

## 4356 Fire-Control System

A new mighty weapon has just been developed, which is so powerful that it can attack a sector of indefinite size, as long as the center of the circle containing the sector is the location of the weapon. We are interested in developing a fire-control system that calculates firing-solutions automatically.

The following picture gives an example of a firing solution:

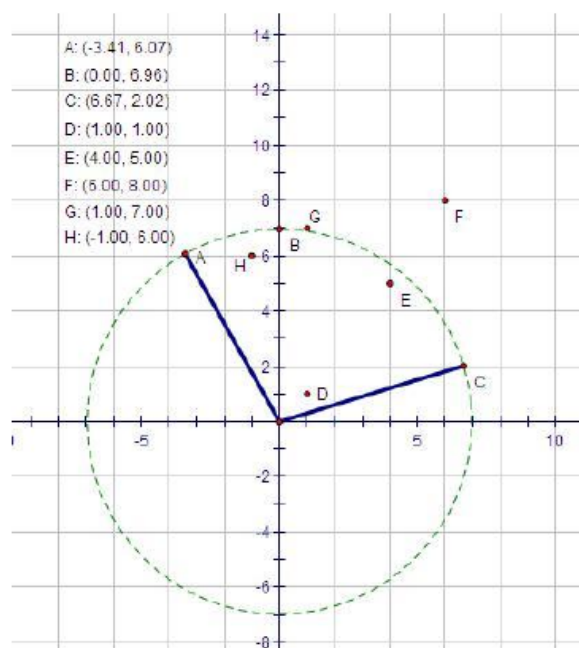


Figure 1

Here the firing region is the sector  $\overline{ABC}$  that covers six points:  $A, B, C, D, E, H$ .

You may further assume that the weapon is always located at point  $(0, 0)$ , no targets will be on the point  $(0, 0)$  and the coordinates of the targets will be distinct.

A firing solution is called *effective* if and only if it covers a minimum of  $K$  points out of  $N$  given points (targets) on the two-dimensional Cartesian plane. Furthermore, since the cost of a particular fire solution is in direct proportion to the size of the area it covers, a firing could be quite costly; thus we are only interested in the optimal firing solution with the minimum cost.

### Input

There are multiple test cases in the input file.

Each test case starts with two non-negative integers,  $N$  and  $K$  ( $1 \leq N \leq 5000$ ,  $K \leq N$ ), followed by  $N$  lines each containing two integers,  $X$ , and  $Y$ , describing the distinct location of one target. It is guaranteed that the absolute value of any integer does not exceed 1000.

Two successive test cases are separated by a blank line. A case with  $N = 0$  and  $K = 0$  indicates the end of the input file, and should not be processed by your program.

## Output

For each test case, please print the required size (to two decimal places), in the format as indicated in the sample output.

## Sample Input

```
3 1
0 1
1 0
-5 -6
```

```
3 2
0 2
2 0
-5 -6
```

```
0 0
```

## Sample Output

```
Case #1: 0.00
Case #2: 3.14
```