Name _____

CSCI 332, Fall 2025
Quiz 7

1. (1 point) Here's the pseudocode to merge two sorted arrays into one sorted array in $\Theta(n)$ time.

```
Merge(arrays A and B of length n):
    let array C be a new array of length 2n
    let i = 1, j = 1, k = 1
    while i ≤ n and j ≤ m:
        if A[i] ≤ B[j]:
            C[k] = A[i]
            i = i + 1
        else:
            C[k] = B[j]
            j = j + 1
        k = k + 1
    return C
```

Fill in the recursive case of the pseudocode for Mergesort.

```
Mergesort(array A of length n):
    if n ≤ 1 :
        return A
    else:
```

Now, we will solve a recurrence (not the one for Mergesort) using recursion trees.

Consider the recurrence $T(n) = 4T(n/2) + n, T(1) = 1$.

2. (2 points) In the left boxes, draw the first three levels of this recursion tree. In the boxes next to them, write the total work on that level.

Level 0	Sum level 0
Level 1	Sum level 1
Level 2	Sum level 2

3. (2 points) What is the work per level in terms of level ℓ?

4. (2 points) Is the work per level (circle one)

   - increasing (work is dominated by leaves)
   - decreasing (work is dominated by root)
   - the same (work is the same at every level)

5. (1 points) What is the total number of levels in the tree? (fill in the base and the argument of the logarithm)

   number of levels = log_____(_____)

6. (2 points) What is the overall runtime of the recurrence?