

LAB 9: PAY THE PRICE

<http://gpe3.acm-icpc.tw/domjudge2/pct/showproblemtab.php?probid=10590&cid=117#problembodytext>



BASIC IDEA OF DYNAMIC PROGRAMMING

- **dynamic programming** (also known as **dynamic optimization**) is a method for solving a complex problem by breaking it down into a collection of simpler subproblems, solving each of those subproblems just once, and storing their solutions.
- ref: https://en.wikipedia.org/wiki/Dynamic_programming



****KEY** BUILD UP THE TABLE**

- $dp[i][j] = dp[i - j][j] + dp[i][j - 1]$

use j coins

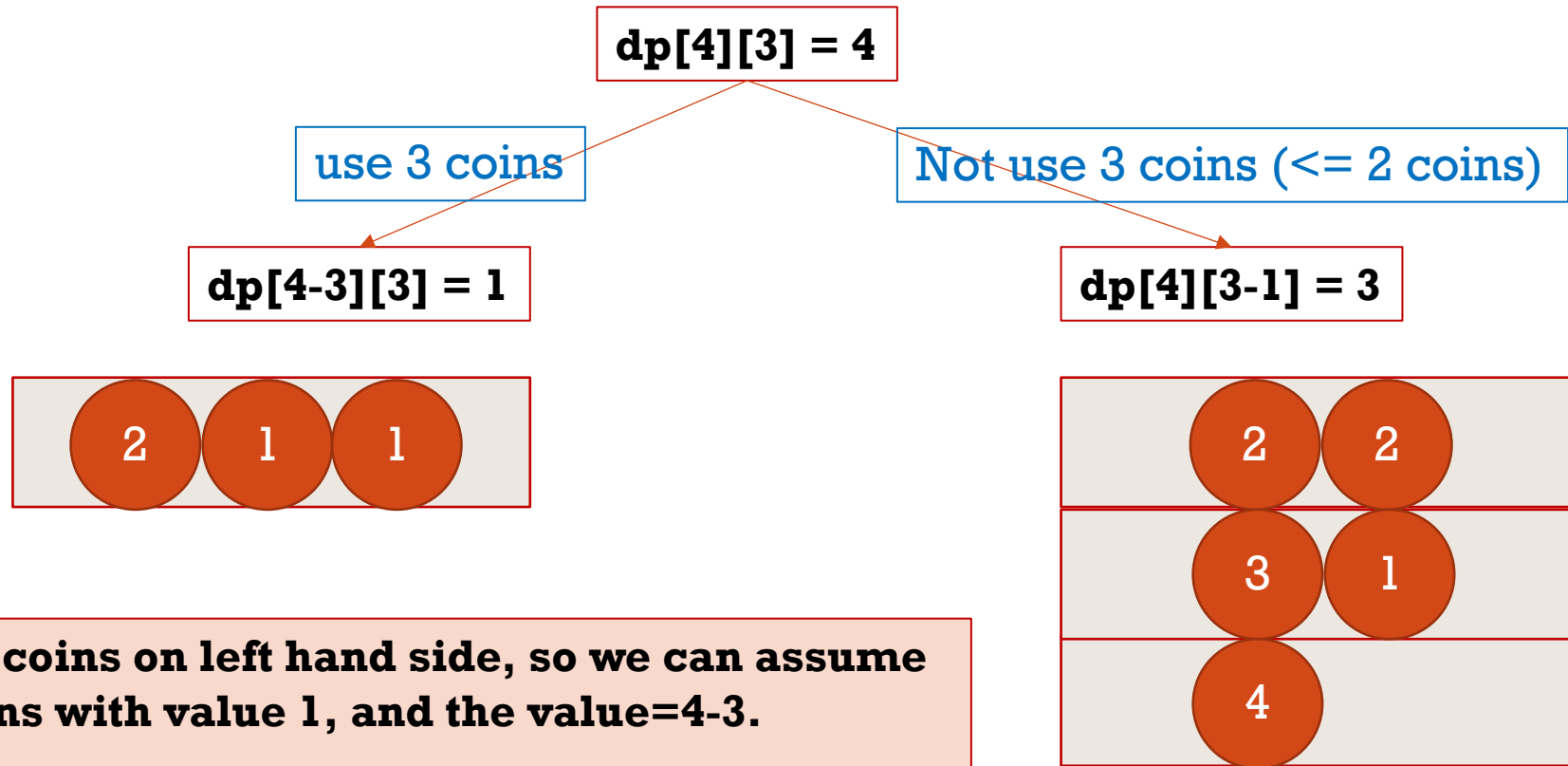
Not use j coins (use $\leq j-1$ coins)

- $dp[i][j]$
which means number of ways to form value i with fewer than or equal to j coins.

- note:
 $dp[0][0] = 1$
 $dp[i][0] = 0$
 $dp[0][j] = 1$



EXAMPLE

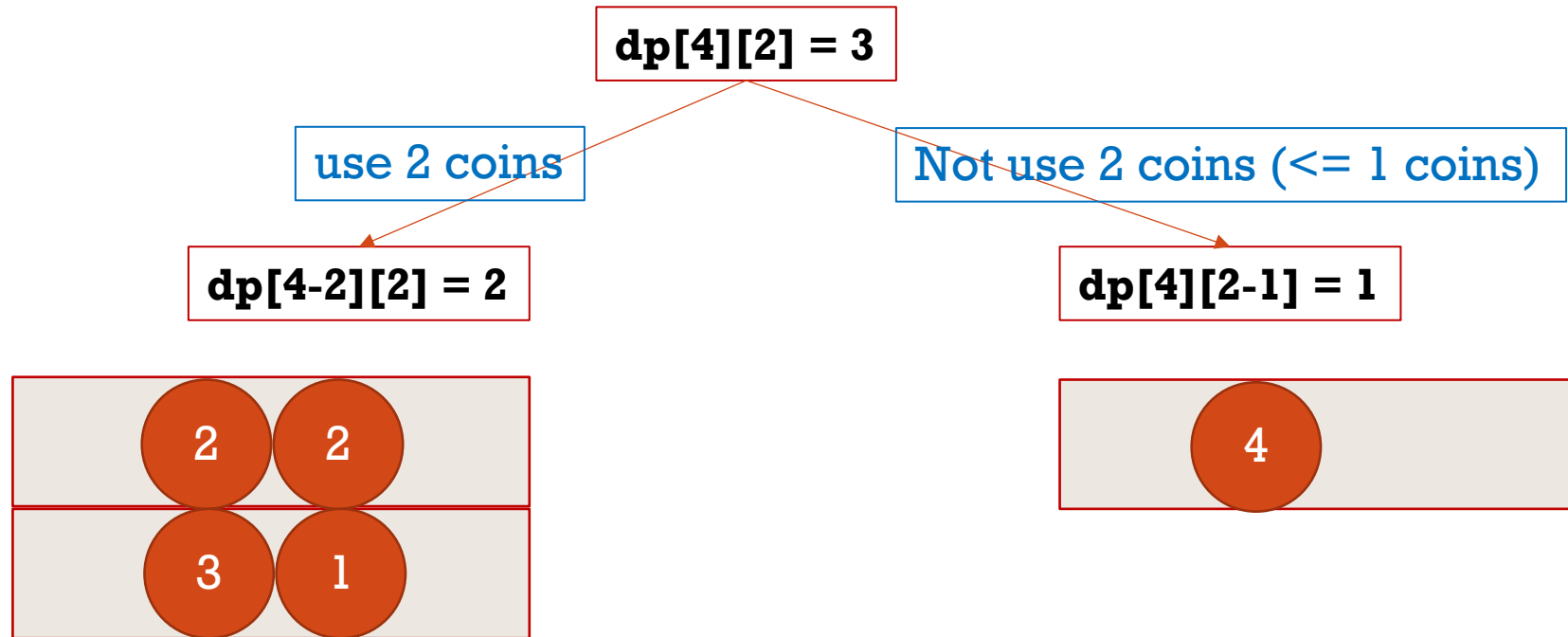


We must use three coins on left hand side, so we can assume there are three coins with value 1, and the value=4-3.

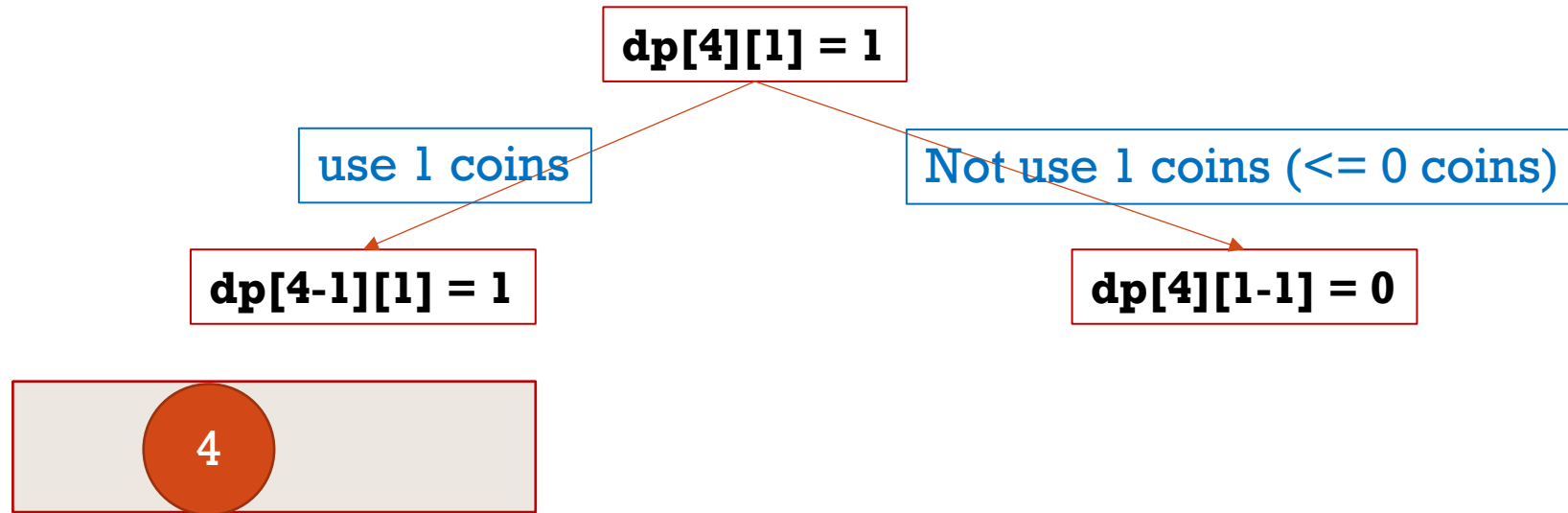
Then we just need to use fewer than or equal to 3 coins to form the value, which is exact the dp[4-3][3].



EXAMPLE



EXAMPLE



EXAMPLE

$\text{dp}[4][0]$ $=0$			$\text{dp}[4][3]$ $=?$
$\text{dp}[3][0]$ $=0$			
$\text{dp}[2][0]$ $=0$			
$\text{dp}[1][0]$ $=0$			
$\text{dp}[0][0]$ $=1$	$\text{dp}[0][1]$ $=1$	$\text{dp}[0][2]$ $=1$	$\text{dp}[0][3]$ $=1$

