COS226 Group Activity
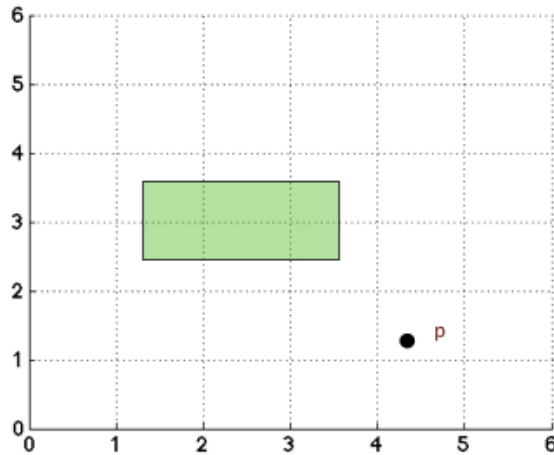
1. KdTree

   (a) To the right of the axis below, draw the KdTree after inserting the points [(2, 3), (4, 2), (4, 5), (3, 3), (1, 5), (4, 4)]. Be careful when inserting (4, 4), as ties are not broken. Instead, ties are treated the same as greater than.

   On the axes, draw each point as well as the red or blue lines that bisect the plane through each point.

   (b) List the corresponding rectangles for each point. The corresponding rectangle of (2, 3) is $(-\infty, +\infty)$.

   (c) Consider a range query on the shaded rectangle. Write R next to each node in your KdTree that is traversed by the range search algorithm. Do not count null nodes or nodes whose corresponding rectangles do not intersect the query rectangle. In terms of rectangles, which node's rectangle is used to rule out the possibility of any of (4, 4)'s children being inside the rectangle? NOTE: This should be a base case for your range search method.

(d) Consider a nearest neighbor query on point p. For your convenience, the correct answer from part a is provided below. Number each node (starting with 0) by the order in which it is visited by the nearest neighbor algorithm UNLESS that node's corresponding rectangle rules out that node or its children. For nodes that are pruned based on rectangle distance, write an X instead of a number. Do not number null nodes.
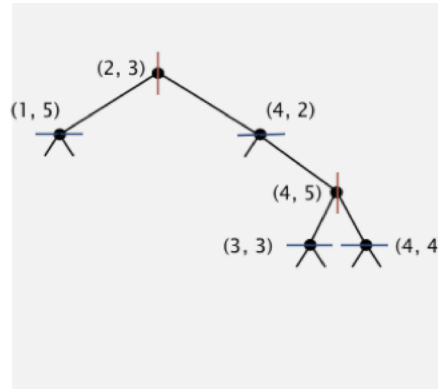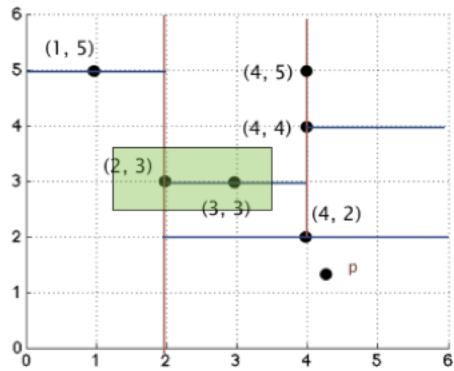
2. What recursive base cases should you check when performing a range search?