Dynamic Programming

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Algoritmia II

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Q1: Given the following recursive code.

a. **Update the code so it uses dynamic programming** (Done in java file)

b. **Do we still need the base case after converting the code to dynamic programming? Why?**

Ans.- As in code using Top-Down we still need the base case validations when n < 3 because it can affect our dynamic recursive performance and also to return a final value and end the recursive way
In Bottom Up.- we also need to initialize the first dp[0..2] in order to perform correctly the cycle for starting in 3 the "i" will subtract i-1 & 1-2 & i-3 to have enough bounds

Q2: If we can solve a problem by combining the solutions to its subproblems, does that mean that we can solve it with a DP algorithm?

Ans.- Top Down que comienza resolviendo el problema principal y luego divide ese problema en subproblemas o Bottom Down que divide el problema general en subproblemas para luego ocuparse de los problemas generales

Q3: In the Edit-Distance algorithm, when we do an insertion operation, why do we need to look at the Edit-Distance of the previous character position of the second string?.

E(i, j) = $E(i, j - 1)$ + 1

Si (Caracteres iguales) entonces se omite la operacion de izquierda y derecha (Insert, Remove) y se añade la operacion de Replace sin aumentar el costo de operacion
Si (Caracteres desiguales) entonces se musca la operacion con menos costo entre (Remove, Insert y Replace) y se aumenta el costo de operación

The Levenshtain Distance DP points that when there isn't a match of characters the lowest cost operation has to be chosen including Insert

1Q4:

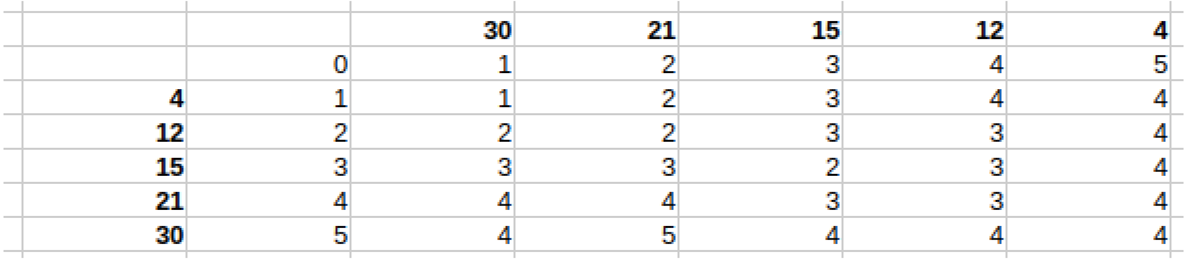
- Fuchsia has organized a surprise party for Coco, and the guests have already arrived and placed their gifts in a row at the gift table.
Fuchsia knows Coco very well, so she knows which gift she would like the most. That is why she labels each gift with a number representing how much she would like a gift.
- Fuchsia decides to make the party more fun for Coco; she will rearrange the gifts so that the first gift is the one she likes the least and so on until the last gift is the one she likes the most.
- Fuchsia wants to know the minimum amount of gifts she should move around so the gifts are arranged correctly.
Input: A number N that represents the number of gifts, followed by N numbers representing how much Coco will like each gift. (Constraint: There are not two gifts with the same value.)
Output: The minimum amount of gifts that Fuchsia should move.
Sample input 1
4

1 12 5 31Sample output 1
1
Sample input 2
5
30 21 15 12 4Sample output 2
4

a. Identify the problem in general terms.
b. Analyse the problem based on sub-problems and find the formula.
c. Identify where the overlap of sub-problems occurs.
d. Implement the solution to the problem using DP bottom-up.

- El problema en si requiere encontrar las operaciones necesarias para ordenar los regalos de manera que esten en orden descendente y vea los que mas le gustan hasta los que menos le gustan

(Codigo en Java uploaded)



		30	**21**	**15**	**12**	**4**
	0	1	2	3	4	5
4	1	1	2	3	4	4
12	2	2	2	3	3	4
15	3	3	3	2	3	4
21	4	4	4	3	3	4
30	5	4	5	4	4	4