# CS 212 Practice Final

Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

## The Rules (if this were a real exam)

* Closed book.
* Closed note.
* Closed neighbor. Merely ***looking*** at the work of others is cheating and carries all of the normal consequences.
* Calculators are allowed.
* Neatness counts. If I can't read it, you won't get credit.
* Use of a calculator is allowed, anything else electronic is not.
* Be sure to show your work.

## Identities

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# Note

The final exam is cumulative. The questions on this handout only include new topics since the last exam. For a complete representation of what will be on the final exam, consult both handouts.

1. [2] Use the master method to solve the following recurrence:

2. [2] Use the master method to solve the following recurrence:

3. [2] Use the master method to solve the following recurrence:

4. [2] Use the master method to solve the following recurrence:

5. [3] Use the Levenshtein algorithm to compute the distance matrix for the strings "PENCIL" and "PAPER"

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|  |  | **P** | **E** | **N** | **C** | **I** | **L** |
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| **P** |  |  |  |  |  |  |  |
| **A** |  |  |  |  |  |  |  |
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6. [3] Use the Needleman-Wunch algorithm (Gap = -2, Match = 1, Mismatch = 1) to compute the distance matrix for the strings "PENCIL" and "PAPER". Draw arrows as a shorthand to represent the direction matrix.

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|  |  | **P** | **E** | **N** | **C** | **I** | **L** |
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# Programming Problems

This exam will have one or more programming problems. Here is an example below:

7. [5] A child is running up a staircase with N steps and can hop either 1, 2, or 3 steps at a time. Write a function to determine the number of possible ways that the child can run up the stairs.

# Algorithm Proposal

You will be given a scenario and must propose an algorithm that could be applied to the problem. For example,

8. You are developing a multiplayer matchmaking client for your team-based shooter.

# Algorithm Identification

Lastly, you must be able to identify each algorithm as greedy, dynamic, or divide and conquer.

E.g. Dijkstra’s Algorithm -> greedy

Rod cutting -> dynamic

Merge sort -> divide and conquer