939. Minimum Area Rectangle

Difficulty

Medium

CSX3009 ALGORITHM DESIGN section 541

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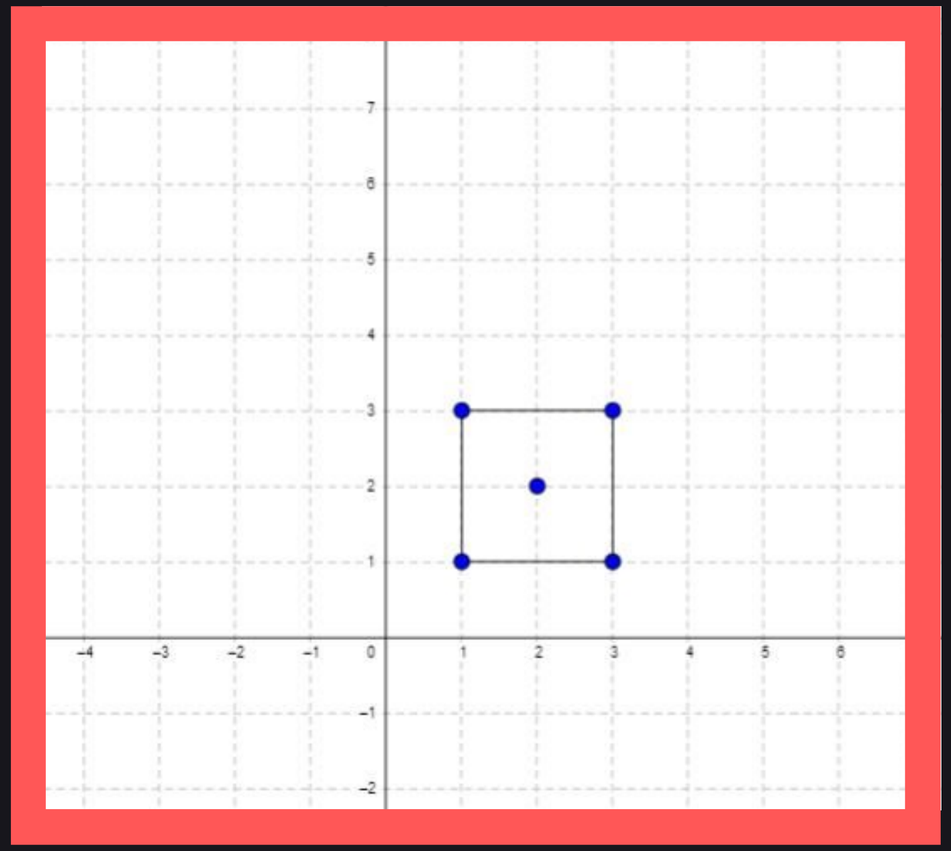
01 PROBLEM DESCRIPTION

THE PROBLEM

939. Minimum Area Rectangle

You are given an array of points in the X-Y plane points where points[i] = [xi, yi]. Return the minimum area of a rectangle formed from these points, with sides parallel to the X and Y axes. If there is not any such rectangle, return 0.

Example 1:



Input: points = [[1,1],[1,3],[3,1],[3,3],[2,2]]

Output: 4

02 PROBLEM ANALYSIS

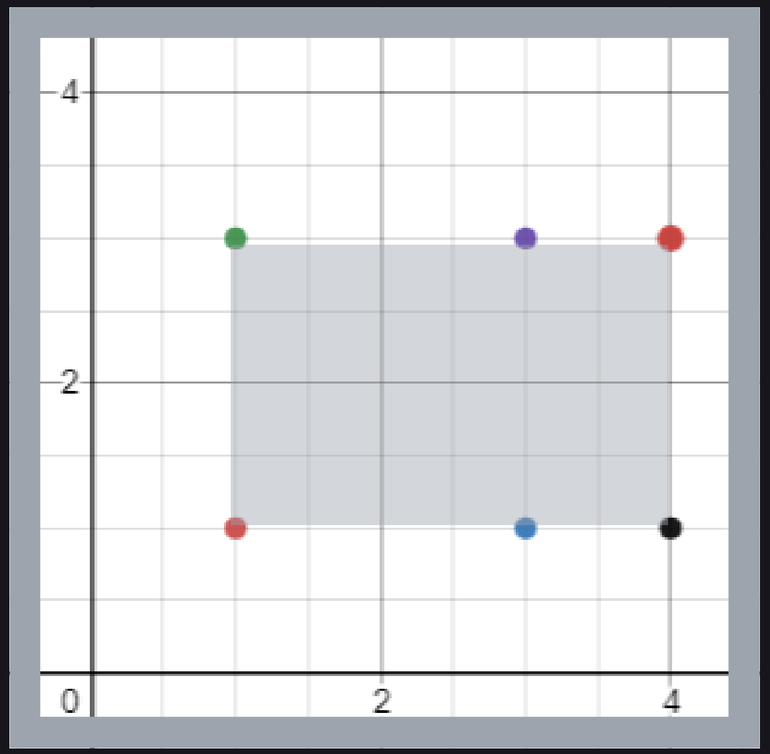
ANALYSIS

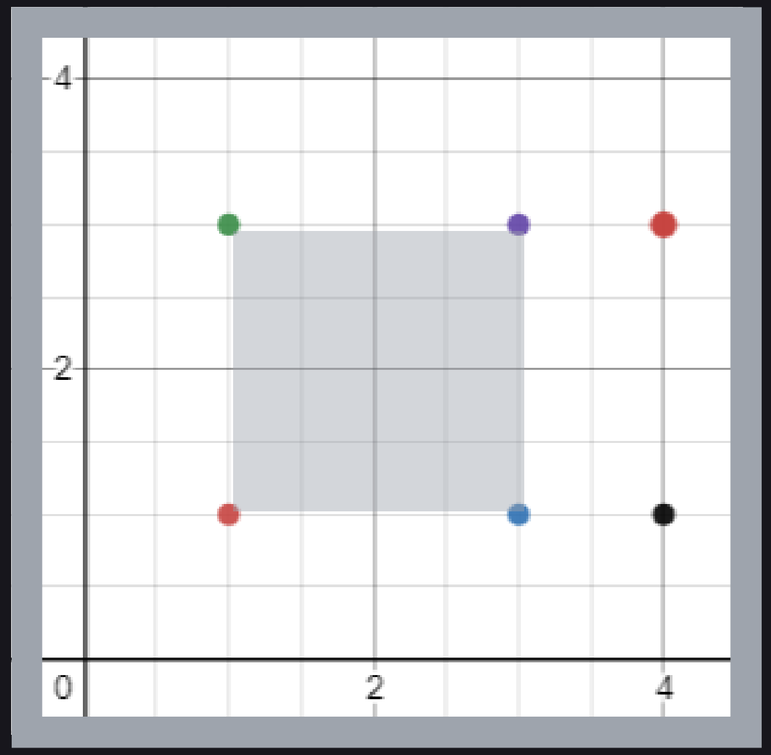
If 4 points can form a rectangular, they have to be (x1, y1), (x1, y2), (x2, y1), and (x2, y2). (x, y) => [(x1, y1), (x2, y2), ...]

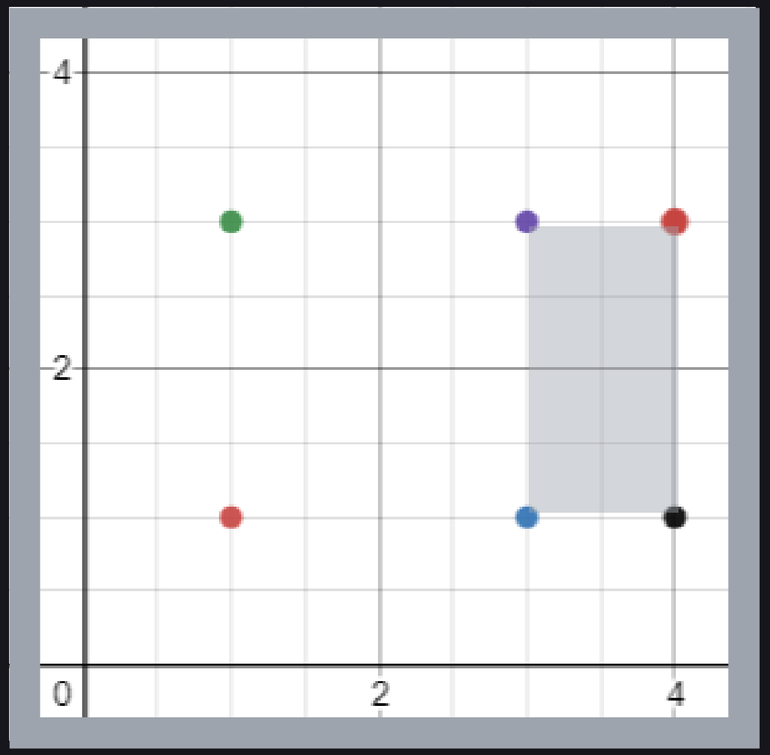
Finding each x paired with any yi, we get xi = {y1, y2, ... yi}.

Looping matches x1 and x2 every possibility.

Calculate the area of the rectangle. Find the sminimum area.

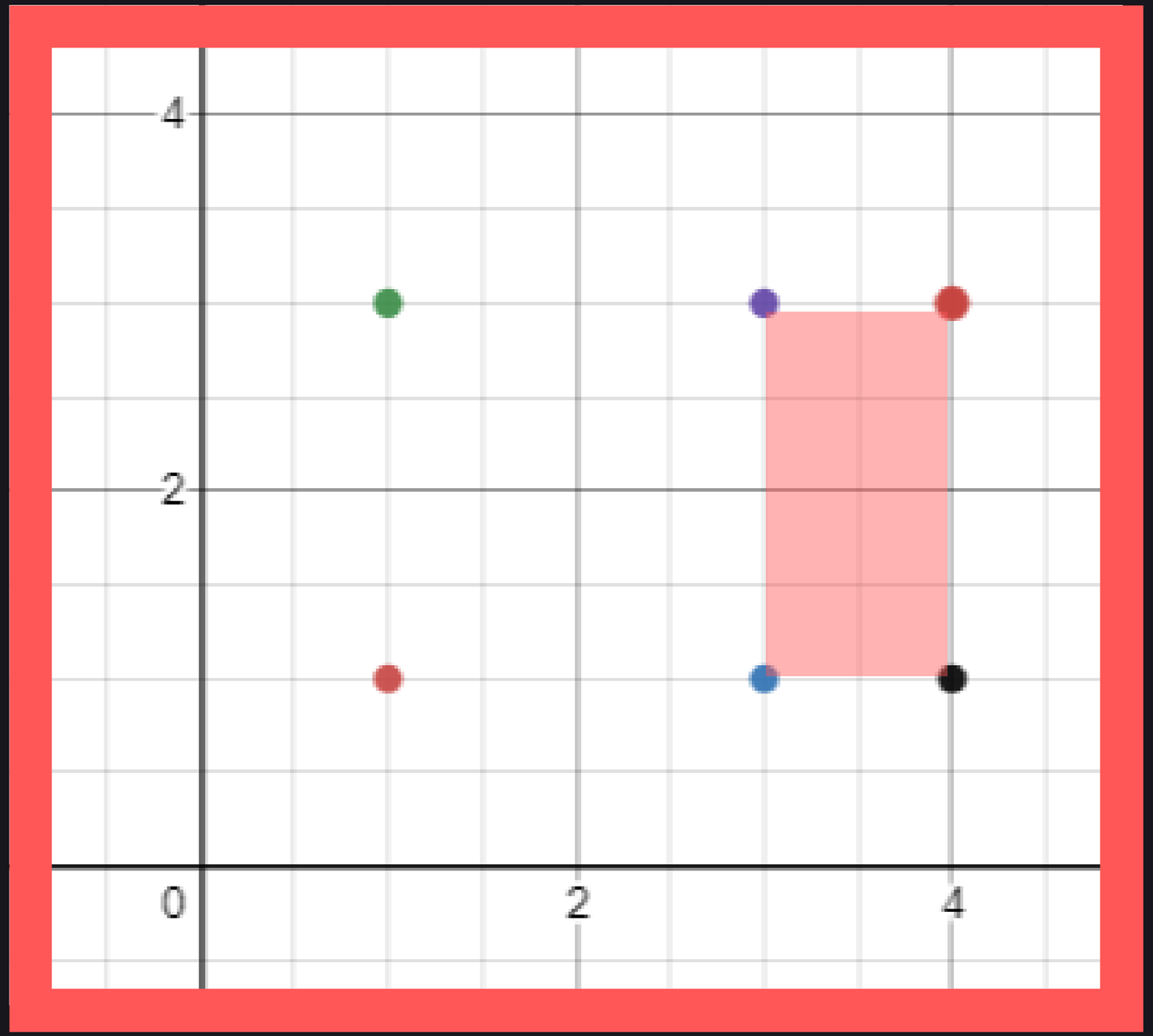




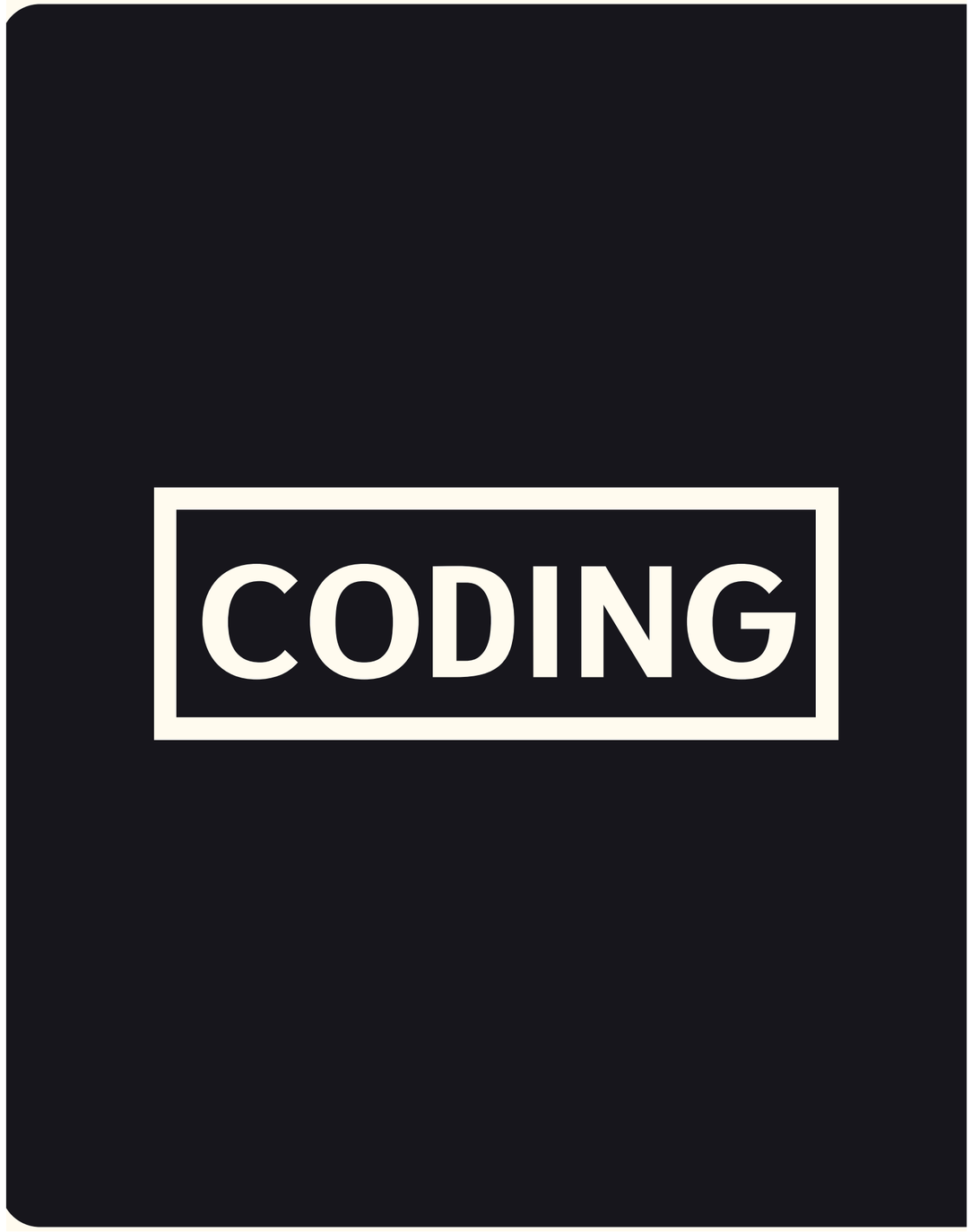


If 4 points can form a rectangular (x, y) => [(x1, y1), (x2, y2), ...]

Find the minimum area



03 SOLUTION




```python
import collections

class Solution(object):
    def minAreaRect(self, points):
        n = len(points)

        mappingx = collections.defaultdict(set)
        mappingy = collections.defaultdict(set)

        for x, y in points:
            mappingx[x].add(y)
            mappingy[y].add(x)

        nx = len(mappingx)
        ny = len(mappingy)
        if nx == n or ny == n:
            return 0

        mapping = mappingx if ny > nx else mappingy

        keys = list(mapping.keys())
        area = float('inf')

        for i in range(len(keys)):
            x1 = keys[i]
            for j in range(i+1, len(keys)):
                x2 = keys[j]

                yset, yset1 = mapping[x1], mapping[x2]
                interset = sorted(yset.intersection(yset1))

                if len(interset) > 1:
                    min_ydiff = min(interset[i+1]-interset[i]
                        for i in range(len(interset)-1))
                    area = min(area, min_ydiff * abs(x2-x1))

        return 0 if area == float('inf') else area
```

CODING

IThe data obtained is List of ordered pairs (x, y) => [(x1, y1), (x2, y2), ...]

```
1   import collections
2
3   class Solution(object):
4       def minAreaRect(self, points):
5           n = len(points)
6
7           mappingx = collections.defaultdict(set)
8           mappingy = collections.defaultdict(set)
9
```

CODING

Finding each x paired with any yi, we get xi = {y1, y2, ... yi}.

```
10          for x, y in points:
11              mappingx[x].add(y)
12              mappingy[y].add(x)
13
14          nx = len(mappingx)
15          ny = len(mappingy)
16          if nx == n or ny == n:
17              return 0
18
19          mapping = mappingx if ny > nx else mappingy
20
21          keys = list(mapping.keys())
```

CODING

Looping matches x1 and x2 every possibility.

```
24 ▾        for i in range(len(keys)):
25              x1 = keys[i]
26 ▾            for j in range(i+1, len(keys)):
27                  x2 = keys[j]
28
29                  yset, yset1 = mapping[x1], mapping[x2]
30                  interset = sorted(yset.intersection(yset1))
```

CODING

Calculate the area of the rectangle. Find the sminimum area.

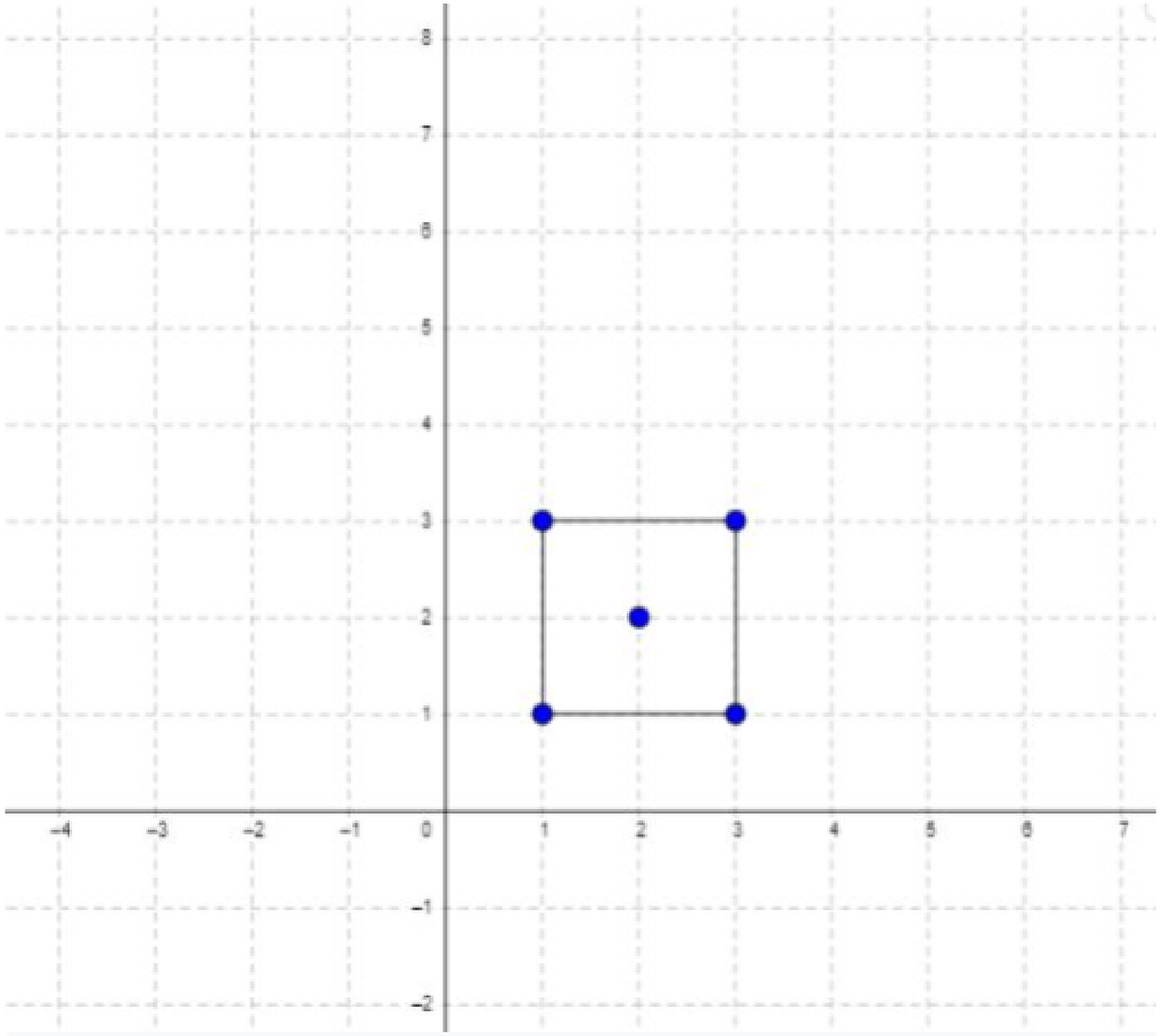
```
32                 if len(interset) > 1:
33                     min_ydiff = min(interset[i+1]-interset[i]
34                         for i in range(len(interset)-1))
35                     area = min(area, min_ydiff * abs(x2-x1))
36 
37         return 0 if area == float('inf') else area
```

RESULT

Testing with sample smaple data the console shows the following results.

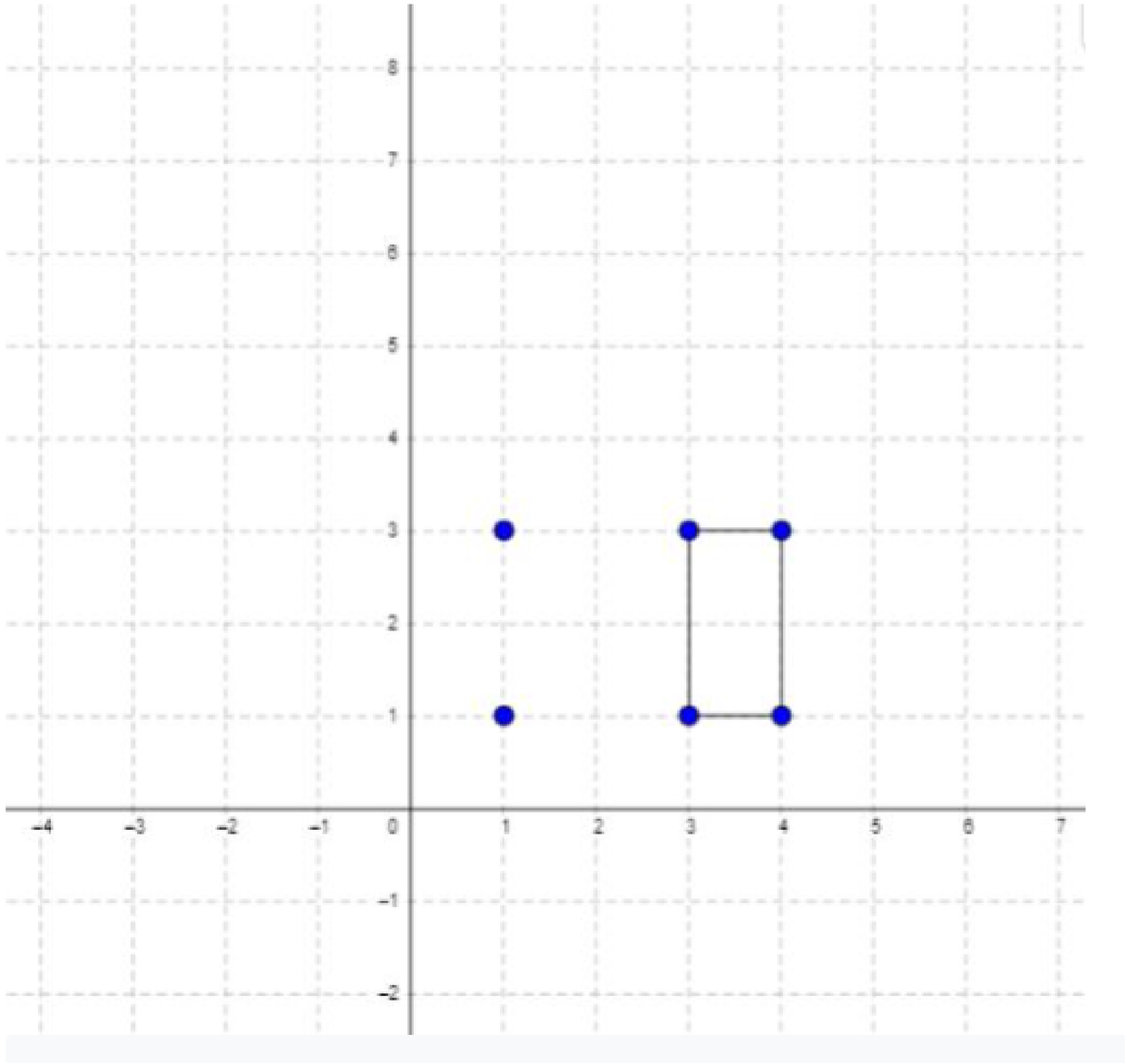
Accepted Runtime: 17 ms

Your input	`[[1,1],[1,3],[3,1],[3,3],[2,2]]`
Output	4
Expected	4



RESULT

Testing with sample smaple data the console shows the following results.



Accepted Runtime: 17 ms

Your input `[[1,1],[1,3],[3,1],[3,3],[4,1],[4,3]]`

Output 2

Expected 2

04 SUBMISSION

SUBMSSION

Time Submitted	Status	Runtime	Memory	Language
09/14/2021 22:42	Accepted	203 ms	13.9 MB	python

Submission Detail

137 / 137 test cases passed.

Runtime: **203 ms**
Memory Usage: **13.9 MB**

Status: **Accepted**

Submitted: **0 minutes ago**

REFERENCE

https://blog.csdn.net/fuxuemingzhu/article/details/83961509

THANKS