Part B:

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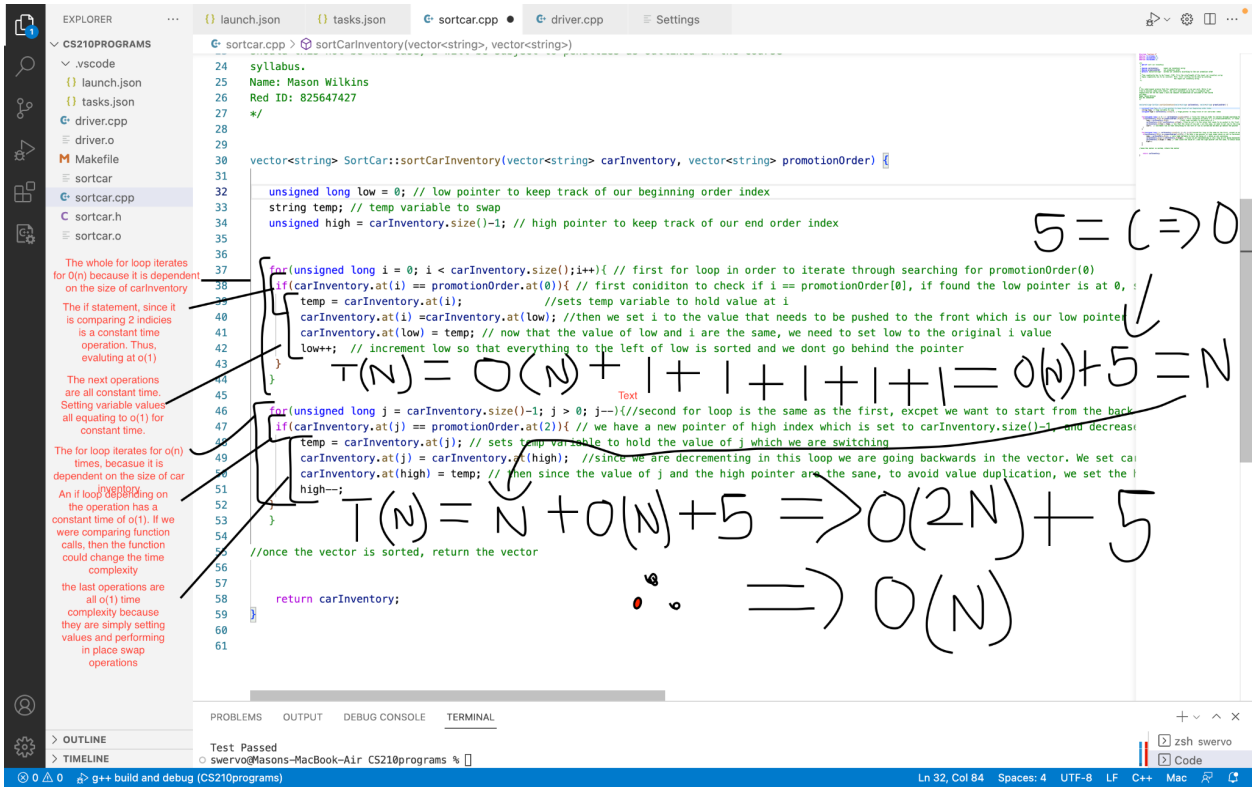

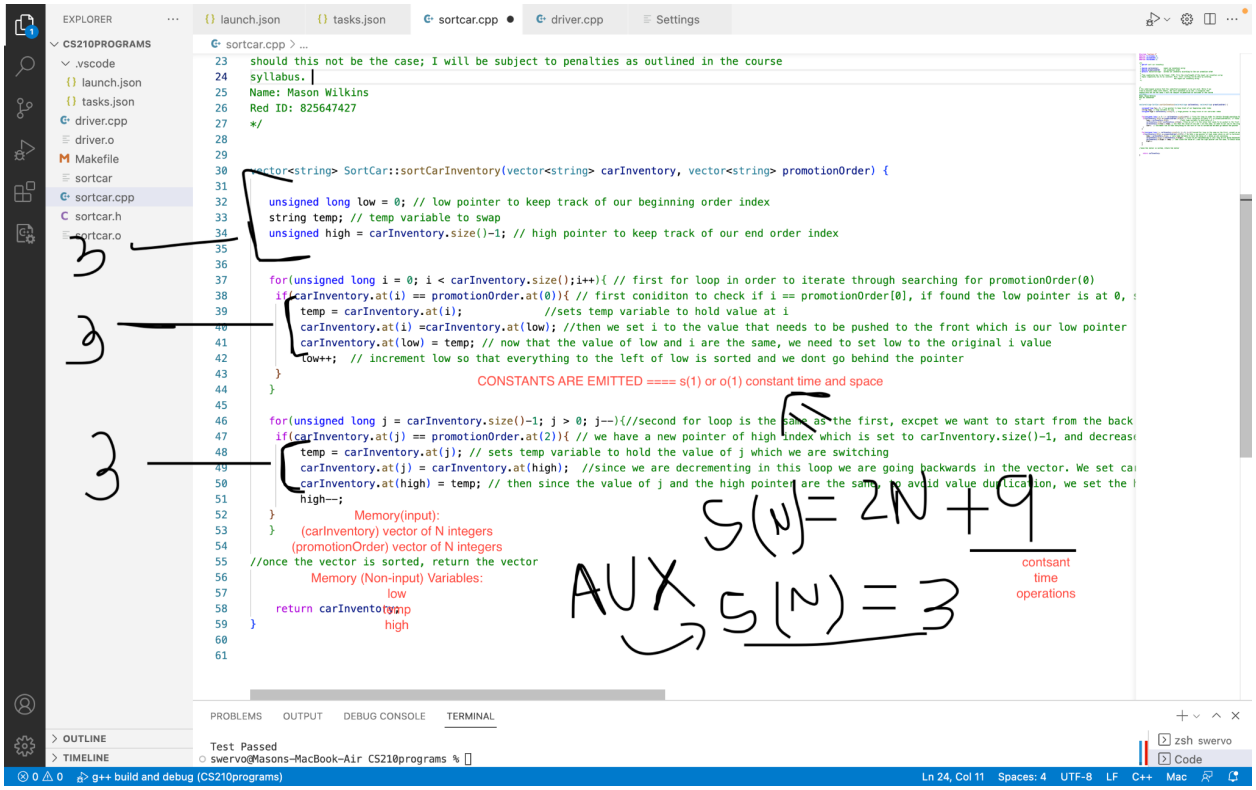

Time complexity explanation:

For my algorithm, the two loops used are running at o(N) because they are dependent on the input size of the car inventory vector. The if loops inside each other for loops are constant time operations only making a comparison between indexes; if in the “if” statements I was comparing two function outputs, that could change the whole complexity of the program depending on those functions.

All in all: N + N = 2N

In each for loop, there are five constant time operations, which are the comparison and in-place swapping of the indices.

T(N) = 2N + 5 + 5;

Constants are emitted because they evaluate to zero.

T(N) = N
Therefore the time complexity for this algorithm is running at O(N);

Space complexity:

For this algorithm, the space complexity evaluates at O(N). To evaluate the space complexity, we first need to consider memory used through our inputs which would be the vectors car inventory and promotion order.
So far:

S(N) = N + N

Once the inputs are accounted for, we go to the variables used in the program holding values in the loops.

S(N) = 2N + 9

Therefore with this analysis, the space complexity of the program is S(N) = 2N + 9 = O(N)

Auxiliary Space:

To evaluate the auxiliary space of this program, we need to evaluate all memory not related to input which would be the first three variables declared at the beginning of the algorithm.

S(N) = 3