Back From Summer '19 P4: Wesley And Cake

Time limit: 1.0s **Memory limit:** 64M

Everybody knows that cake comes in two shapes, circular or rectangular.
Everybody except for Wesley.

In his defence:

> You wouldn't buy a rectangular shaped pizza would you?

Thus Wesley has only ever cut his cake in one way.

- Imagine a Cartesian grid over the center of the cake labelled at $(0, 0)$.
- Make M cuts over the line formed by $y = m_i x$ within the cake's boundaries.

*A cake fit for a king ~**wleung_bvg**.*

With Wesley's birthday coming up, his friends have decided to play a little prank on him. They have purchased a **square** shaped cake with side length $2N$ and would like to know the side length of the largest axis-aligned **square** obtainable that does not intersect with any cut. A square intersects a cut if there is a non-zero area of the square on both sides of the cut. This means that *touching* a cut does not count as an intersection.

Slope will be given as a_i, b_i where $m_i = \frac{a_i}{b_i}$.

Input Specification

The first line will contain two integers, N and M $(1 \leq N \leq 10^3, 1 \leq M \leq 10^5)$, half the length of the cake, and the number of cuts Wesley makes.

The next M lines will each contain two integers, a_i, b_i $(1 \leq |a_i|, b_i \leq 10^3)$, the numerator and denominator of the slope of the line used to determine the cut. a_i and b_i are guaranteed to be coprime, and the pair (a_i, b_i) is guaranteed to be unique.

Output Specification

Output two *positive* integers, n and d space-separated on one line. This means the side length of the largest obtainable axis-aligned square is $\frac{n}{d}$. **Note that n and d must be *coprime*.**

Constraints

Subtask 1 [30%]

$M \leq 2$

Subtask 2 [70%]

No additional constraints.

Sample Input 1

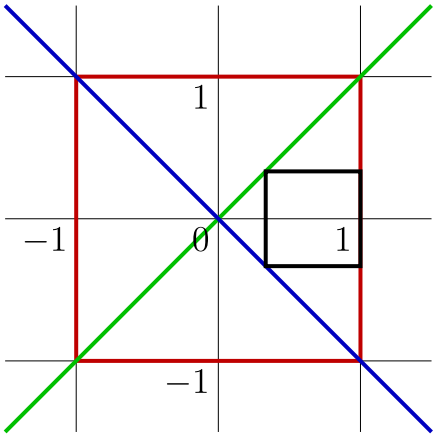
```
1 2
-1 1
1 1
```

Sample Output 1

```
2 3
```

Explanation For Sample 1

The following image shows the cake:



The red square is the cake, and the blue and green lines show the two cuts. The black line shows one of the many different largest squares obtainable.

Sample Input 2

```
2 2
-1 2
1 1
```

Sample Output 2

```
3 2
```

Sample Input 3

```
1000 2
-1000 1
1000 1
```

Sample Output 3

```
2000000 2001
```