Exercise 2.3.15: Nuts and bolts. You have a mixed pile of N nuts and N bolts and need to quickly find the corresponding pairs of nuts and bolts. Each nut matches exactly one bolt, and each bolt matches exactly one nut. By fitting a nut and bolt together, you can see which is bigger, but it is not possible to directly compare two nuts or two bolts. Give an efficient method for solving the problem.

Solution: A variation of QuickSort

- Use the nuts as pivots for QuickSort method
- Using 1 nut as a pivot at a time, partition the bolts array. We compare each of the bolts with this nut and move them to the LHS and RHS respectively depending on the size.
- After partitioning, the resultant bolts array will have the bolt associated with the pivot nut to be in the correct position.
- Bolts smaller will be to the left of this point while larger bolts will be to the right
- Next, choose the next nut nut which will become the pivot. Keep track of previous nut/bolt pivot pair using a HashMap or dictionary(Python). This is to keep track of matching pairs.
- The new pivot must be compared with the previous pivot bolt to determine to check in the left or right subarrays.
- Once this is determined, repeat the same steps as above until all the nuts and bolts are matched.
- Finally, iterate through the HashMap/dictionary and connect the pairs.