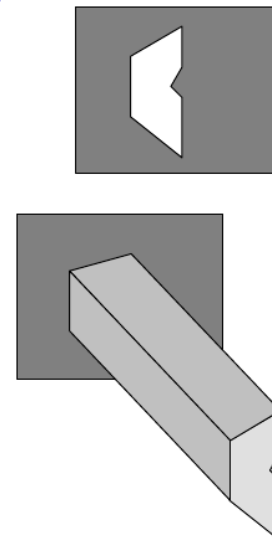


## 3428 Extrusion

The Acme Extrusion Company specializes in the production of steel bars with custom-designed cross-sections. The manufacturing process involves cutting a hole in a thick metal plate, the shape of the hole being determined by the customer's specifications.

Molten metal is then forced through the hole to form a long bar. The shape of the hole determines the shape of the cross-section of the resulting bar.

Given a description of a polygonal hole and the volume of molten metal available, determine how long a bar can be formed by this process.



### Input

Input consists of one or more data sets consisting of the following information:

- An integer,  $N$ , indicating the number of vertices making up the polygon. End of input is signaled by any  $N$  less than 3.
- Next are  $N$  lines, each containing a pair of floating-point numbers,  $(x_i, y_i)$ , each denoting one vertex of the polygon. Vertices will be presented in clockwise order (relative to the closest interior point) proceeding around the perimeter of the polygon. The  $x_i$  and  $y_i$  values are in units of meters.
- The data set is terminated by a floating point value indicating the amount of molten metal available (in cubic meters).

### Output

For each data set, the program should produce a single line of output of the form:

BAR LENGTH:  $x$

where  $x$  is the maximum bar length, a floating point number expressed with two digits precision.

### Sample Input

```
4
0.0 0.0
0.1 0.1
0.0 0.1
0.1 0.0
1.0
7
0.5 1.25
0.9 1.6
0.9 1.1
0.85 1.0
0.9 0.85
```

```
0.9 0.5
0.5 0.75
100.0
0
```

**Sample Output**

```
BAR LENGTH: 100.00
BAR LENGTH: 318.73
```