15-295

Meeting #2

3 Hour Team Practice

- **5 Problems, A – E**
- **6 Pages, including this one**

Problem A: Euclid Problem

VA: 10104

From Euclid it is known that for any positive integers A and B there exist such integers X and Y that $AX+BY=D$, where D is the greatest common divisor of A and B. The problem is to find for given A and B corresponding X, Y and D.

Input Specification

The input will consist of a set of lines with the integer numbers A and B, separated with space ($A,B<10000$).

Output Specification

For each input line the output line should consist of three integers X, Y and D, separated with space. If there are several such X and Y, you should output that pair for which $|X|+|Y|$ is the minimal (primarily) and $X<=Y$ (secondarily).

Sample Input

```
4 6
17 17
```

Sample Output

```
-1 1 2
0 1 17
```

Problem B: How many Fibs?

VA: 10183

Recall the definition of the Fibonacci numbers:

$f_1 := 1$
$f_2 := 2$
$f_n := f_{n-1} + f_{n-2}$ (n>=3)
Given two numbers *a* and *b*, calculate how many Fibonacci numbers are in the range [*a*,*b*].

Input Specification

The input contains several test cases. Each test case consists of two non-negative integer numbers *a* and *b*. Input is terminated by *a=b=0*. Otherwise, $a<=b<=10^9$. The numbers *a* and *b* are given with no superfluous leading zeros.

Output Specification

For each test case output on a single line the number of Fibonacci numbers f_i with $a<=f_i<=b$.

Sample Input

```
10 100
1234567890 9876543210
0 0
```

Sample Output

```
5
4
```

Problem C: The Knights Of The Round Table

VA: 10195

King Arthur is planning to build the round table in a new room, but this time he wants a room that have sunlight entering it, so he planned to build a glass roof. He also wishes his round table to shine during the day, specially at noon, so he wants it to be covered totally by the sunlight. But Lancelot wants the glass part of the room roof to be triangular (and nobody knows the reason why, maybe he made a vow or something like that). So, there will be a triangular area in the room which will be all covered by the sunlight at noon and the round table must be build in this area.

Now, King Arthur wants to build the biggest table that he cans such that it fits in the triangular sunlighted area. As he is not very good in geometry, he asked Galahad to help him (Lancelot is very good in geometry, but King Arthur didn't asked Lancelot to help him because he feared that he would come up with another strange suggestion).

Can you help Galahad (since he's not too good with computers) and write a program which gives the radius of the biggest round table that fits in the sunlighted area? You can assume that the round table is a perfect circle.

Input Specification

There'll be an arbitrary number of rooms. Each room is represented by three real numbers (a, b and c), which stand for the sizes of the triangular sunlighted area. No triangle size will be greater than 1000000 and you may assume that max(a,b,c) <= (a + b + c) / 2. You must read until you reach the end of the file.

Output Specification

For each room configuration read, you must print the following line:

```
The radius of the round table is: r
```

Where r is the radius of the biggest round table that fits in the sunlighted area, rounded to 3 decimal digits.

Sample Input

12.0 12.0 8.0

Sample Output

The radius of the round table is: 2.828

Problem D: Weights and Measures

VA: 10154

I know, up on top you are seeing great sights,
But down at the bottom, we, too, should have rights.
We turtles can't stand it. Our shells will all crack!
Besides, we need food. We are starving!" groaned Mack.

Mack, in an effort to avoid being cracked, has enlisted your advice as to the order in which turtles should be dispatched to form Yertle's throne. Each of the five thousand, six hundred and seven turtles ordered by Yertle has a different weight and strength. Your task is to build the largest stack of turtles possible.

Input Specification

Standard input consists of several lines, each containing a pair of integers separated by one or more space characters, specifying the weight and strength of a turtle. The weight of the turtle is in grams. The strength, also in grams, is the turtle's overall carrying capacity, including its own weight. That is, a turtle weighing 300g with a strength of 1000g could carry 700g of turtles on its back. There are at most 5,607 turtles.

Output Specification

Your output is a single integer indicating the maximum number of turtles that can be stacked without exceeding the strength of any one.

Sample Input

```
300 1000
1000 1200
200 600
100 101
```

Sample Output

3

Problem E: Piggy Bank

CMUR-S05: 4

A standard automated teller machine dispenses cash in multiples of ten dollars; for example, it can dispense $10 or $20, but not $15. The management of the National Piggy Bank has decided to gain competitive edge by installing Accuracy Cash Machines (ACM), which can dispense any amount of dollars and cents. These machines use the minimal number of coins and bills to dispense the required amount. For example, if a customer needs five cents, she gets a nickel rather than five pennies; as another example, if she needs $5.14, she gets a five-dollar bill, a dime, and four pennies. The denominations of the available coins and bills are $0.01, $0.05, $0.10, $0.25, $1, $5, $10, $20, $50, and $100. Your task is to write a program that determines the minimal number of coins and bills for a given amount of cash.

Input Specification

The input is a list of cash amounts, one amount per line; each amount is between 0.01 and 1000.00. We represent an amount by a real value with exactly two digits after the decimal point. Note that we include these two digits even if they are zeros; for instance, we represent five dollars as $5.00 rather than $5. The total number of lines in the input file is at most 1000; the last line is "0.00", which does not represent a cash amount.

Output Specification

The output shows the minimal number of coins and bills for each amount; each number is on a separate line.

Sample Input

```
0.05
5.14
1000.00
0.00
```

Sample Output

1
6
10