

Test Session for the Northwestern Europe Regional Contest 2023

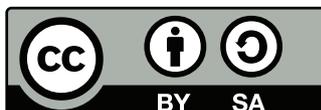
NWERC 2023 Test Session

November 25, 2023



Problems

- A Artistic Souvenir
- B Basic Math
- C Cheese Comparison



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NWERC 2023 Test Session

Problem A

Artistic Souvenir

Time limit: 1 second

Delft is world-famous for its blue and white pottery (also known as *Delfts blauw*), and the earliest pieces date back to the 16th century.

During a stroll in Delft, Christiaan sees a lot of beautifully painted pottery objects like plates, tiles, and vases in the souvenir shops. Inspired by those, he decides to hand paint such a square tile himself. He has already picked a circular design he wants to place in the middle of the tile. He would like to leave a margin of at least 1 cm around the design. Now, Christiaan just needs to buy a square tile of a suitable size.



A typical circular design on a square Delft tile.

Given the area of the circular design, what is the minimum area of the square tile?

Input

The input consists of:

- One line with an integer a ($1 \leq a \leq 10^{15}$), the area of the circular design in cm^2 .

Output

Output the minimum area of the square tile in cm^2 that is needed for a design with area a if Christiaan wants to leave a margin of at least 1 cm around the design.

Your answer should have an absolute or relative error of at most 10^{-9} .

Sample Input 1

42

Sample Output 1

86.7269920446

Sample Input 2

20231125

Sample Output 2

25779373.7414336279

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NWERC 2023 Test Session

Problem B

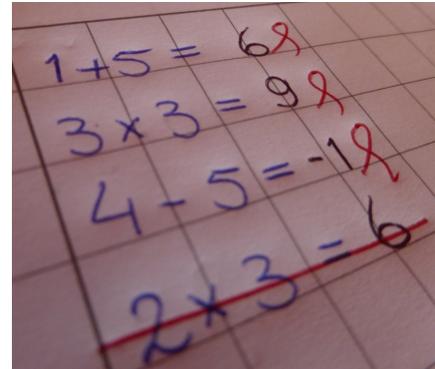
Basic Math

Time limit: 5 seconds

Ellen is teaching elementary math to her students and the time for the final exam has come. The exam consists of n questions. In each question, the students have to add ('+'), subtract ('-') or multiply ('*') a pair of numbers.

Ellen has already chosen the n pairs of numbers. All that remains is to decide for each pair which of the three possible operations the students should perform. To avoid students getting bored, Ellen wants to make sure that the n correct answers to her exam are all different.

Please help Ellen finish constructing the exam by automating this task.



Example exam by Ellen.

Input

The input consists of:

- One line with an integer n ($1 \leq n \leq 2500$), the number of pairs of numbers.
- n lines with two integers a and b ($|a|, |b| \leq 10^6$), a pair of numbers used.

Output

If there is no way to construct the exam such that the n correct answers are all different, output "impossible".

Else, for each pair of numbers (a, b) in the same order as in the input, output a valid equation. Each equation should consist of five parts: a , one of the three operators, b , an equals sign ('='), and the result of the expression. All the n expression results must be different.

If there are multiple valid solutions, you may output any one of them.

Sample Input 1

```
4
1 5
3 3
4 5
-1 -6
```

Sample Output 1

```
1 + 5 = 6
3 * 3 = 9
4 - 5 = -1
-1 - -6 = 5
```

Sample Input 2

```
4
-4 2
-4 2
-4 2
-4 2
```

Sample Output 2

```
impossible
```

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NWERC 2023 Test Session

Problem C Cheese Comparison Time limit: 3 seconds

Every Thursday, the big square in front of the New Church in Delft is filled with market stands. Today, you brought your formidable cheese wheels¹ to the market for the first time, and to optimize sales, you need to position your cheese wheels in an appealing way. From your experience of playing with blocks as a child, you know that the cheese wheels will look most appealing when they are ordered by weight, from small to large.



A cheese store in Delft, close to the market.
CC BY-ND 2.0 by Lindsey Reul on Flickr

Ordering the cheese wheels would have been easy, if you had brought your highly accurate digital cheese-weighing scale. However, due to unfortunate planning at your cheese factory, you only have a balancing scale with you. The market is already starting to fill up with potential customers, so you hurriedly start comparing cheese wheels to order them from lightest to heaviest.

Interaction

This is an interactive problem. Your submission will be run against an *interactor*, which reads from the standard output of your submission and writes to the standard input of your submission. This interaction needs to follow a specific protocol:

The interactor first sends one line with an integer n ($1 \leq n \leq 100$), the number of cheese wheels.

Then, your program needs to order the cheese wheels by weight. The weight of two cheese wheels can be compared by printing one line of the form “? i j ” ($1 \leq i, j \leq n$), indicating you want to compare the weights of cheese wheels i and j . The interactor will respond with ‘<’ if cheese wheel i is lighter than cheese wheel j , ‘=’ if they have the same weight, or ‘>’ if cheese wheel i is heavier than cheese wheel j .

Once you have determined the order of the cheese wheels, print one line of the form “! $a_1 \dots a_n$ ” ($1 \leq a_i \leq n$ for $1 \leq i \leq n$), indicating the order of the cheese wheels from light to heavy, after which the interaction will stop. Printing the answer does not count as a query.

If there are multiple valid solutions, you may output any one of them.

The interactor is not adaptive: the weights of all cheese wheels is determined up-front.

Make sure you flush the buffer after each write.

A testing tool is provided to help you develop your solution.

Making more than 20 000 comparisons will result in a wrong answer.

¹A cheese wheel is large, circular, typically yellow, has a crust on the outside to keep the cheese inside fresh, and can weigh several kilos.

NWERC 2023 Test Session

Read

Sample Interaction 1

Write

4

? 2 1

>

? 2 3

>

? 2 3

>

? 1 3

>

? 4 1

=

? 4 2

<

! 3 1 4 2

Read

Sample Interaction 2

Write

3

? 2 1

=

? 1 3

=

! 2 1 3