CS 2003 – FA2018
Project 01 - Due: 2:00pm Monday, February 04, 2019

Submit to harvey.utulsa.edu a zip file containing all of your source code files for the project, your .txt input file, and a file containing the output from an execution of your root (main) program. Feel free to include (or not) a txt file of comments. Do not include any of the other .docx or .pdf or .idea files that are currently a part of postings.

Modify files of the point/polygon/rectangle project to accomplish the following:

1. Create a text file named project01data.txt of polygons/rectangles that includes the following polygon/rectangle objects in the format described with Lab03. Your starting place is the collection of .py files in the AllPolygonPython3x directory of the Day04and05 posting.

```
P  5
1.7   4.9
6.1  6.2
7.0  2.8
4.8  0.1
1.5  1.4
R  4
7.0  5.0
1.0  5.0
1.0  3.0
7.0  3.0
P  4
4.1  5.4
6.9  2.5
2.9  0.8
0.9   2.5
P  3
1.2  4.7
6.5  4.2
4.0  1.7
```

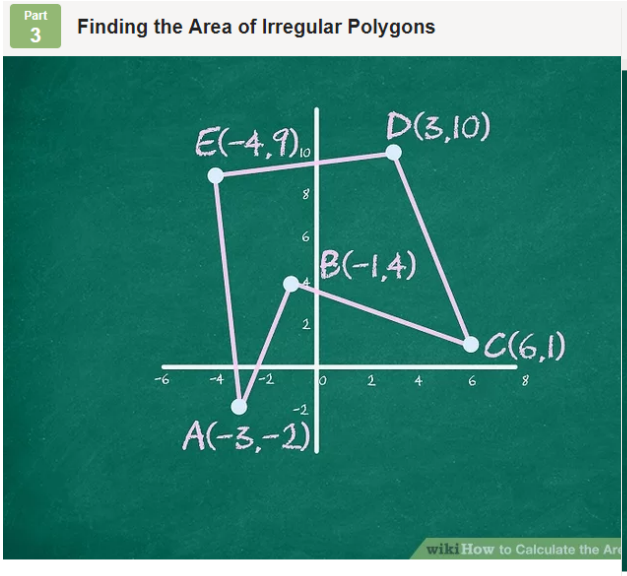
(2) For each polygon/rectangle, create the appropriate object, request that each object report its vertices, its perimeter, and its area. (If you leave your echo check of the data in your root (main) program, that is fine; but then you will see the collection of vertices showing up twice for each of the polygons, once as reported in the main, and again as reported by the object.)

Among other possible changes, you should

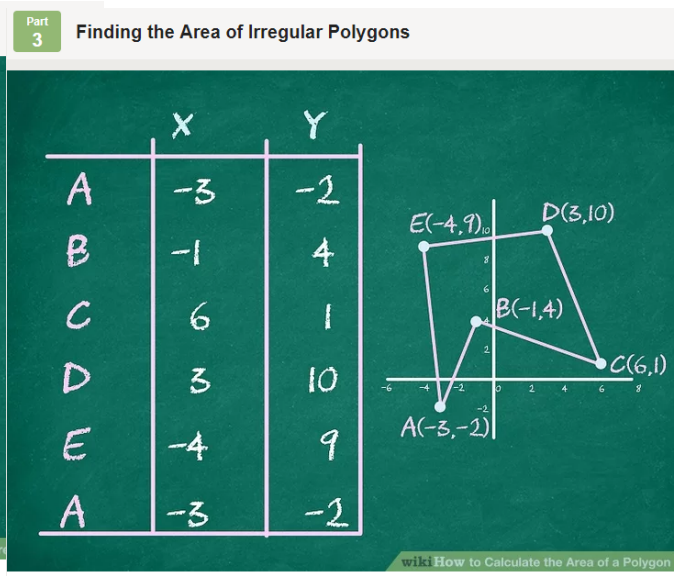
- modify the Polygon.py code to add a function to compute the area.
- modify the constructor in the Polygon.py code to accept a list of vertices as opposed to hard-coding the vertices.
- modify the Rectangle code so that length and width are computed, rather than assigned, and so that the area is computed with an improved function for computing the area: 2*(length*width).

Make sure there are no errors in your data file; you do not need to do any exception processing.

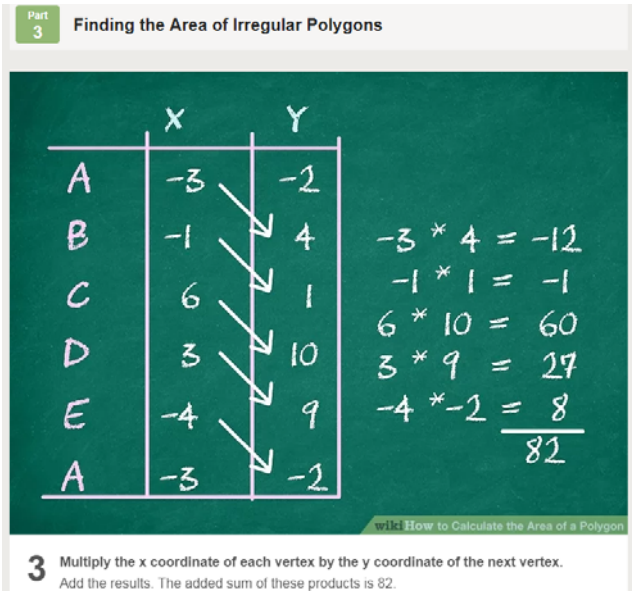
A perhaps not so well known fact: See: https://www.wikihow.com/Calculate-the-Area-of-a-Polygon



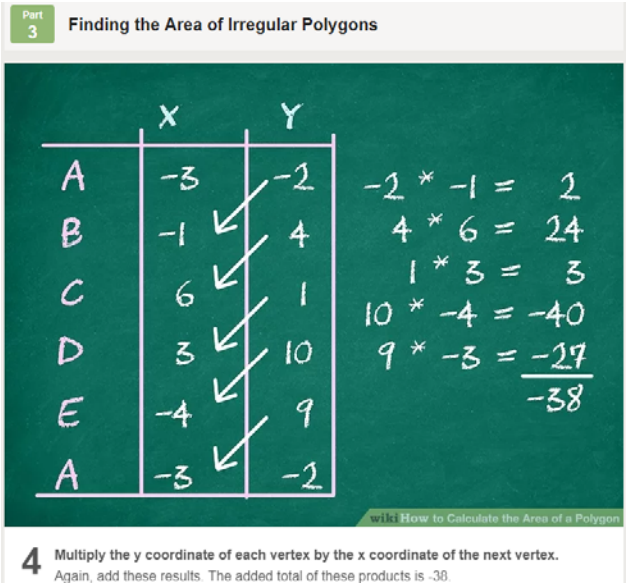
1 **Write down the coordinates of the vertices of the irregular polygon.** Determ the area for an irregular polygon can be found when you know the coordinates o vertices.



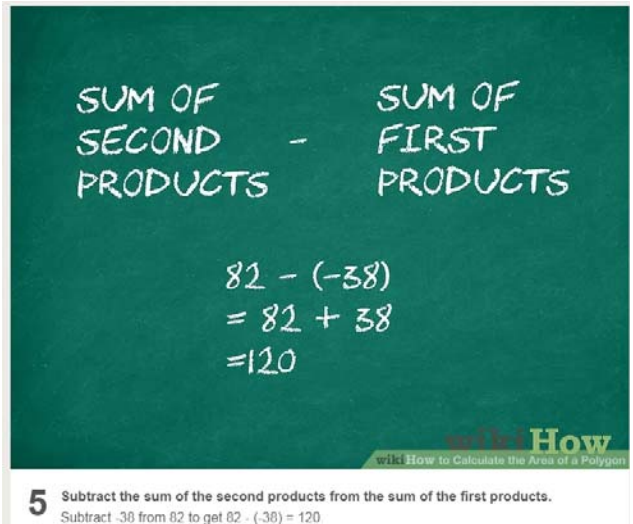
2 **Create an array.** List the x and y coordinates of each vertex of the polygon in counterclockwise order. Repeat the coordinates of the first point at the bottom of the list.



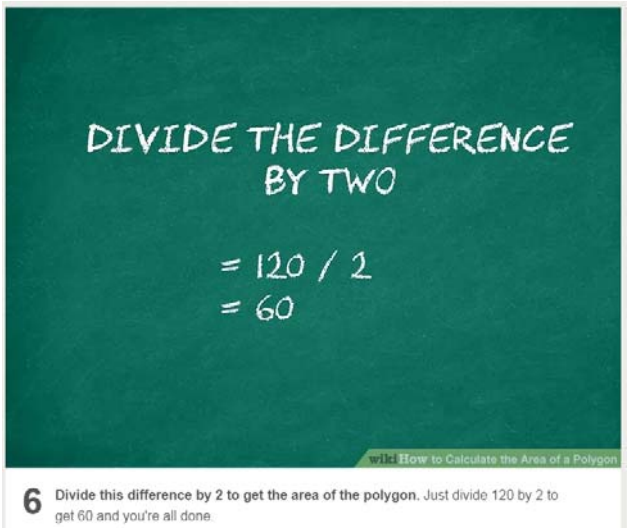
3 **Multiply the x coordinate of each vertex by the y coordinate of the next vertex.** Add the results. The added sum of these products is 82.



4 **Multiply the y coordinate of each vertex by the x coordinate of the next vertex.** Again, add these results. The added total of these products is -38.



5 **Subtract the sum of the second products from the sum of the first products.** Subtract -38 from 82 to get 82 - (-38) = 120.



6 **Divide this difference by 2 to get the area of the polygon.** Just divide 120 by 2 to get 60 and you're all done.

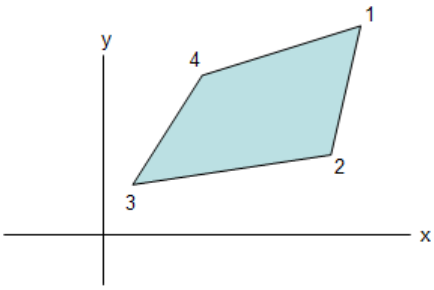
https://www.mathopenref.com/coordpolygonarea.html

Area of a polygon (Coordinate Geometry)

A method for finding the area of any polygon when the coordinates of its vertices are known.

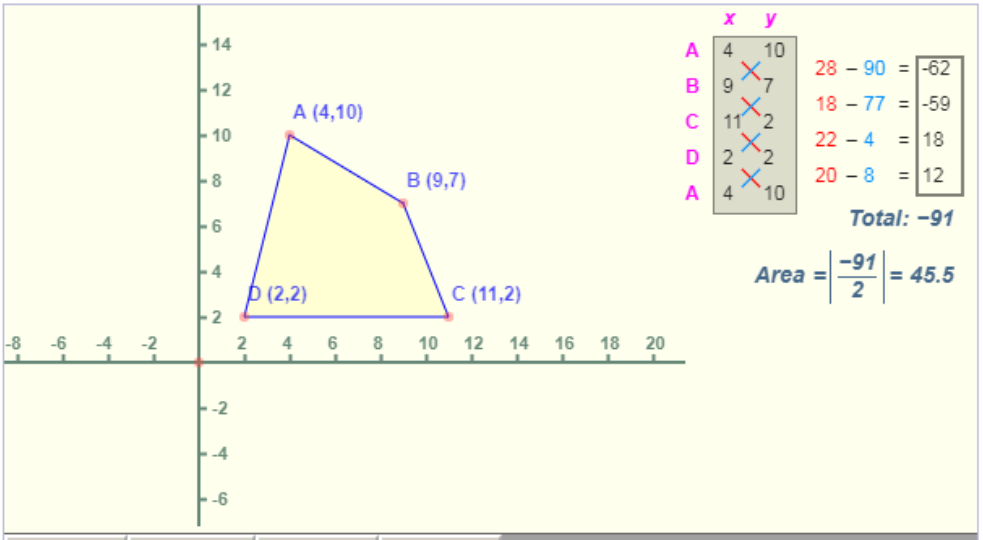
(See also: Computer algorithm for finding the area of any polygon.)

First, number the vertices in order, going either clockwise or counter-clockwise, starting at any vertex.



Try it here

Adjust the quadrilateral ABCD by dragging any vertex. The area is calculated using this method as you drag. A detailed explanation follows the diagram.



Limitations

This method will produce the wrong answer for self-intersecting polygons, where one side crosses over another, as shown on the right. It will work correctly however for triangles, regular and irregular polygons, convex or concave polygons.