## Laboratory work #3

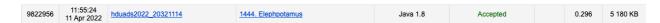
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## Problem # 1444. Elephpotamus

Screenshot from Timus:



## Explanation of algorithm:

- 1. Build the polygon along the first point depending on the atan2 function;
- 2. If the polygon turn around, then let the point start after the turning.

Computational complexity of algorithm:

 $O(n \log n)$ 

## Source code:

```
import java.io.*;
import java.util.Arrays;
public class Elephpotamus {
    public static void main(String[] args) throws IOException {
        new Elephpotamus().run();
    private Point[] POINTS;
    private int SIZE;
    private int STEP = 0;
    StreamTokenizer in;
    PrintWriter out;
    int nextInt() throws IOException {
        in.nextToken();
        return (int) in.nval;
    void run() throws IOException {
       in = new StreamTokenizer(new BufferedReader(new
InputStreamReader(System.in)));
        out = new PrintWriter(System.out);
        initPoints();
```

```
sortPoints();
        paveBoard();
        outputStep();
        out.flush();
    void initPoints() throws IOException {
        SIZE = nextInt();
        POINTS = new Point[SIZE + 1];
        for (int i = 0; i < SIZE; i++) {</pre>
            POINTS[i] = new Point(nextInt(), nextInt());
            POINTS[i].setIndex(i + 1);
        }
    }
    void sortPoints() {
        for (int i = SIZE - 1; i >= 0; i--) {
            POINTS[i].reset (POINTS[i].getX() - POINTS[0].getX(),
POINTS[i].getY() - POINTS[0].getY());
        Arrays.sort (POINTS, 1, SIZE, Point::SOLVE);
    void paveBoard() {
        for (int i = 0; i < SIZE - 1; i++) {</pre>
            int d1 x = POINTS[i].getX() - POINTS[0].getX();
            int d1 y = POINTS[i].getY() - POINTS[0].getY();
            int d2 x = POINTS[i + 1].getX() - POINTS[0].getX();
            int d2 y = POINTS[i + 1].getY() - POINTS[0].getY();
            if (d1 x * d2 y - d1 y * d2 x <= 0 && d1 x * d2 x + d1 y * d2 y <
0) {
                STEP = i;
                break;
            }
        }
    ŀ
    void outputStep() {
        out.println(SIZE);
        out.println(POINTS[0].getIndex());
        for (int i = 0; i < SIZE - 1; i++) {</pre>
            out.println(POINTS[(STEP + i) % (SIZE - 1) + 1].getIndex());
    }
}
class Point {
    private int x;
    private int y;
    private int index;
    public Point(int x, int y) {
        this.x = x;
        this.y = y;
    public void reset(int x, int y) {
        this.x = x;
        this.y = y;
    public int getX() {
        return x;
```

```
}
    public int getY() {
        return y;
    public void setIndex(int index) {
       this.index = index;
    public int getIndex() {
       return index;
    public static int SOLVE(Point P1, Point P2) {
        if (P1.getX() * P2.getY() == P1.getY() * P2.getX() && P1.getX() *
P2.getX() + P1.getY() * P2.getY() >= 0) {
           if (P1.getX() * P1.getX() + P1.getY() * P1.getY() < P2.getX() *</pre>
P2.getX() + P2.getY() * P2.getY())
               return -1;
            else
                return 1;
        else if (Math.atan2(P1.getY(), P1.getX()) < Math.atan2(P2.getY(),</pre>
P2.getX()))
            return -1;
        else
            return 1;
   }
```