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36



391. Perfect Rectangle

Notes

[Description \(/problems/perfect-rectangle/description/\)](/problems/perfect-rectangle/description/)[Hints \(/problems/perfect-rectangle/hints/\)](/problems/perfect-rectangle/hints/)[Submissions \(/problems/perfect-rectangle/submissions/\)](/problems/perfect-rectangle/submissions/)[Pick One \(/problems/random-one-question/\)](/problems/random-one-question/)

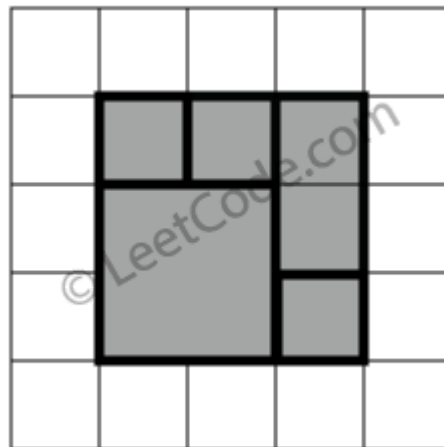
Given N axis-aligned rectangles where $N > 0$, determine if they all together form an exact cover of a rectangular region.

Each rectangle is represented as a bottom-left point and a top-right point. For example, a unit square is represented as $[1,1,2,2]$. (coordinate of bottom-left point is $(1, 1)$ and top-right point is $(2, 2)$).

Example 1:

```
rectangles = [  
  [1,1,3,3],  
  [3,1,4,2],  
  [3,2,4,4],  
  [1,3,2,4],  
  [2,3,3,4]  
]
```

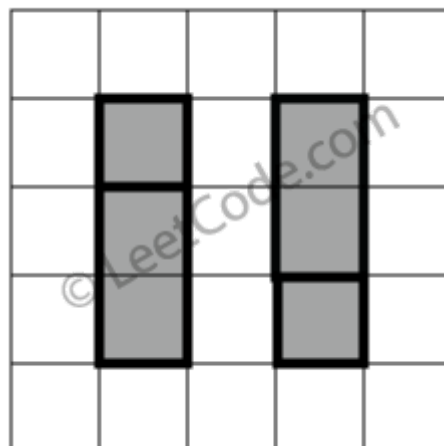
Return true. All 5 rectangles together form an exact cover of a rectangular region.



Example 2:

```
rectangles = [  
  [1,1,2,3],  
  [1,3,2,4],  
  [3,1,4,2],  
  [3,2,4,4]  
]
```

Return false. Because there is a gap between the two rectangles $[1,1,2,3]$ and $[3,1,4,2]$.



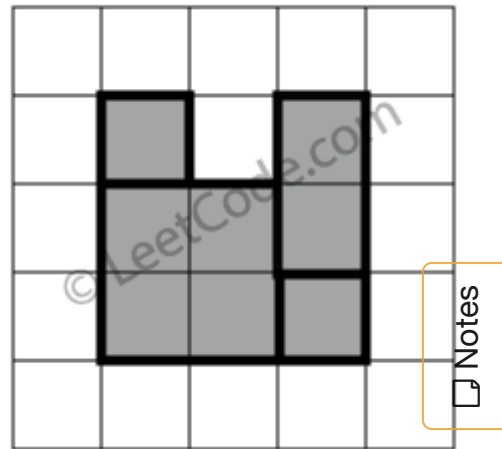
Example 3:

```

rectangles = [
  [1,1,3,3],
  [3,1,4,2],
  [1,3,2,4],
  [3,2,4,4]
]

```

Return false. Because there is a gap in the top center.



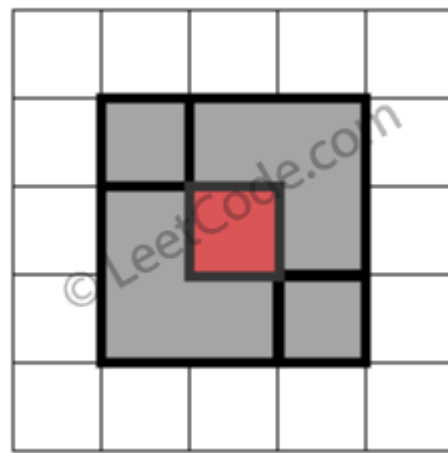
Example 4:

```

rectangles = [
  [1,1,3,3],
  [3,1,4,2],
  [1,3,2,4],
  [2,2,4,4]
]

```

Return false. Because two of the rectangles overlap with each other.



Seen this question in a real interview before?



Companies ▼

C++ ▼



```

1 // A perfect rectangle must satisfy following conditions
2 // -- Area adds up exactly as bounding box area
3 // -- For all rectangle corners (except the four bounding box corner), it must
4 //   be overlapped for exactly two or four times
5 // -- Each overlapping cannot must be from different type of corners (e.g., TL
6 //   and TR )
7 //   can't overlap on the same corner grid
8 //   TL-0x1    TR-0x2
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14  BL-0x4    BR-0x8
15  */
16  class Solution {
17  public:
18  bool isRectangleCover(vector<vector<int>>& rectangles) {
19      // Compute bounding box
20      int left = INT_MAX;
21      int bottom = INT_MAX;
22      int right = 0;
23      int up = 0;
24      int area = 0;
25      unordered_map<string, int> overlaps; // to count overlapping of
rectangle corners
26  vector<int> bitmask = {0x1, 0x2, 0x4, 0x8}; // for corner type
27
28      // 1. count corners and areas
29  for(int i=0; i<rectangles.size(); ++i) {
30      int l = rectangles[i][0];
31      int b = rectangles[i][1];
32      int r = rectangles[i][2];
33      int t = rectangles[i][3];
34      vector<pair<int,int>> corners = {{l,t}, {r,t}, {l,b}, {r,b}};
35      for(int i=0; i<4; ++i) {
36          string key = to_string(corners[i].first) + "_" +
to_string(corners[i].second);
37          if(overlaps[key]&bitmask[i]) // overlapping of same type of
corners is invalid
38              return false;
39          overlaps[key] += bitmask[i];
40      }
41
42      left = min(left, rectangles[i][0]);
43      bottom = min(bottom, rectangles[i][1]);
44      right = max(right, rectangles[i][2]);
45      up = max(up, rectangles[i][3]);
46      area += (r-l)*(t-b);
47  }
48
49      // 2. sanity check on corner overlapping
50      int count = 0;
51  for(auto item : overlaps) {
52      int m = item.second;
53      if(m==3 || m==10 || m==12 || m==5 // on bounding box boundary
54      || m==15) { // inside bounding box
55      }
56      else if(m==1 || m==2 || m==4 || m==8) { // on bounding box corner
57          ++count;
58          if(count > 4)
59              return false;
60      }
61      else

```

```
62         return false;
63     }
64
65     if(count != 4)
66         return false;
67
68     return area==(right-left)*(up-bottom);
69 }
70
71 };
```

 Notes☐ **Custom Testcase (Contribute ⓘ)** Run Submit

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