[I2A] - Compare Function for Vector Sorting

Time: 1 sec / Memory: 256 MB

Background

This problem simulates a basic building block for the Graham-Scan algorithm used in the [Convex Hull] (/fQL6Z7YpT-SQfkZMr01VQQ) problem.

Use the *Inner-product* and *Cross-product* of the vectors to answer this problem. Note that, for any $\vec{u}, \vec{v}$ in the x-y plane, the third coordinate of $\vec{u} \times \vec{v}$ determines the relative orientation of $\vec{u}$ and $\vec{v}$

Hint: Use `long long` data-type to prevent integer overflow.

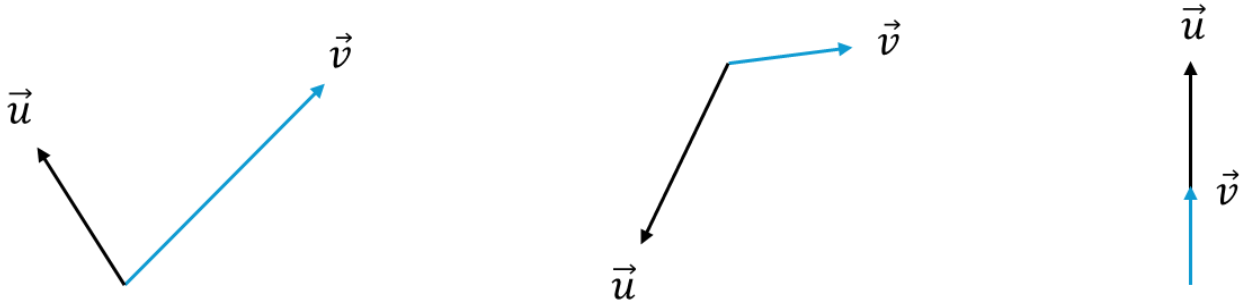
Problem Statement

Let $\vec{u}, \vec{v} \in \mathbb{R}^2$ be two distinct vectors.

Consider the following ordering rule for $\vec{u}$ and $\vec{v}$.

- If $\vec{u}$ to $\vec{v}$ is a counter-clockwise rotation,
  then $\vec{u}$ is ordered before $\vec{v}$.
- If $\vec{u}$ to $\vec{v}$ is a clockwise rotation,
  then $\vec{u}$ is ordered after $\vec{v}$.
- If $\vec{u}$ is parallel to $\vec{v}$,
  then the one with a shorter length is ordered before the other.

Given two distinct vectors $\vec{u}$ and $\vec{v}$, determine the relative ordering between them.



In the first figure, $\vec{v}$ is ordered before $\vec{u}$.

In the second figure, $\vec{u}$ is ordered before $\vec{v}$.

In the third figure, $\vec{v}$ has a shorter length and is ordered before $\vec{u}$.

Input

The first line contains two integers x_1, y_1, representing the first vector $\vec{u} = (x_1, y_1)$.

The second line contains two integers x_2, y_2, representing the second vector $\vec{v} = (x_1, y_1)$.

You may aassume that

- $|x_1|, |x_2|, |y_1|, |y_2| \leq 10^9$.
- $|\vec{u}| \neq |\vec{v}|$ when $\vec{u}$ is parallel to $\vec{v}$.

Output

Output `true` if $\vec{u}$ is ordered before $\vec{v}$.
Otherwise, output `false` .

Example

Input1:

```
1 0
0 -1
```

Output1:

```
false
```

Input2:

```
2 6
3 9
```

Output2:

```
true
```