

Polygon Area - Solution

The area of a polygon can be determined by the Shoelace formula, where (x_i, y_i) are the coordinates of the i th vertex:

$$2A = \begin{vmatrix} x_1 & x_2 \\ y_1 & y_2 \end{vmatrix} + \begin{vmatrix} x_2 & x_3 \\ y_2 & y_3 \end{vmatrix} + \dots + \begin{vmatrix} x_n & x_1 \\ y_n & y_1 \end{vmatrix} \quad (1)$$

```
1 def calculate_area(vertices) -> float:
2     """
3     Calculates the area of the polygon.
4
5     Returns:
6         float: The area of the polygon.
7
8     Raises:
9         ValueError: If the polygon has less than 3 vertices.
10    """
11    if len(vertices) < 3:
12        raise ValueError("A_polygon_must_have_at_least_3_vertices.")
13
14    area = 0.0
15
16    for i in range(len(vertices)):
17        x1, y1 = vertices[i]
18        x2, y2 = vertices[(i + 1) % len(vertices)]
19        area += (x1 * y2) - (x2 * y1)
20
21    area = abs(area) / 2.0
22
23    return area
```