Problem B. Rolling The Polygon

Time limit: 10 seconds

Bahiyyah has a convex polygon with n vertices $P_0, P_1, \cdots, P_{n-1}$ in the counterclockwise order. Two vertices with consecutive indexes are adjacent, and besides, P_0 and P_{n-1} are adjacent. She also assigns a point Q inside the polygon which may appear on the border.

Now, Bahiyyah decides to roll the polygon along a straight line and calculate the length of the trajectory (or track) of point Q.

To help clarify, we suppose $P_n = P_0, P_{n+1} = P_1$ and assume the edge between P_0 and P_1 is lying on the line at first. At that point when the edge between P_{i-1} and P_i lies on the line, Bahiyyah rolls the polygon forward rotating the polygon along the vertex P_i until the next edge (which is between P_i and P_{i+1}) meets the line. She will stop the rolling when the edge between P_n and P_{n+1} (which is same as the edge between P_0 and P_1) meets the line again.

Input

The input contains several test cases, and the first line is a positive integer T indicating the number of test cases which is up to 50.

For each test case, the first line contains an integer n ($3 \le n \le 50$) indicating the number of vertices of the given convex polygon. Following n lines describe vertices of the polygon in the counterclockwise order. The i-th line of them contains two integers x_{i-1} and y_{i-1}, which are the coordinates of point P_{i-1}. The last line contains two integers x_Q and y_Q, which are the coordinates of point Q.

We guarantee that all coordinates are in the range of -10^3 to 10^3, and point Q is located inside the polygon or lies on its border.

Output

For each test case, output a line containing `Case #x: y`, where `x` is the test case number starting from 1, and `y` is the length of the trajectory of the point Q rounded to 3 places. We guarantee that 4-th place after the decimal point in the precise answer would not be 4 or 5.

Sample

standard input	standard output
4 4 0 0 2 0 2 2 0 2 1 1 3 0 0 2 1 1 2 1 1 5 0 0 1 0 2 2 1 3 -1 2 0 0 6 0 0 3 0 4 1 2 2 1 2 -1 1 1 0	Case #1: 8.886 Case #2: 7.318 Case #3: 12.102 Case #4: 14.537

Hint

The following figure is the the trajectory of the point Q in the first sample test case.