Practice Exercise #45: Points and Lines

http://www.comp.nus.edu.sg/~cs1010/4_misc/practice.html

Reference: Week 11 Lecture Exercise #2

Date of release: 27 October 2014

Objective: Sorting

Task statement:

You are given a list of points on a 2-dimensional plane, each point represented by its x- and y-coordinates, both integers.

You are to sort the points in ascending order of their x-coordinates, and for those points with the same x-coordinate, sort them in ascending order of their y-coordinates.

Two arrays are used to store the points: array x for their x-coordinates and array y for their y-coordinates. $x[p]$ and $y[p]$ refer to the point p.

You may assume that there are at most 20 points and no two points are identical.

Do the sorting by calling **Selection Sort** only <u>once</u>. How do you adapt the Selection Sort code given in the lecture for this problem?

After sorting the points, imagine that you trace the points in their order in the sorted array. Write a function **traceLines()** to compute the sum of lengths of those lines that are horizontal or vertical.

For example, suppose this is the list of 15 sorted points: (1, 2), (1, 3), (2, 1), (2, 4), (3, 2), (3, 3), (3, 4), (5, 3), (5, 6), (6, 2), (6, 5), (7, 2), (10, 4), (11, 4), (12, 2). The diagram below shows the tracing of the points. The vertical and horizontal lines are marked in green. The sum of lengths of horizontal and vertical lines is 13.
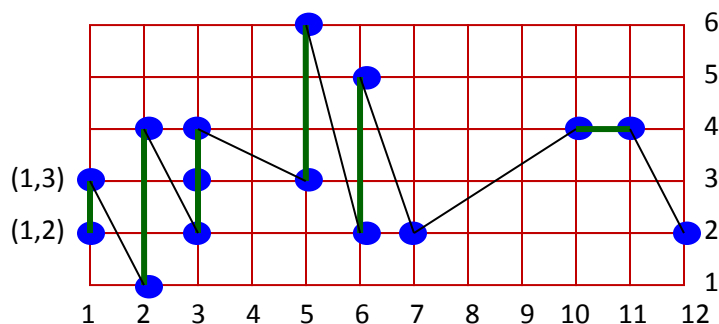
Sample run:

```
Enter number of points: 15
Enter x- and y-coordinates of 15 points:
5 3
2 4
11 4
3 2
1 2
10 4
3 4
6 5
5 6
3 3
1 3
6 2
12 2
7 2
2 1
After sort:
Point # 0: (1,2)
Point # 1: (1,3)
Point # 2: (2,1)
Point # 3: (2,4)
Point # 4: (3,2)
Point # 5: (3,3)
Point # 6: (3,4)
Point # 7: (5,3)
Point # 8: (5,6)
Point # 9: (6,2)
Point #10: (6,5)
Point #11: (7,2)
Point #12: (10,4)
Point #13: (11,4)
Point #14: (12,2)
Sum of lengths of vertical and horizontal lines = 13
```