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# **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  $\rightarrow$  B  $\rightarrow$  C  $\rightarrow$  D  $\rightarrow$  E  $\rightarrow$  F  $\rightarrow$  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 <u>underlined</u>. Ensure that the last line of output is followed by a newline character.

• Sample run #1:

```
Enter number of vertices: <u>5</u>
<u>0 10</u>
<u>5 20</u>
<u>10 10</u>
<u>8 0</u>
<u>2 0</u>
YES
```

• Sample run #2:

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

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