

Hoy:
Divide y vencerás
ejemplos

1. **Divide** the problem into a number of subproblems that are smaller instances of the same problem.
2. **Conquer** the subproblems by solving them recursively. If they are small enough, solve the subproblems as base cases.
3. **Combine** the solutions to the subproblems into the solution for the original problem.

Merge sort
Quick Sort

Multiplicación de enteros

$$\begin{array}{r} 3743 \\ | 247 \\ \hline \end{array} \begin{array}{l} m \\ m \\ O(m \times m) \\ O(m^2) \end{array}$$

$X = 61,438,521$ and $Y = 94,736,407$, $XY = 5,820,464,730,934,047$.

$X_L = 6,143$, $X_R = 8,521$, $Y_L = 9,473$, and $Y_R = 6,407$.

$$XY = X_L Y_L 10^8 + (X_L Y_R + X_R Y_L) 10^4 + X_R Y_R$$

$$T(N) = 4T(N/2) + O(N)$$

$$X_L Y_R + X_R Y_L = (X_L - X_R)(Y_R - Y_L) + X_L Y_L + X_R Y_R$$

$$T(N) = 3T(N/2) + O(N)$$

$$T(N) = O(N^{\log_2 3}) = O(N^{1.59})$$

Function	Value	Computational Complexity
X_L	6,143	Given
X_R	8,521	Given
Y_L	9,473	Given
Y_R	6,407	Given
$D_1 = X_L - X_R$	-2,378	$O(N)$
$D_2 = Y_R - Y_L$	-3,066	$O(N)$
$X_L Y_L$	58,192,639	$T(N/2)$
$X_R Y_R$	54,594,047	$T(N/2)$
$D_1 D_2$	7,290,948	$T(N/2)$
$D_3 = D_1 D_2 + X_L Y_L + X_R Y_R$	120,077,634	$O(N)$
$X_R Y_R$	54,594,047	Computed above
$D_3 10^4$	1,200,776,340,000	$O(N)$
$X_L Y_L 10^8$	5,819,263,900,000,000	$O(N)$
$X_L Y_L 10^8 + D_3 10^4 + X_R Y_R$	5,820,464,730,934,047	$O(N)$

Más ejemplos de programación dinámica: Longest Common Subsequence

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S1 = {B, C, D, A, A, C, D}  
S2 = {A, C, D, B, A, C}
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Then, common subsequences are

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{B, C}, {C, D, A, C}, {D, A, C}, {A, A, C}, {A, C}, {C, D},
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X

A

C

A

D

B

The first sequence

Y

C

B

D

A

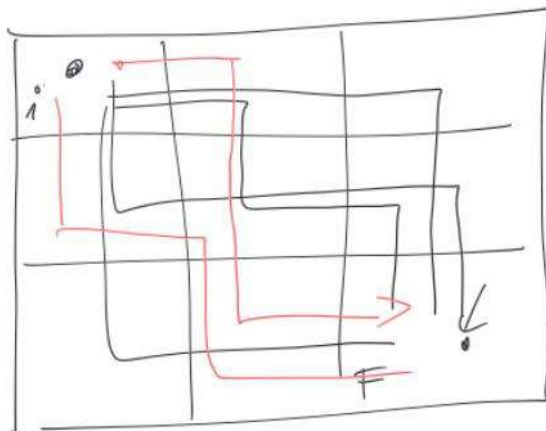
Second Sequence

		C	B	D	A
	0	0	0	0	0
A	0	0	0	0	1
C	0	1	1	1	1
A	0	1	1	1	2
D	0	1	1	2	2
B	0	1	2	2	2

If the character corresponding to the current row and current column are matching, then fill the current cell by adding one to the diagonal element. Point an arrow to the diagonal cell.

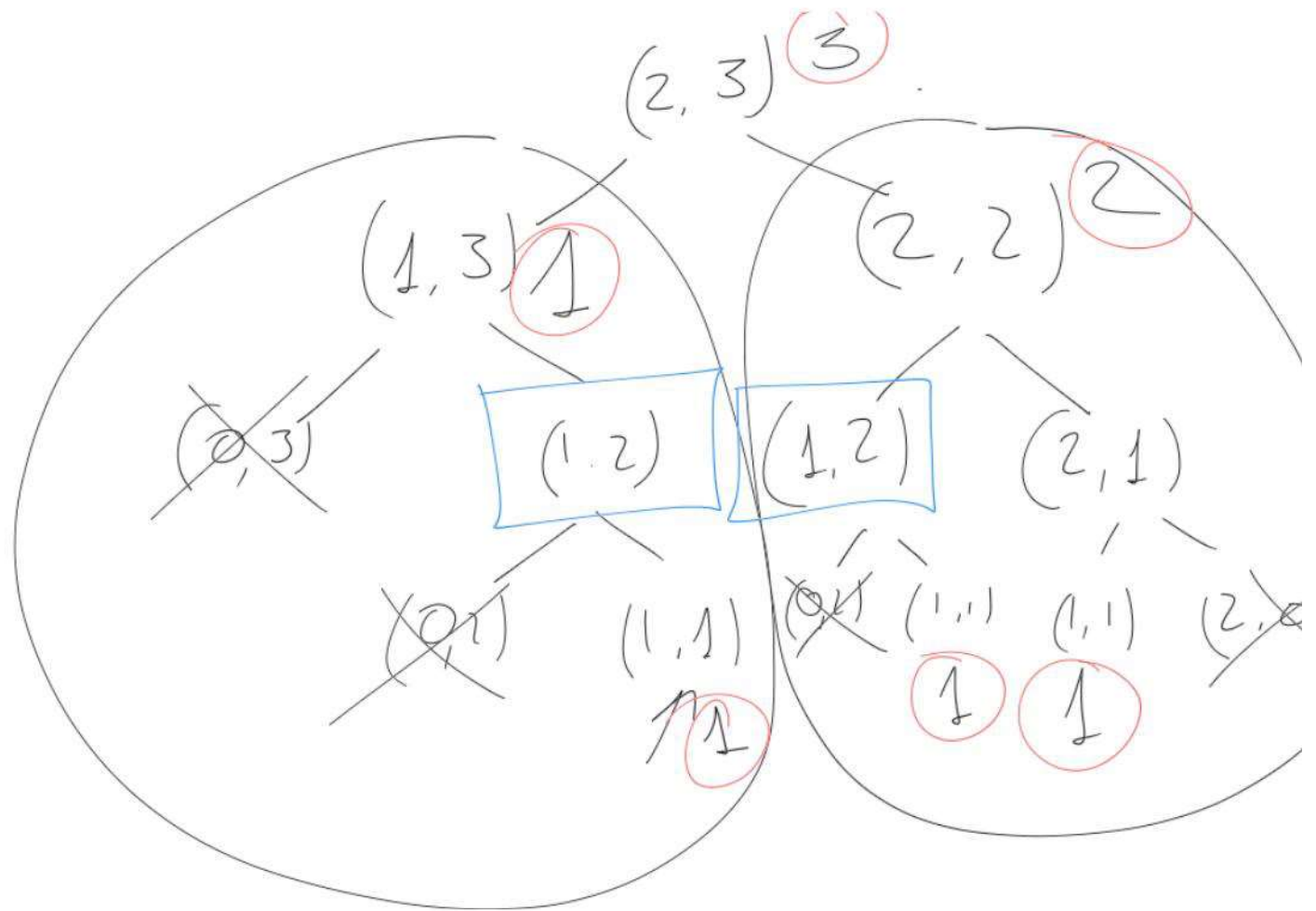
Else take the maximum value from the previous column and previous row element for filling the current cell. Point an arrow to the cell with maximum value. If they are equal, point to any of them.

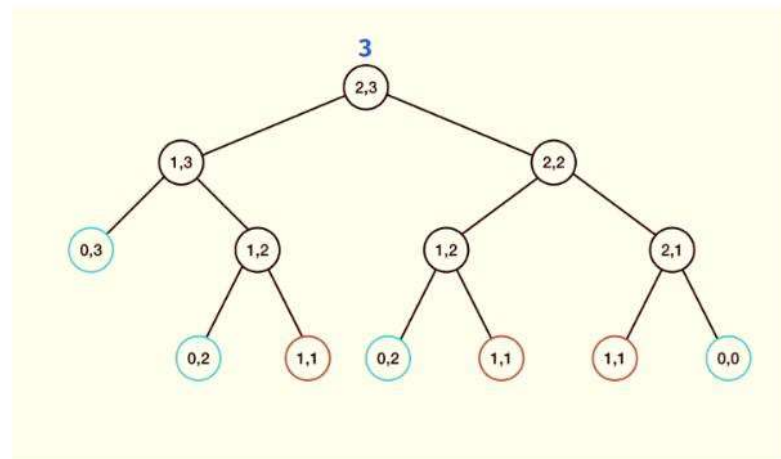
Grid Traveler:



3 x 3

1 x 1





Dada una colección de naturales, verificar si se puede obtener otro número natural a través de sumas de los elementos de la colección.
Puede haber duplicados

$(2, 3, 5)$ ← 12

