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Q2 solution

As we are only comparing nuts with bolts we can use a 'double quick sort' algorithm to partition the nuts into bigger and smaller piles and likewise for the bolts. We begin each iteration of the quick sort by choosing a random nut as the pivot. We then split the bolts into two piles where one is smaller than the pivot and the other is larger. Using the one bolt which matches the nut, we use it as the pivot to split the nuts likewise. With this, each partitioned pile of nuts has a matching pile of bolts. This means that rather than looking through every single remaining nut to match with a bolt, we will just need to look through the matching nut pile for the bolt. For this modified algorithm ordering will not matter as we are just comparing the size with the pivot. Since the pile which we look through is halved each time, there will be $log(n)$ splits where on average each split will compare n bolts making the overall runtime $O(nlog(n))$.