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CSC 212 Practical 1 Term 4

D.

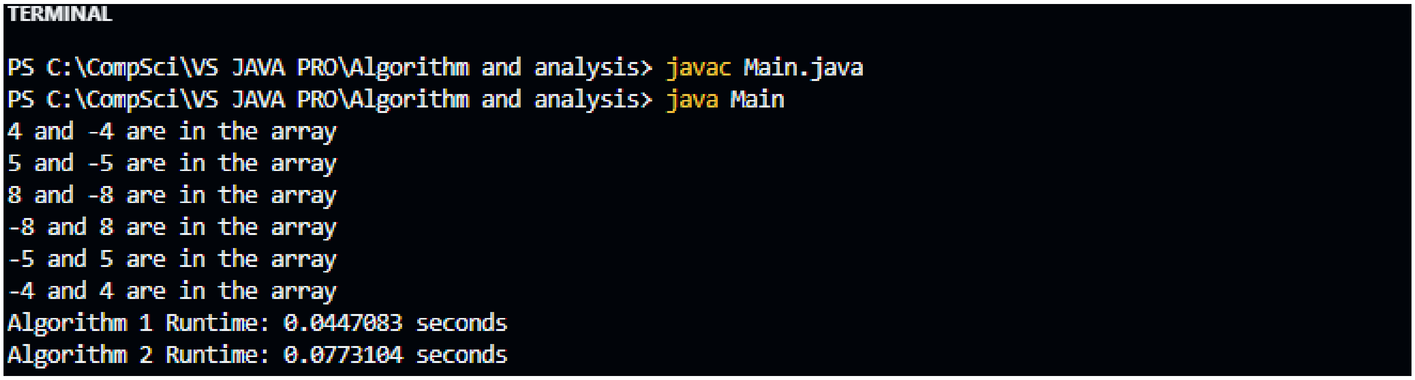
1. Algorithm 1 runs a linear search for every positive element in the array, this makes it a time complexity of O(n^2) because for each positive element, it searches through the entire array to find its negative pair.

   Algorithm 2 is O(n), it traverses the array once and points to 2 elements. In each iteration of the while loop, it either increments “I” or decrements **“j”**, but never both, which guarantees that each element is checked at most once. So, it is O(n)

2. Algorithm 2 is more efficient in terms of time complexity. It has a linear time complexity of O(n), that means its runtime grows linearly with the size of the input array. Algorithm 1, on the other hand, has a quadratic time complexity of O(n^2), which means its runtime grows quadratically with the size of the input array.

3. No, when I run the algorithms for both arrays, I find that algorithm 1 has a shorter runtime than algorithm 2. That means algorithm 1 is much faster than algorithm 2, which troubles me, since I can’t figure out why.

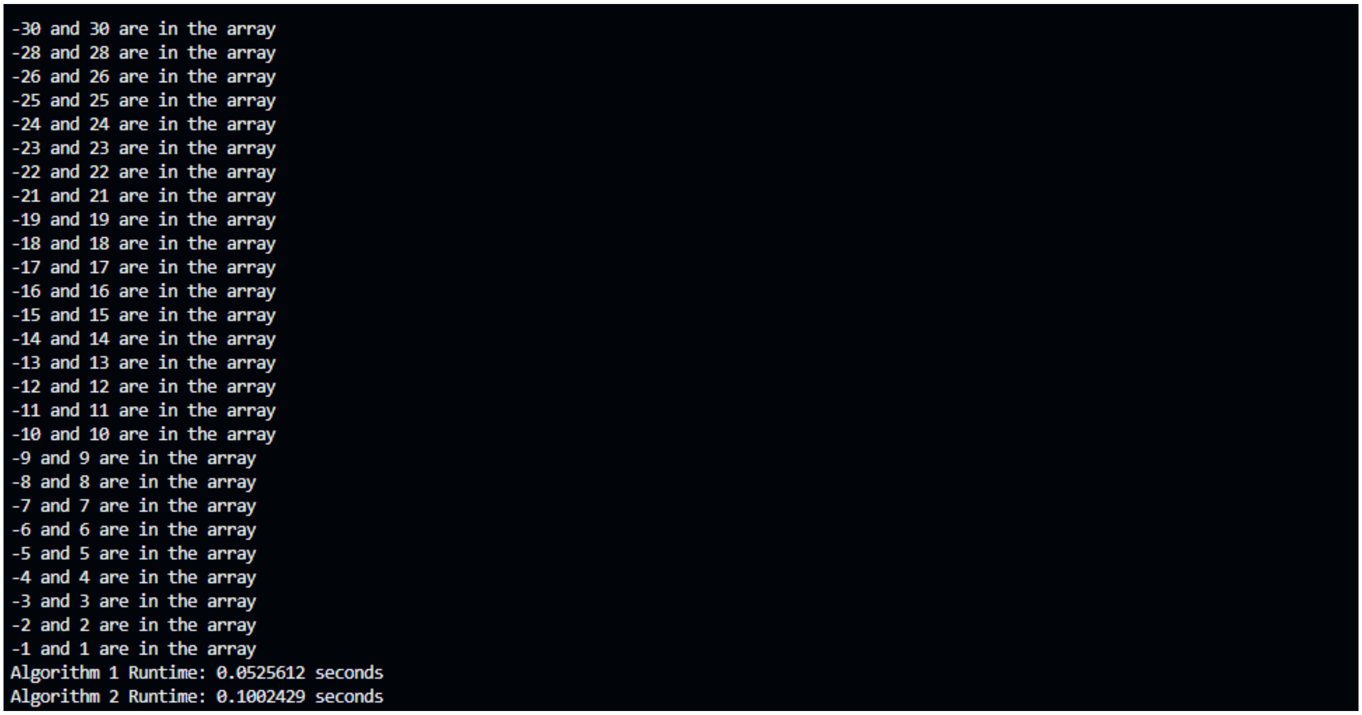
4. For Input 1



```
TERMINAL

PS C:\CompSci\VS JAVA PRO\Algorithm and analysis> javac Main.java
PS C:\CompSci\VS JAVA PRO\Algorithm and analysis> java Main
4 and -4 are in the array
5 and -5 are in the array
8 and -8 are in the array
-8 and 8 are in the array
-5 and 5 are in the array
-4 and 4 are in the array
Algorithm 1 Runtime: 0.0447083 seconds
Algorithm 2 Runtime: 0.0773104 seconds
```

5. For Input 2



```
-30 and 30 are in the array
-28 and 28 are in the array
-26 and 26 are in the array
-25 and 25 are in the array
-24 and 24 are in the array
-23 and 23 are in the array
-22 and 22 are in the array
-21 and 21 are in the array
-19 and 19 are in the array
-18 and 18 are in the array
-17 and 17 are in the array
-16 and 16 are in the array
-15 and 15 are in the array
-14 and 14 are in the array
-13 and 13 are in the array
-12 and 12 are in the array
-11 and 11 are in the array
-10 and 10 are in the array
-9 and 9 are in the array
-8 and 8 are in the array
-7 and 7 are in the array
-6 and 6 are in the array
-5 and 5 are in the array
-4 and 4 are in the array
-3 and 3 are in the array
-2 and 2 are in the array
-1 and 1 are in the array
Algorithm 1 Runtime: 0.0525612 seconds
Algorithm 2 Runtime: 0.1002429 seconds
```

e.