

dynamic.pdf (application/pdf Object) - Mozilla Firefox

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http://www.columbia.edu/~cs2035/courses/csr4231.F09/dynamic.pdf

3 / 13 79.1%

Change in another system

Suppose

$$d_1 = 1 \quad d_2 = 4 \quad d_3 = 5 \quad d_4 = 10$$

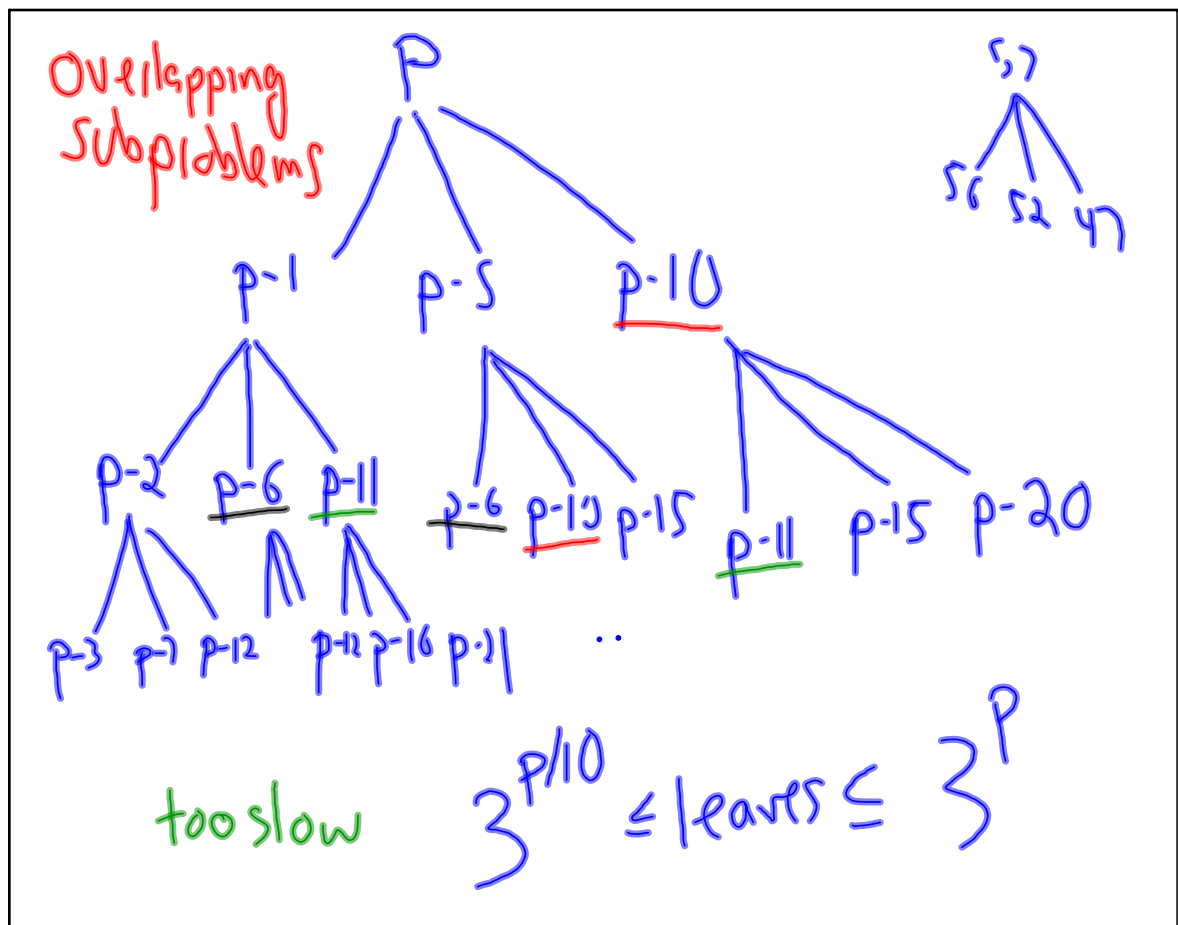
- Change for 7 cents – 5,1,1
- Change for 8 cents – 4,4

What can we do?

5,1,1,1

Can't make the first choice w/o looking "ahead."

Oct 6-4:22 PM



Oct 6-4:30 PM

σ 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
 (0 1 2 3 4 1 2 3 4 5 1 2 3 4 5 2 3 4 ...
 p p p p n p ←

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Handwritten notes on a grid background:

Top left: 1 1 1 1

Below that: 1 1 2

Below that: 1 3

Below that: 2 2 ←

Below that: 4

Top right: 4

Below that: 7

Below that: 9

Below that: 10

Below that: 9

Far right: 1 2 3 4

Below that: 1 5 8 9

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Optimal Substructure - the optimal solution to your problem is composed of optimal solutions to subproblems (each of which is a smaller instance of the original problem)

$(\$5)$ | ~~non-optimal solution to 14~~ $(\$10)$ $5+10$
 3 | 17

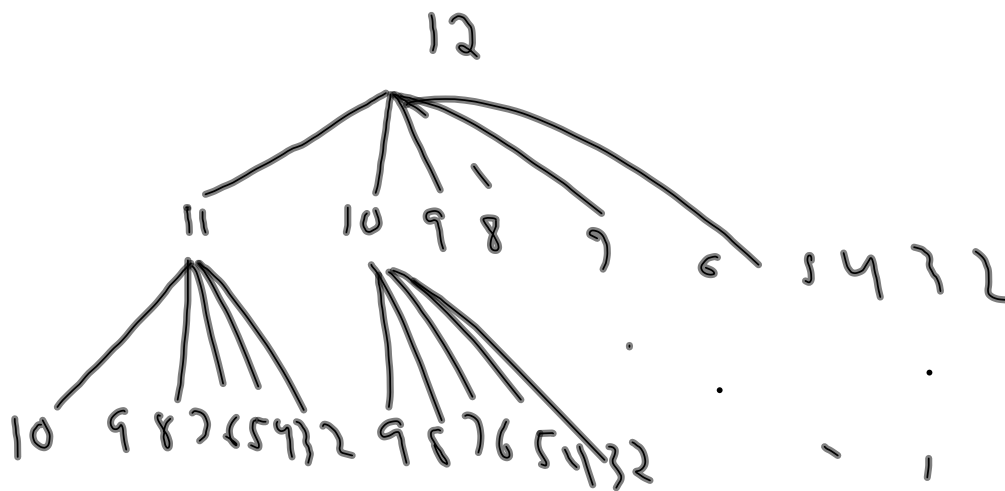
~~opt solution to 14~~ $(\$12)$ $5+12$

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$r_n = \text{opt. sol'n for a rod of size } n$

$$r_6 = \max \begin{cases} P_1 + r_5 \\ P_2 + r_4 \\ P_3 + r_3 \\ P_4 + r_2 \\ P_5 + r_1 \end{cases}$$

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n

to compute
 r_n you need
 $r_1 \dots r_{n-1}$

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0 1 2 3 4 5 6 7
 0 1 5 8 9 10 17

R 1 5 8 10 13 . . .

$$r_2 = p_1 + r_1 = 1 + 1$$

$$p_2 + r_0 = 5 + 0$$

$$r_3 = p_1 + r_2 = 1 + 5 = 6$$

$$p_2 + r_1 = 5 + 1 = 6$$

$$p_3 + r_0 = 8 + 0 = 8$$

$$r_4 = p_1 + r_3 = 1 + 8$$

$$p_2 + r_2 = 5 + 5 = 10$$

$$p_3 + r_1 = 8 + 1$$

$$p_4 + r_0 = 9 + 0$$

$$r_5 = p_1 + r_4 = 1 + 10$$

$$p_2 + r_3 = 5 + 8 = 13$$

$$p_3 + r_2 = 8 + 5$$

$$p_4 + r_1 = 9 + 1$$

$$p_5 + r_0 = 10 + 0$$

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$O(n^2)$ running time



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