CS 370 Final Project: Build a String

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I pledge my honor that I have abided by the Stevens Honor System.

In this assignment, we solve the problem Build a String on Hackerrank:

https://www.hackerrank.com/challenges/build-a-string/problem

Greg wants to build a string, S of length N. He can perform 2 operations:

1. Add a character to the end of S for A dollars.

2. Copy any substring of S, and then add it to the end of S for B dollars.

Calculate minimum amount of money Greg needs to build S.

==== SOLUTION 1: Simple Dynamic Programming Approach O(n3) ====

Keep track of the lowest costs so far in cost[] as we build up the new string

Iterate through the length of the string from 0 to length(cost)

replace the cost array with the min cost.

First assume that the minimum is appending a single character, and then check if the built string is a substring to the larger string, and proactively set the future cost array index to be the minimum of itself and the current cost plus the substring cost B.

\* There are some caveats to this approach. We should not be copying if:

a. copying exceeds the string length

b. appending is cheaper by length

c. there is no pattern in the future

The approach described above is much easier to follow in pythonic psuedocode:

A the cost of appending a character

B the cost of appending a substring copy of S

S the string we want to build

solve(A, B, S):

cost = [0] + ([MAX\_INT] \* len(S))

copy\_length = min(1, B/A) # when does it make sense to copy?

for i in range(1, len(cost)):

# First get the minimum of itself and the append operation

cost[i] = min(cost[i], cost[i-1] + A)

j = copy\_length

while in bounds AND you are able to copy:

cost[i+j] = min(cost[i+j], cost[i] + B)

j += 1

return cost[-1]

Results: Passed 10/20 test cases, times out on the rest

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==============Solution 2: Give up and kill yourself===============

After much thought, I have really nothing better than this. Maybe some idea will strike tomorrow or next week.

In the meantime, I will be committing Sudoku.