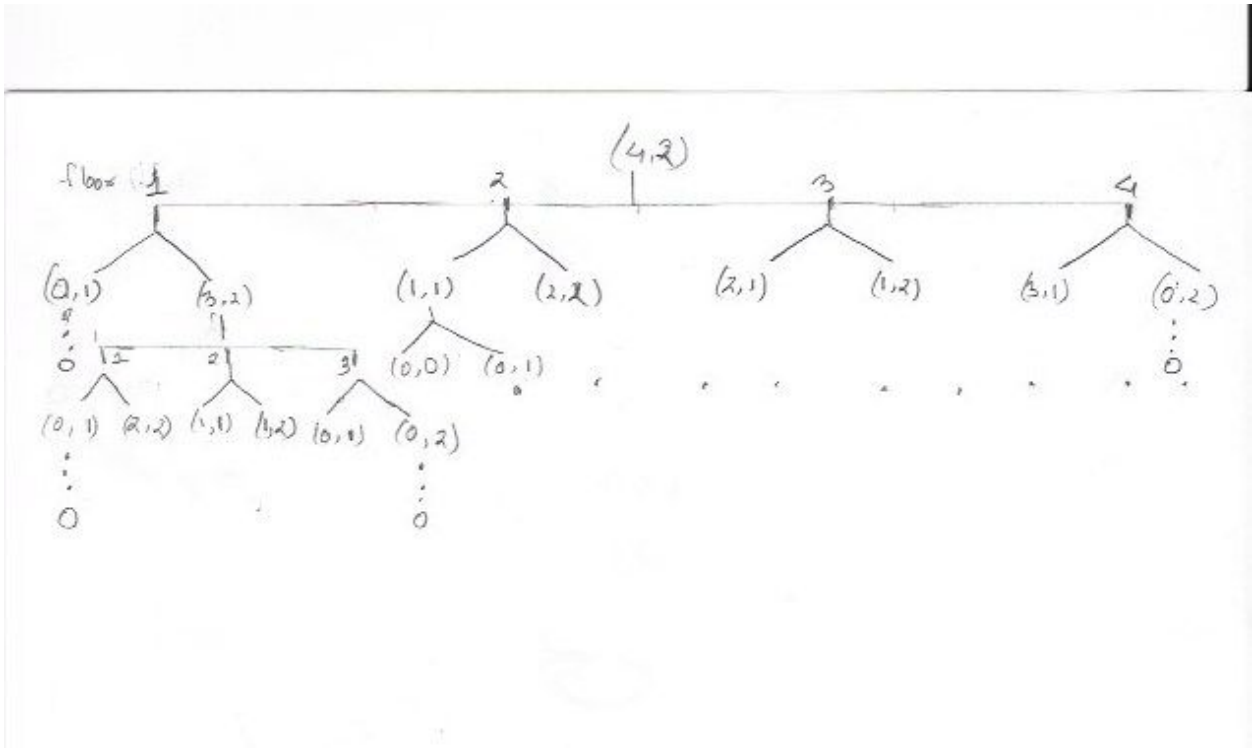
Falling glass problem

(a) Describe the optimal substructure/recurrence that would lead to a recursive solution

In the given problem about falling glass, when a glass falls from a given floor there will be only 2 outcomes. Either the glass shatters or it doesn't. Based on these 2 outcomes we can and given condition if the glass breaks from a given floor we have to check only the floors less than that. Let K be the total number of floors, x be the floor being tested and N be the total number of glass.So lets say if the glass breaks falling from xth floor, the problem reduces to x-1 floors with total n-1 glasses. If the glass doesn't shatter we have to check the floors greater than the tested floor. So the problem reduces to K-x floor with n-1 glasses.

(b) Draw recurrence tree for given (floors = 4, sheets = 2)



(d) How many distinct subproblems do you end up with given 4 floors and 2 sheets?

2*4^2=32

(e) How many distinct subproblems for n floors and m sheets?

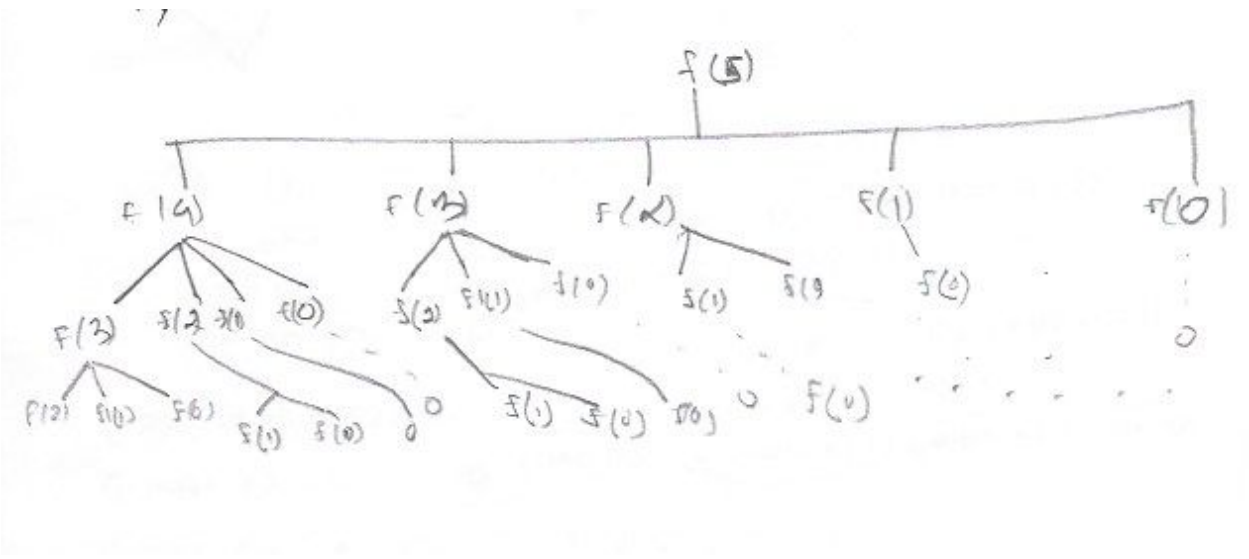
m*n^2

(f) Describe how you would memoize GlassFallingRecur

At first i would initialize a 2 table of size mxn. Then for each cell i would assign a large integer number. Then for each floor and each number of glasses we iterate thru the possibilities and populate the cells with the minimum possible trial yielded by the algorithm.

Rod Cutting problem

(a) Draw the recursion tree for a rod of length 5



(b) On page 370: answer 15.1-2 by coming up with a counterexample, meaning come up with a situation / some input that shows we can only try all the options via dynamic programming instead of using a greedy choice.

Counter example:

Let length be 4

And Price: (1,20,33,36) respectively.

So, depending on the data above we get 3 inch of rob to be the most profitable. So if we apply greedy algorithm the first choice of greedy will be the most price per length which happens to be 3 inch with profit of 33. If our total rod length is 4 inches, we will have only one inch left which is priced at 1. So total profit would be 34. But according to the assumed data if a 4 inch rod is cut into half and is sold then it yields the

most profit as each 2 inch rod is worth 20 so it would in total yield 40. So clearly greedy algorithm does not work in this particular case.