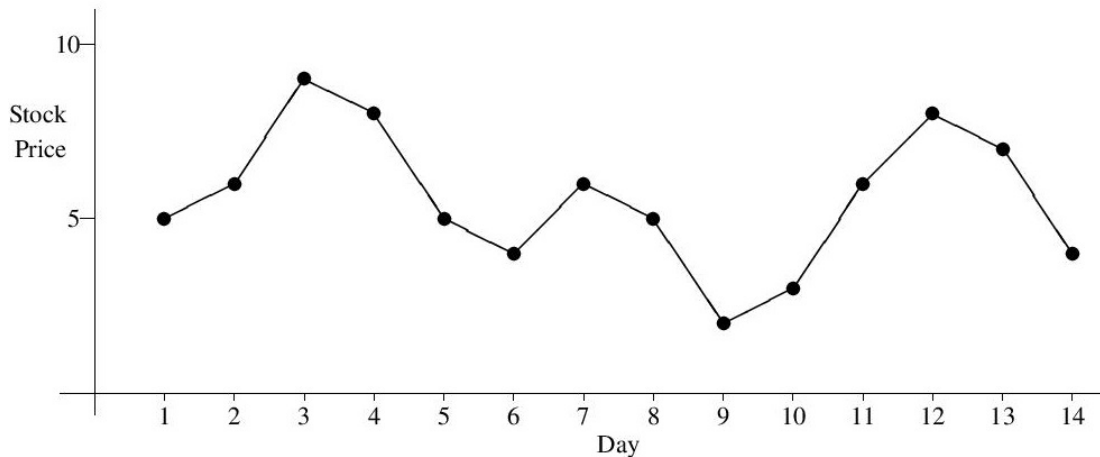
If $n = 2$ and $m = 3$ then there are three peaks in this data (with highest points on days 3, 7 and 12) and one valley (with lowest point on day 9). Notice that there is no valley around day 6, since there is not an increasing sequence of length 3 starting at day 6.

Given a set of stock prices and values for n and m, Liam would like to know how many peaks and valleys there are in the data.

Input

Input starts with a line containing three positive integers $s \; n \; m$, where $1 \le s \le 1\,000$ is the number of stock prices, and $2 \le n, m \le 100$ are the parameters described above. Following this line will be one or more lines containing a total of s stock prices. All stock prices are non-negative and no two consecutive stock prices will be the same.

Output

Display the number of peaks in the data and the number of valleys in the data.

Sample Input 1	Sample Output 1
14 2 3 5 6 9 8 5 4 6 5 2 3 6 8 7 4	3 1

Sample Input 2	Sample Output 2
14 3 2 5 6 9 8 5 4 6 5 2 3 6 8 7 4	2 2