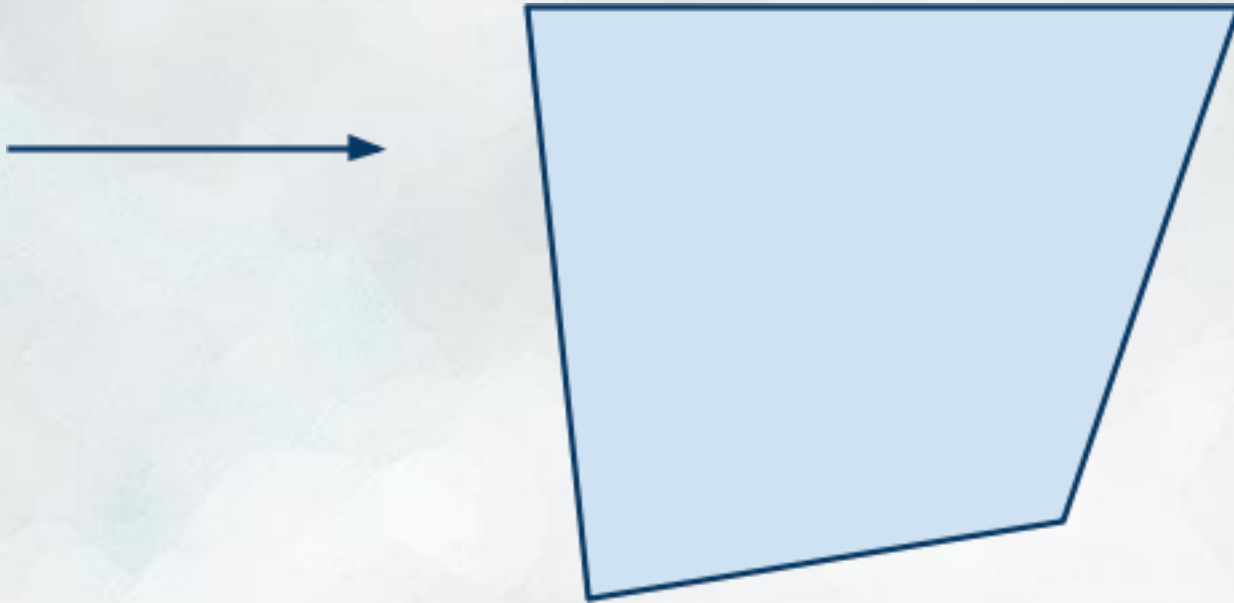


# Cave Explorer

ICPC Japan Alumni Group.

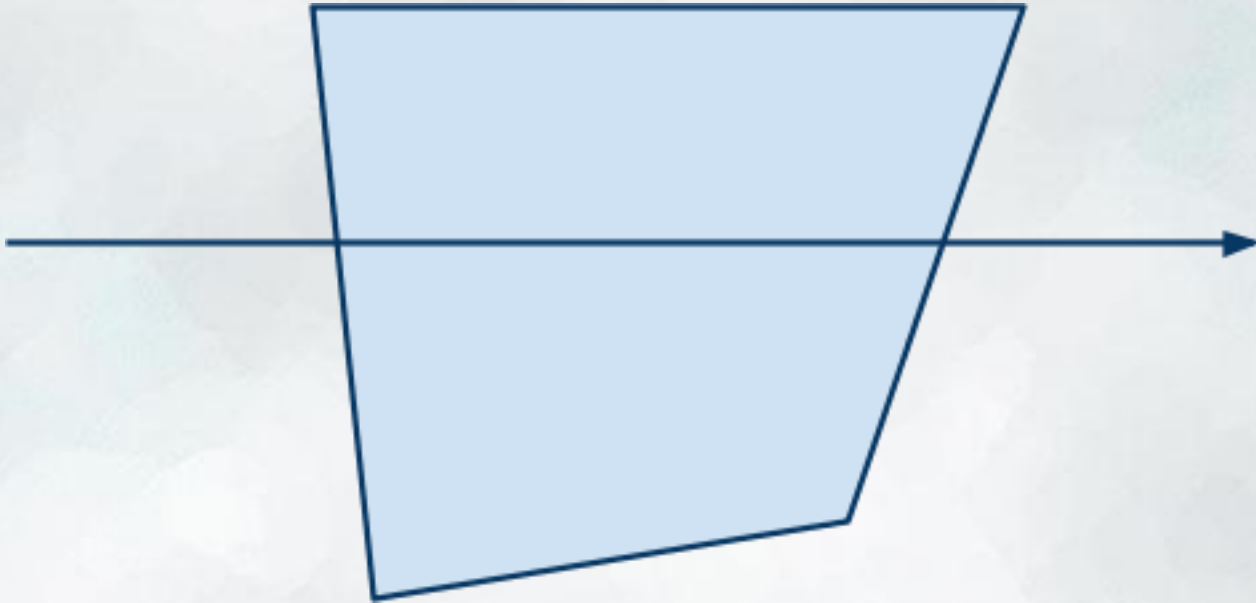
# Problem

Given a polygon and a vector, cut the polygon in that direction.



# Problem

Given a polygon and a vector, cut the polygon in that direction, so that the area of the largest pieces is minimized.



The line divides the polygon by half, if the polygon is convex.

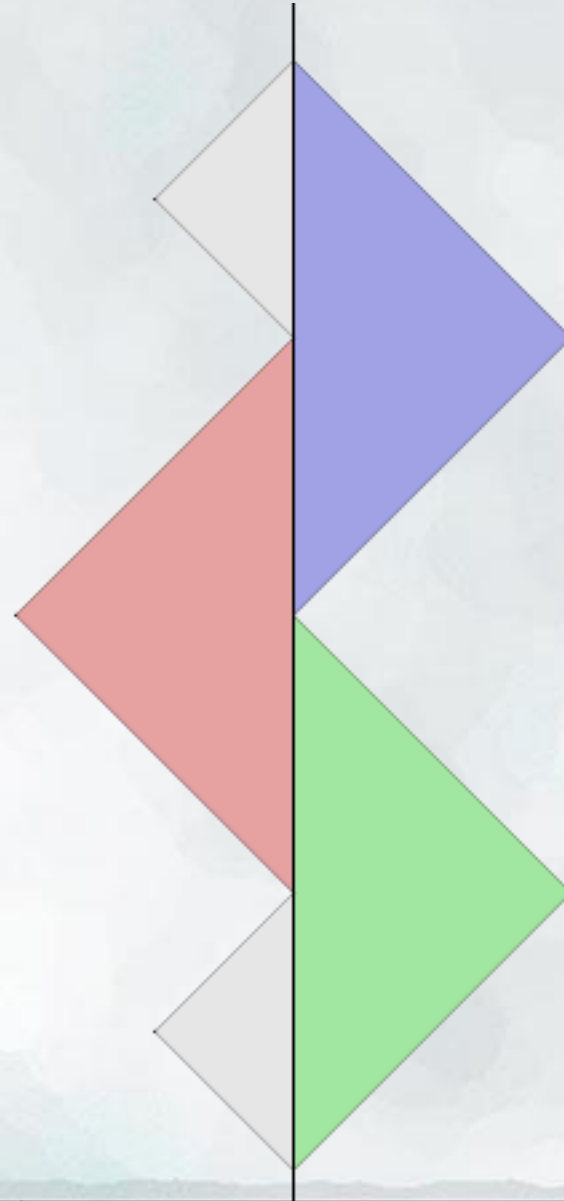
# Examples.

The cutting line can pass vertices of the polygon.



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The cutting line can pass vertices of the polygon.



# Solution. (1)

1. Fix the location of the line and calculate the area of the pieces of the polygon.

- Note that the pieces can touch the line multiple times.
- Should handle lines crossing the vertices.

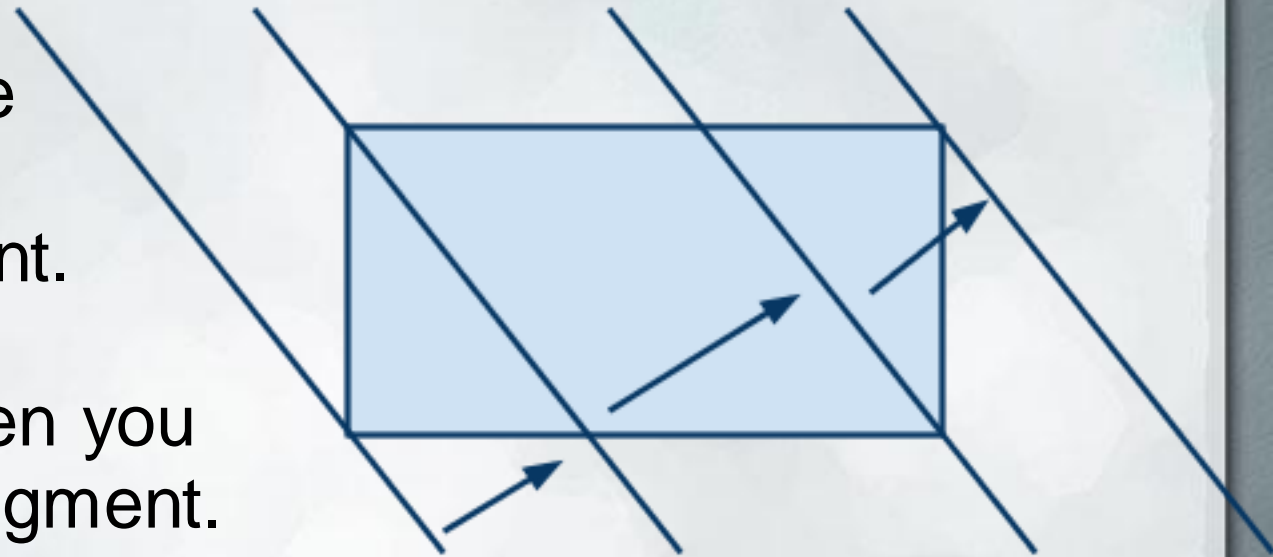




# Solution. (2)

2. Find the right place for the line.

- Try all the candidates where the line touches any of the vertices.
- Sort the vertices by the distance to the line.
- Focus on each segment.
- The areas monotonically increase/decrease when you move the line in the segment.



# Solution. (3)

3. Find the right place of the line for the answer.

- 1. Directly by analytics.
  - All the areas are written in quadrics:). Just solve some equations.
- 2. Numeric solution.
  - The function  $f$ : line place  $\rightarrow$  maximum area is monotonic or has only one extremum (minimum.)
  - You can find the minimum by Golden Section Search, for example.



# Fight against calculation errors.

Should take special care on vertices \* on line \*.

- The minimum width of the segments is  $\sim 10^{-4}$ .
- Should do Golden Section search in such thin areas:(
- Doing following algorithm is a bad thing.

```
const double EPS = 1.0e-10;  
void onLine(line, point) {  
    return distance(point, line) < EPS;  
}
```

# Results

- Total submits: 0