

Burgers and Chips

As much as every other person, Lea loves fastfood. But as eating all by herself does make her feel guilty about all the calories, she needs some friends to accompany her to the nearest **TBOBT** (The **B**est **O**ption for **B**urgers in **T**own). Lea is in a very good mood and invites her friends to some burgers and chips. She places her order at the bar and receives the burgers. The efficient person that she is, she does not want to walk back to the table with all the burgers more than once, so she asks for a big plate to put all the food on. She is very finicky when it comes to the arrangement on her plate, that is why she developed a system which is to arrange the burgers side by side at the edge of the plate in a ring around a big mountain of chips in the middle. Nothing must be lost on the way back to the table, so all burgers must lie fully on the plate. However, the height of the mountain of chips in the middle is no issue, Lea is a master of chips stacking. Can you tell Lea what size the plate must be at least to fit all the ordered burgers on it?

Input

The first line of the input contains an integer t . t test cases follow, each of them separated by a line break.

Each test case consists of two integers r and b , with r being the radius of a burger (a round one) and b being the number of burgers ordered.

Assume that the plate is round. Moreover, because Lea is a chips stacking master, she can successfully stack chips on top of burgers, should the case occur (and it does occur with less than three burgers).

Output

For each test case, output one line containing “Case # i : x ” where i is its number, starting at 1, and x is the smallest radius of a plate that can hold all b burgers and the chips.

Your solution is considered correct if the relative error in the radius is less than 10^{-6} .

Constraints

- $1 \leq t \leq 100$
- $1 \leq r \leq 10000$
- $1 \leq b \leq 10000$

Sample Input 1

```
2
3 2
4 9
```

Sample Output 1

```
Case #1: 6.0
Case #2: 15.69521760065235
```

Sample Input 2

```
9
8 2
6 9
10 4
1 6
2 5
2 4
4 10
3 5
8 6
```

Sample Output 2

```
Case #1: 16.0
Case #2: 23.542826400978523
Case #3: 24.14213562373095
Case #4: 3.0
Case #5: 5.4026032334081595
Case #6: 4.82842712474619
Case #7: 16.94427190999916
Case #8: 8.10390485011224
Case #9: 24.0
```