

Chinary Search

Filename: chinary

A more appropriate name for this problem would be Chisection, but part of the title was lost in translation by our Chinese to English dictionary. Do worry not, problem translated statement perfect.

In Chinese markets, the only communication between the vendors and the customer (you) is through the LCD of a four-function calculator. You push through crowds, scooters and bicycles to find your desired item in the market. You point at it to let the vendor know that you are interested, and she types in a number into the calculator. This initial price, n , is not completely unreasonable, but one of the fun parts about being a tourist in China is haggling with the shop keepers, so you punch in a much lower number, p , than the one initially presented. The vendor laughs and mentions something about her family and how she has mouths to feed at home. Although she is not yet willing to sell you the item at your low offer, she will be; it just takes patience and persistence. She wants to get as much of your money as she possibly can, so she lowers her price by a percentage, r . But, you have been in China for a couple of days and know that the vendor will eventually reduce her price to yours, so you punch your initial offer back in the calculator to let her know that you mean business. Again, she repeats the process of lowering her current price by the percentage r , and you again type in your initial offer. This process repeats until the price she enters is less than or equal to your initial offer. How can you sleep at night knowing you haggled her down to such a low price, thus taking food out of her children's mouths?

The Problem:

You will be given three numbers: two integers representing the vendor's initial price of the item and the price that you are willing to pay. The third value will be a floating-point number indicating the percentage the vendor lowers her price each iteration. Your job is to determine how many times the Chinary Search algorithm iterates before you are satisfied.

Here is an example to illustrate how the algorithm works:

$$n = 150, p = 50, r = .25$$

| <u>Iteration</u> | <u>n</u> | <u>p</u> |
|------------------|-----------------------|-----------------------|
| 0 | 150 | 50 |
| 1 | 112 | 50 |
| 2 | 84 | 50 |
| 3 | 63 | 50 |
| 4 | 47 | 50 |

Notice that in iteration 1, the initial price 150 was dropped by 25% (37.50). This produces a new value for n , 112.50, but because prices in China rarely contain fractions of a Yuan (Chinese dollar), the vendor will always round down to set her new price when the new value contains fractions. The answer to this example would be 4.

The Input:

Each line of input will contain 3 numbers (n , p and r), separated by one or more spaces ($0 < p < n < 2000$ and $0.001 \leq r \leq 0.999$). The input terminates when p equals zero.

The Output:

For each input case, print out the number of iterations required before the Chinary Search yields a result less than or equal to p .

Sample Input:

```
150 50 0.25
350 80 0.01
1999 2 0.20
0 0 0.0
```

Sample Output:

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4
115
28
```