

Q8. Area of Convex Quadrilateral (40 Marks)

Find the area of the convex quadrilateral bounded by 4 straight lines connecting four given coordinates. For example, given the four coordinates (1,3), (2,2), (3,4), and (-1, -2) as shown in Figure Q8, the area of the convex quadrilateral formed by these coordinates is 5. **However, be caution, you need to arrange the coordinates correctly to form a convex quadrilateral.**

Hint 1: To calculate the distance between two coordinates.

The formula to find the distance between the two points is given by.

$$distance = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Hint 2: To calculate the area of a triangle using three side lengths.

In geometry, Heron's formula gives the area of a triangle in terms of the three side lengths a , b , and c . Just use this two-step process:

Step 1: Calculate "s" (half of the triangles perimeter):

$$s = \frac{a + b + c}{2}$$

Step 2: Then calculate the Area:

$$Area = \sqrt{s(s - a)(s - b)(s - c)}$$

Finally, a convex quadrilateral consists of 2 triangles.

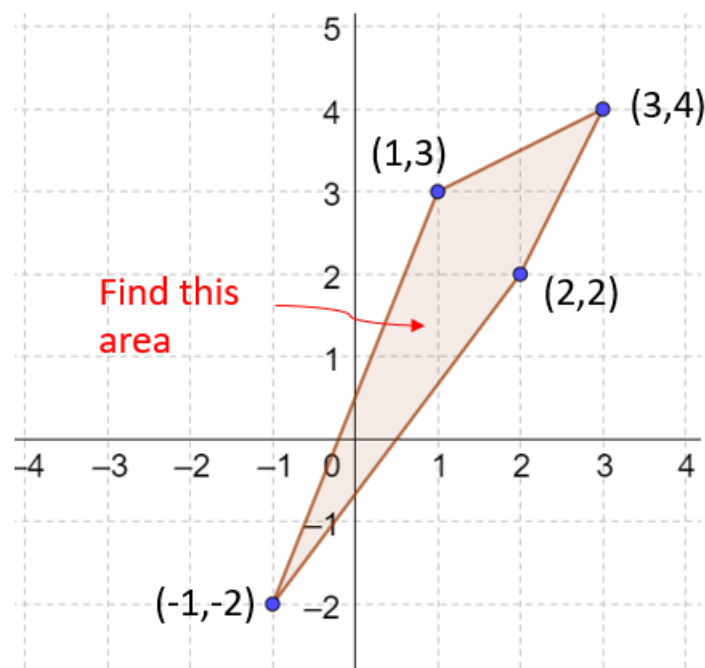


Figure Q8. The area of quadrilateral formed by four coordinates.

Write a program to

Input, in sequence:

Four coordinates in the form of

x_1 y_1

x_2 y_2

x_3 y_3

x_4 y_4

Note: All the values of the above coordinates are integers in the interval $[-100, 100]$.

Output:

The area of convex quadrilateral formed by the above coordinates.

试题 8. 凸四边形的面积 (40 分)

给定四个坐标，假设它们的连线可以界定一个凸四边形 (convex quadrilateral)，求出这个四边形的面积。例如，给定坐标(1, 3)、(2, 2)、(3,4) 和 (-1, -2)，如图 Q8 所示，由这些坐标形成的凸四边形的面积为 5。然而，需要注意的是，您需要正确排列这些坐标以形成一个凸四边形。

提示 1：计算两个坐标之间的距离。

计算两点之间距离的公式如下：

$$\text{距离} = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

提示 2：使用三边长度计算三角形的面积。

在几何中，海伦公式 (Heron's formula) 能按照以下两步计算，利用三条边长 a 、 b 、和 c 为参数，找出三角形的面积。：

步骤 1：计算“ s ” (三角形半周长)：

$$s = \frac{a + b + c}{2}$$

步骤 2：然后计算面积：

$$\text{面积} = \sqrt{s(s-a)(s-b)(s-c)}$$

最后，凸四边形由 2 个三角形组成。

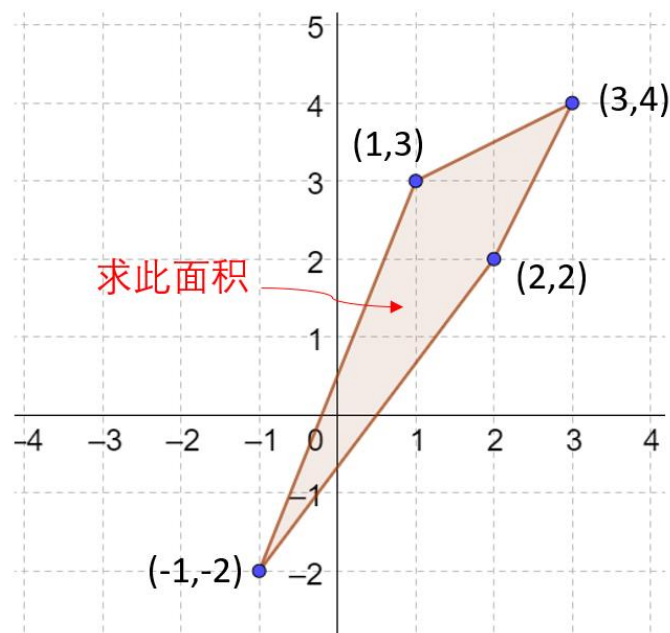


图 Q8. 由四个坐标形成的四边形的面积

试写一程式以

依序输入:

以下形式的四点坐标

x_1 y_1

x_2 y_2

x_3 y_3

x_4 y_4

注意： 以上坐标的数值皆为整数，且都落在区间 $[-100, 100]$ 里。

输出:

由这四个坐标形成的凸四边形的面积。

Examples (例子)

Input (输入)	Output (输出)
2 2 3 4 1 3 -1 -2	5
22 40 47 40 9 23 30 23	391
10 7 -7 8 5 17 7 -8	211.5
18 10 14 46 7 15 51 29	820
21 -4 50 -4 12 -10 37 -10	162

Test Case

Input (輸入)	Output (輸出)
2 2 3 4 1 3 -1 -2	5
22 40 47 40 9 23 30 23	391
10 7 -7 8 5 17 7 -8	211.5
18 10 14 46 7 15 51 29	820
21 -4 50 -4 12 -10 37 -10	162
12 34 -12 -3 46 75 78 -20	4140
-12 -45 -78 -47 -21 -56 -43 -54	396
35 23 3 20 40 3 16 32	500
-7 39 50 39 -7 19 50 19	1140