Assignment 2 Question 2

Imagine a collection of nuts and bolts that are all together in one pile on a table. Describe, in pseudocode, how you would find all matching pairs of nuts and bolts. You need to find one solution for each of the problem-solving approaches given below. For each of your solution, determine how many comparisons of pairs of nuts and bolts you might have to make in the best- and worst- case scenario. You can assume that there are complete pairs, no single nuts or bolts, and that for each bolt, there is exactly one nut that fits. Describe a solution to the nuts-and-bolts problem (in pseudocode) using a **Brute Force Approach.**

All nuts have a bolt to pair with – so for *'n' nuts* there are *'n' bolts,* where each nut fits with exactly one bolt.

Brute Force Approach is a problem-solving approach that goes through all the possible solutions for the given set of problems. For instance, for this nuts-and-bolts problem, if one nut is compared to all the bolts until the correct pair is found, that means, all the possible candidates for the solution are being checked. The approach is quite inefficient and requires a lot of computational power.

Pseudocode:

The computation is O(n^2) and all the pairs are found.

1. *Separate all nuts and pile them together to form a nut collection on the table*
2. *Separate all the leftover bolts and pile them together to form a bolt collection on the table*
3. *Get one nut from nut collection*
4. *Compare that nut to ANY RANDOM ONE bolt from bolt collection*
5. ***If** a match, then pair is found. Pair them together and keep them away from the 2 collections to forma new pile of paired nuts & bolts collection. Continue to step 7*
6. ***If NOT a match**, then get ANOTHER RANDOM bolt from bolt collection and repeat from step 4*
7. *Repeat from step 3 until all nuts are gone though and a pair is found for them all.*
8. *The new collection pile is the paired-up nuts and bolts.*

Worst Case Scenario

In the worst-case scenario, each nut would be compared to each bolt. Let's say there are **N nuts** and **N bolts.**

Therefore, the number of comparisons = $\mathbf{N^2}$

Best Case Scenario

The best case would be finding the correct bolt for the chosen nut right away. Which means, let's say I chose the nut 'A', I find the bolt 'A' in the first pick.

Therefore, the number of comparisons = **N** (for N nuts and bolts)