CS1010E Practice Exercise: Convex Polygon

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Convex Polygon

A convex polygon of six vertices is shown below.

To determine whether a polygon is convex, one can walk along the boundary of the polygon in a clockwise direction (e.g. `A -> B -> C -> D -> E -> F -> A`) going from one vertex to the next. If every turn is a right turn, then the polygon is convex.

Given three consecutive vertices in a clockwise direction, say $A=(x_A,y_A)$, $B=(x_B,y_B)$, and $C=(x_C,y_C)$, to determine a right turn at `B`, we can compute

$$x_A(y_B - y_C) - y_A(x_B - x_C) + (x_By_C - y_Bx_C)$$

and check if the result is negative.

Write a program that reads the number of vertices of a polygon as well as the `x` and `y` coordinates of each vertex, and determines if the polygon is convex by printing `YES` or `NO`. Assume the polygon has between `3` to `10` vertices (both inclusive) given in a clockwise direction, and no three consecutive vertices are on a straight line.

Sample Runs

The following are sample runs of the program. User input is underlined. Ensure that the last line of output is followed by a newline character.

- Sample run #1:

```
Enter number of vertices: 5
0 10
5 20
10 10
8 0
2 0
YES
```

- Sample run #2:

```
Enter number of vertices: 4
0 0
```

```
0 5
4 -2
-6 -2
NO
```

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