A. Help Victoria the Wise

time limit per test: 1 second
memory limit per test: 256 megabytes
input: standard input
output: standard output

Vasilisa the Wise from a far away kingdom got a present from her friend Helga the Wise from a farther away kingdom. The present is a surprise box, yet Vasilisa the Wise doesn't know yet what the surprise actually is because she cannot open the box. She hopes that you can help her in that.

The box's lock is constructed like that. The box itself is represented by an absolutely perfect black cube with the identical deepening on each face (those are some foreign nanotechnologies that the far away kingdom scientists haven't dreamt of). The box is accompanied by six gems whose form matches the deepenings in the box's faces. The box can only be opened after it is correctly decorated by the gems, that is, when each deepening contains exactly one gem. Two ways of decorating the box are considered the same if they can be obtained one from the other one by arbitrarily rotating the box (note that the box is represented by a perfect nanotechnological cube)

Now Vasilisa the Wise wants to know by the given set of colors the following: in how many ways would she decorate the box in the worst case to open it? To answer this question it is useful to know that two gems of one color are indistinguishable from each other. Help Vasilisa to solve this challenging problem.

Input

The first line contains exactly 6 characters without spaces from the set $\{\mathrm{R}, \mathrm{O}, \mathrm{Y}, \mathrm{G}, \mathrm{B}, \mathrm{V}\}$ — they are the colors of gems with which the box should be decorated.

Output

Print the required number of different ways to decorate the box.

Sample test(s)

input
```
YYYYYY
```
output
```
1
```

input
```
BOOOOB
```
output
```
2
```

input
```
ROYGBV
```
output
```
30
```

B. Help King

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

This is the modification of the problem used during the official round. Unfortunately, author's solution of the original problem appeared wrong, so the problem was changed specially for the archive.

Once upon a time in a far away kingdom lived the King. The King had a beautiful daughter, Victoria. They lived happily, but not happily ever after: one day a vicious dragon attacked the kingdom and stole Victoria. The King was full of grief, yet he gathered his noble knights and promised half of his kingdom and Victoria's hand in marriage to the one who will save the girl from the infernal beast.

Having travelled for some time, the knights found the dragon's lair and all of them rushed there to save Victoria. Each knight spat on the dragon once and, as the dragon had quite a fragile and frail heart, his heart broke and poor beast died. As for the noble knights, they got Victoria right to the King and started brawling as each one wanted the girl's hand in marriage.

The problem was that all the noble knights were equally noble and equally handsome, and Victoria didn't want to marry any of them anyway. Then the King (and he was a very wise man and didn't want to hurt anybody's feelings) decided to find out who will get his daughter randomly, i.e. tossing a coin. However, there turned out to be n noble knights and the coin only has two sides. The good thing is that when a coin is tossed, the coin falls on each side with equal probability. The King got interested how to pick one noble knight using this coin so that all knights had equal probability of being chosen (the probability in that case should always be equal to $1 / n$). First the King wants to know the expected number of times he will need to toss a coin to determine the winner. Besides, while tossing the coin, the King should follow the optimal tossing strategy (i.e. the strategy that minimizes the expected number of tosses). Help the King in this challenging task.

Input

The first line contains a single integer n from the problem's statement ($1 \le n \le 10000$).

Output

Print the sought expected number of tosses as an irreducible fraction in the following form: "a/b" (without the quotes) without leading zeroes.

Sample test(s)

input
2
output
1/1

input
3
output
8/3

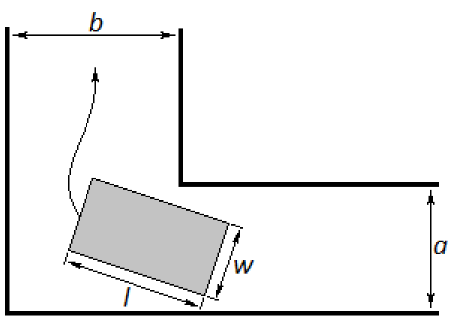
input
4
output
2/1

C. Help Greg the Dwarf

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

A very unusual citizen lives in a far away kingdom — Dwarf Gracula. However, his unusual name is not the weirdest thing (besides, everyone long ago got used to calling him simply Dwarf Greg). What is special about Dwarf Greg — he's been living for over 200 years; besides, he lives in a crypt on an abandoned cemetery and nobody has ever seen him out in daytime. Moreover, nobody has ever seen Greg buy himself any food. That's why nobody got particularly surprised when after the infernal dragon's tragic death cattle continued to disappear from fields. The people in the neighborhood were long sure that the harmless dragon was never responsible for disappearing cattle (considering that the dragon used to be sincere about his vegetarian views). But even that's not the worst part of the whole story.

The worst part is that merely several minutes ago Dwarf Greg in some unintelligible way got inside your house and asked you to help him solve a problem. The point is that a short time ago Greg decided to order a new coffin (knowing his peculiar character, you are not surprised at all). But the problem is: a very long in both directions L-shaped corridor leads to Greg's crypt, and you can't drag just any coffin through that corridor. That's why he asked you to help.



You've formalized the task on a plane like this: let the corridor's width before and after the turn be equal to a and b correspondingly (see the picture). The corridor turns directly at a right angle, the coffin is a rectangle whose length and width are equal to l and w ($l \geq w$) correspondingly. Dwarf Greg has already determined the coffin's length (l), which is based on his height; your task is to determine the coffin's maximally possible width (w), at which it can be brought to the crypt. Besides, due to its large mass (pure marble!) the coffin is equipped with rotating wheels; therefore it is impossible to lift it off the ground, however, arbitrary moves and rotations of the coffin in the plane become possible. The coffin may be rotated arbitrarily just before you drag it into crypt and move through the corridor.

Greg promised that if you help him, he will grant you immortality (I wonder how?). And if you don't, well... trust me, you don't want to know what happens if you don't help him...

Input

The first line contains three space-separated integers a, b and l from the problem's statement ($1 \leq a, b, l \leq 10^4$).

Output

Print the maximally possible width of a coffin with absolute or relative error no more than 10^{-7}. If a coffin with the given length and positive width (the coffin that would meet the conditions from the problem's statement) does not exist, print "`My poor head =(`" (without quotes).

It is guaranteed that if the answer is positive, it will be not less than 10^{-7}. All the hacks will also be checked to meet that condition.

Sample test(s)

```
input
2 2 1
output
1.0000000
```

```
input
2 2 2
output
2.0000000
```

```
input
2 2 3
output
1.3284271
```

```
input
2 2 6
```

output
My poor head =(

Note

In the first example the answer is restricted by the coffin's length (remember — coffin's widths should not be larger than it's length).

In the second example it is possible to drag the coffin through the corridor thanks to rotating wheels: firstly, drag it forward by one side while it will not be hampered by the wall, then move it forward by adjacent side perpendicularly to the initial movement direction (remember — arbitrary moves and rotations of the coffin are possible).

D. Help Monks

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

In a far away kingdom is the famous Lio Shan monastery. Gods constructed three diamond pillars on the monastery's lawn long ago. Gods also placed on one pillar n golden disks of different diameters (in the order of the diameters' decreasing from the bottom to the top). Besides, gods commanded to carry all the disks from the first pillar to the third one according to the following rules:

- you can carry only one disk in one move;
- you cannot put a larger disk on a smaller one.

There was no universal opinion concerning what is to happen after the gods' will is done: some people promised world peace and eternal happiness to everyone, whereas others predicted that the kingdom will face communi… (gee, what am I rambling about?) the Armageddon. However, as everybody knew that it was impossible to solve the problem in less than 2^n - 1 moves and the lazy Lio Shan monks never even started to solve it, everyone lives peacefully even though the problem was never solved and nobody was afraid of the Armageddon.
However, the monastery wasn't doing so well lately and the wise prior Ku Sean Sun had to cut some disks at the edges and use the gold for the greater good. Wouldn't you think that the prior is entitled to have an air conditioning system? Besides, staying in the monastery all year is sooo dull… One has to have a go at something new now and then, go skiing, for example… Ku Sean Sun realize how big a mistake he had made only after a while: after he cut the edges, the diameters of some disks got the same; that means that some moves that used to be impossible to make, were at last possible (why, gods never prohibited to put a disk on a disk of the same diameter). Thus, the possible Armageddon can come earlier than was initially planned by gods. Much earlier. So much earlier, in fact, that Ku Sean Sun won't even have time to ski all he wants or relax under the air conditioner.

The wise prior could never let that last thing happen and he asked one very old and very wise witch PikiWedia to help him. May be she can determine the least number of moves needed to solve the gods' problem. However, the witch laid out her cards and found no answer for the prior. Then he asked you to help him.

Can you find the shortest solution of the problem, given the number of disks and their diameters? Keep in mind that it is allowed to place disks of the same diameter one on the other one, however, the order in which the disks are positioned on the third pillar in the end should match the initial order of the disks on the first pillar.

Input

The first line contains an integer n — the number of disks ($1 \le n \le 20$). The second line contains n integers d_i — the disks' diameters after Ku Sean Sun cut their edges. The diameters are given from the bottom to the top ($1 \le d_i \le 20$, besides, $d_i \ge d_{i+1}$ for any $1 \le i < n$).

Output

Print on the first line number m — the smallest number of moves to solve the gods' problem. Print on the next m lines the description of moves: two space-separated positive integers s_i and t_i that determine the number of the pillar from which the disk is moved and the number of pillar where the disk is moved, correspondingly ($1 \le s_i, t_i \le 3$, $s_i \ne t_i$).

Sample test(s)

input

```
3
3 2 1
```

output

```
7
1 3
1 2
3 2
1 3
2 1
2 3
1 3
```

input

```
3
3 1 1
```

output

```
5
1 2
1 2
1 3
2 3
2 3
```

input

```
3
3 3 3
```

output

```
5
```

```
1 2
1 2
1 3
2 3
2 3
```

Note

Pay attention to the third test demonstrating that the order of disks should remain the same in the end, even despite the disks' same radius. If this condition was not necessary to fulfill, the gods' task could have been solved within a smaller number of moves (three — simply moving the three disks from the first pillar on the third one).

E. Help Shrek and Donkey

time limit per test: 2 seconds
memory limit per test: 256 megabytes
input: standard input
output: standard output

Shrek and the Donkey (as you can guess, they also live in the far away kingdom) decided to play a card game called YAGame. The rules are very simple: initially Shrek holds m cards and the Donkey holds n cards (the players do not see each other's cards), and one more card lies on the table face down so that both players cannot see it as well. Thus, at the beginning of the game there are overall $m + n + 1$ cards. Besides, the players know which cards the pack of cards consists of and their own cards (but they do not know which card lies on the table and which ones the other player has). The players move in turn and Shrek starts. During a move a player can:

- Try to guess which card is lying on the table. If he guesses correctly, the game ends and he wins. If his guess is wrong, the game also ends but this time the other player wins.
- Name any card from the pack. If the other player has such card, he must show it and put it aside (so that this card is no longer used in the game). If the other player doesn't have such card, he says about that.

Recently Donkey started taking some yellow pills and winning over Shrek. Now Shrek wants to evaluate his chances to win if he too starts taking the pills.
Help Shrek assuming the pills are good in quality and that both players using them start playing in the optimal manner.

Input

The first line contains space-separated integers m and n ($0 \le m, n \le 1000$).

Output

Print space-separated probabilities that Shrek wins and Donkey wins correspondingly; the absolute error should not exceed 10^{-9}.

Sample test(s)

input
0 3
output
0.25 0.75

input
1 0
output
1 0

input
1 1
output
0.5 0.5