CS 2420 Python Spring 2022 Test 1

Name:_____ 100 Points. Closed book and notes.

Logs and Exponents:

1. What is (approximately) the Log base 2 of 33,000,000,000,000?

2. What is 3 to the power of 4?

Big O:

3. What is Big O analysis?

4. Give the Big-O for these algorithms.

   Appending to the end of a python list:

   Removing from the beginning of a python list:

   Traveling Salesperson solver by trying all paths:

   Counting Sort:

   Adding two numbers of N digits each (this is a new problem):

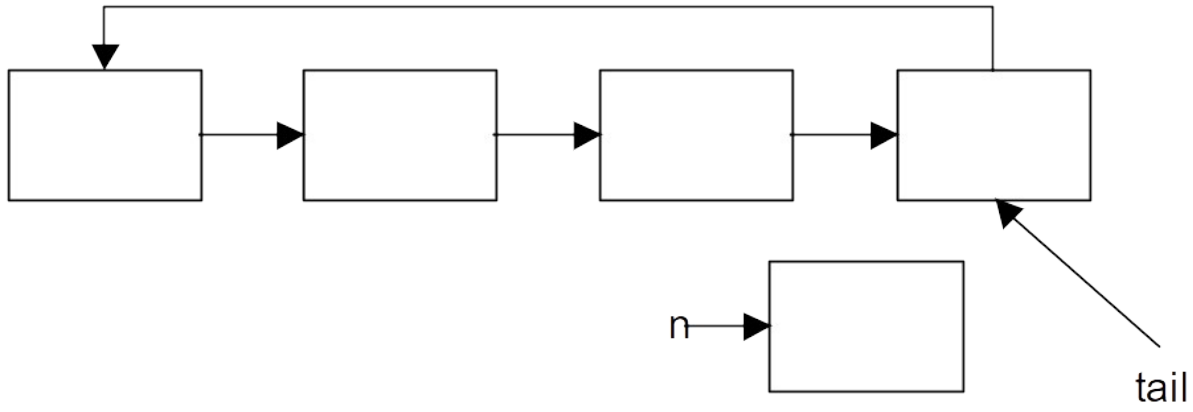
5. Which Big O category does this code use?

```
For loop N times
        For loop N times
                Do N^3 work here.
        For loop N times
                For loop N times
                        Do N^2 work here.
                For loop N times
                        Do N work here.
```

A. N^3
B. N^4
C. N^5
D. N^6

Linked Lists:

6. The picture below represents a queue implemented using a circular linked list with a back (tail) pointer. Draw arrows where the new pointers should go after enqueueing the node that n points to. (Put it on the back, or right, of the queue.) Cross off old arrows. Also, number the changes, according to the order they must be implemented.



7. Write lines of Python code (in the correct order) which handle the enqueue operation steps of the previous question. Don't worry about the empty list special case. Assume node n is already stuffed with an object.

8. Show what happens to this array after one pass of the basic quick sort. Use the 'D' on the far left as the pivot, and use the same algorithm we studied in class.
Original Array: D T A W F V C G

Use this table for problem 9 below.

	BubbleSort	ShakerSort	MergeSort	QuickSort	MQuickSort	HashSort
3	5.39	4.16	4.58	4.45	3.8	3.0
4	7.9	5.39	6.0	6.72	5.24	4.0
5	9.95	6.49	7.32	8.77	6.75	5.0
6	11.97	7.53	8.58	10.97	8.11	6.0
7	13.97	8.56	9.8	12.96	9.38	7.0
8	15.99	9.57	11.0	14.99	10.64	8.0
9	17.99	10.57	12.16	16.99	11.85	9.0
10	19.99	11.58	13.32	18.98	13.03	10.0
11	21.99	12.58	14.45	20.99	14.2	11.0
12	23.99	13.58	15.58	22.99	15.35	12.0

9. Given the chart above which measures compares on mostly sorted data, approximately how many compares does the QuickSort require when the data is 2K big? Give the answer as a base 10 number, not as a power of 2.

Homework Review:

10. Write Python code for the BubbleSort, as we did in class and for our homework assignment.

```
def BubbleSort(A):
```