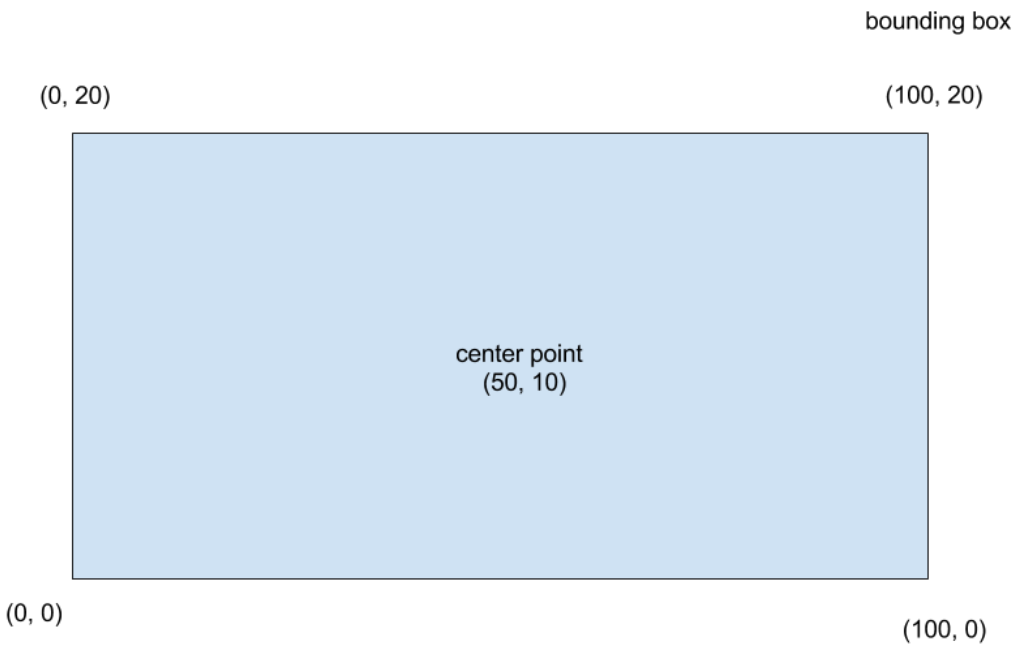
A quadtree is a specialized tree structure that it has a node and 4 child nodes. It's often used to store geo coordinates data(Wikipedia definition: https://en.wikipedia.org/wiki/Quadtree). **All the information you need to understand and complete this exercise is contained in this document, the wikipedia link is just a reference, there's no need to read it in full.** In this exercise, you should write an implementation of quadtree with the following assumptions and requirements:

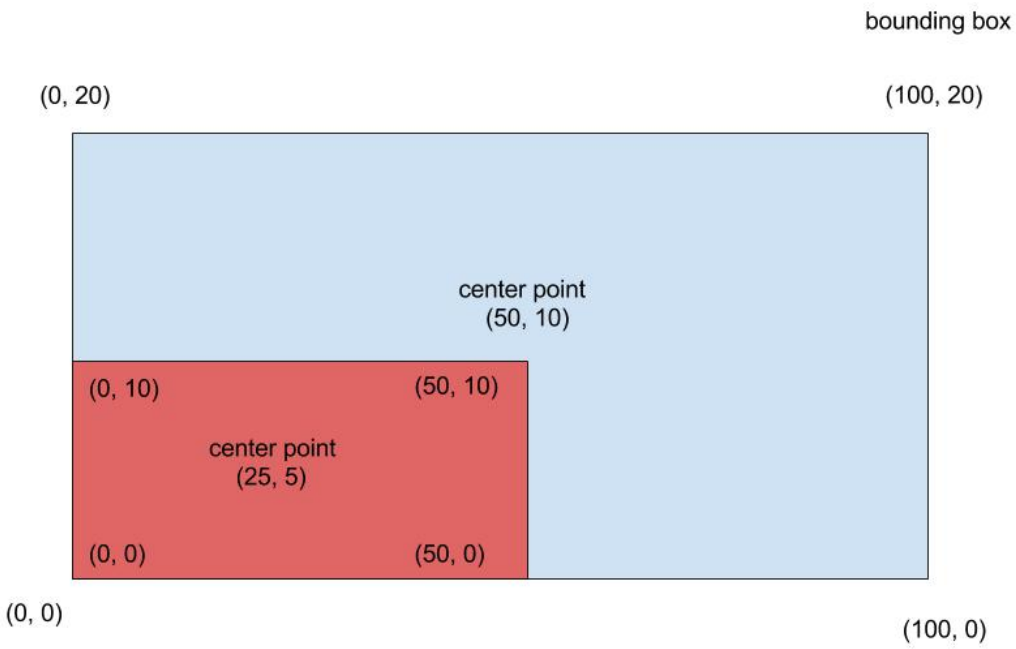
Requirements

- Each node
  - has a bounding box that's rectangular in shape
  - can store a coordinate
- Coordinates that can be inserted into a particular node should fall within the node's bounding box.
- If the point falls within the bounding box of the current node but a point is already stored at the node, we need to figure out which child node we should try to store the point at. The appropriate child node should be determined by the **quadrant** the point falls within the current node's bounding box(see pic 1). A coordinate of (1, 5) would fall within the **southwest** quadrant of the bounding box.



pic 1

- If the child node doesn't exist, create a new child node and store the point in the child node. The child node should have a bounding box a quarter in size to that of the parent node and it should take the entire area of the appropriate quadrant with regard to the parent bounding box. In the example in the pic, a child node that should contain the coordinate of (1, 5) as the **southwest child** should have a bounding box illustrated in pic 2: (parent node bounding box in blue and child node bounding box in red)



pic 2

Assumptions

- assume the coordinates to be inserted into the tree are 2-dimensional points with x and y integer values
- assume the coordinates will never exceed the bounding box of the root node.

Exercise

Please create the quadtree data structure with an initial bounding box shown in pic 1. Create a function/method that insert coordinates into the quadtree.