

15-211: Assignment 2 Theory Questions

Due July 10, 2009 in class

Name: _____

Andrew ID: _____

These questions count for 20% of the homework grade. Please hand in your answers, written or typeset, in lecture on Friday.

```
static int x = 0;

int foo(int n) {
    if (n <= 0) {
        x++;
        return x;
    }
    return n + foo(n-1) + foo(n-4);
}
```

- (5) 1. Is it possible to speed up the code above using dynamic programming? If so, show how; if not, explain why not.
- (5) 2. Consider the knapsack problem with $W = 12$ and the following (weight, value) pairs of items: (6,25),(2,8),(5,19),(7,26),(3,10),(4,10),(1,1). Find the maximum achievable value of items. Show your work by drawing a DP table.

- (5) 3. In class, we discussed the algorithm for finding the minimum number of coins needed to make change for a given amount, with a given set of coin denominations. Design a DP algorithm for finding the total number of ways of changing a given amount, with a given set of coin denominations.
- (5) 4. In class, we also discussed a string reconstruction algorithm for inserting spaces into a spaceless text file. Our solution only determines if there exists a valid break up of the given text. Extend the given DP algorithm to reconstruct the solution file.