Rod Cutting (Example)

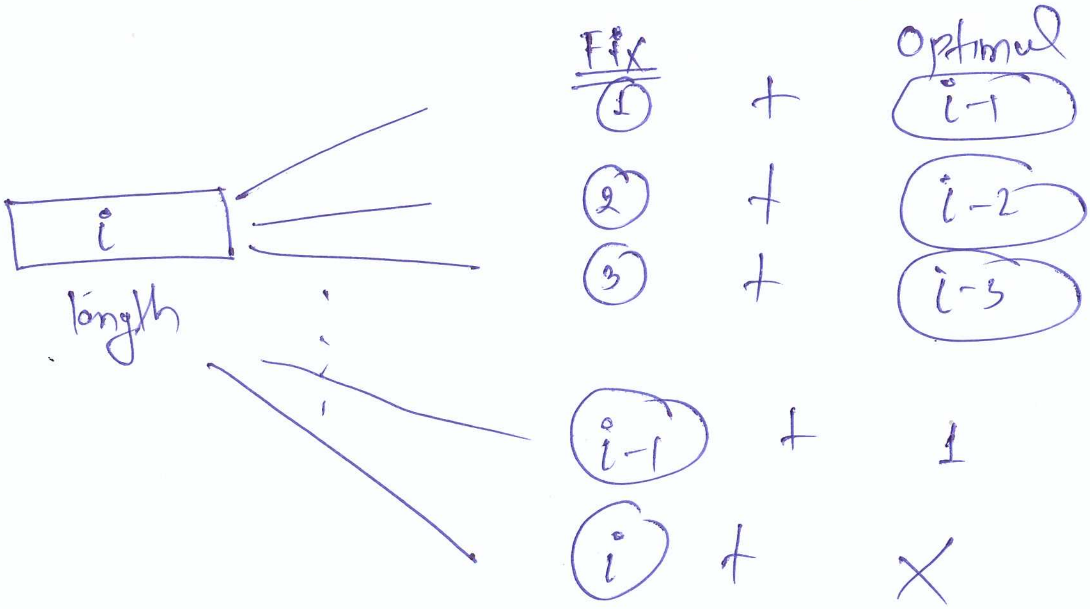
Length (i)	1	2	3	4	5	6	7	8
Price (p_i)	1	5	8	9	10	17	~~18~~ 17	20

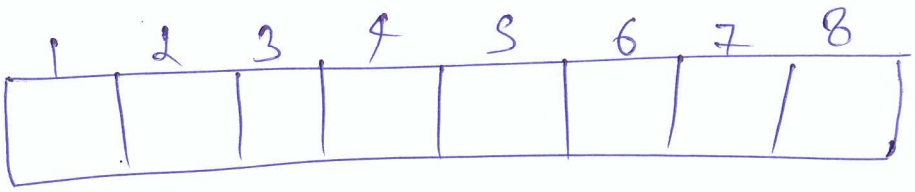
r_i = Price of optimal cutting of <u>ROD</u> till length i unit

~~$r_i = \text{Max}(p_1 + r_{i-1}, p_2$~~

$$r_i = \max_{1 \leq k \leq i} \{ p_i + r_{i-k} \}$$

$$= \text{Max}\{p_1 + r_{i-1},\ p_2 + r_{i-2},\ p_3 + r_{i-3}, \text{---} \text{---},\ p_i + r_0\}$$





Length = 8

(1, 7)
(2, 6)
(3, 5)
(4, 4)
(5, 3) → One piece of length 5 + Best price for length 3
(6, 2)
(7, 1)
(8, 0)

Solution

(I) $r_1 = 1$

(II) $r_2 = \text{Max} \begin{cases} p_1 + r_1 = 1 + 1 \\ p_2 = 5 \end{cases} = 5$

(III) $r_3 = \text{Max} \begin{cases} p_1 + r_2 = 1 + 5 = 6 \\ p_2 + r_1 = 5 + 1 = 6 \\ p_3 + = 8 + = 8 \end{cases} = 8$

IV $\sigma_4 = \text{Max}$

$p_1 + \sigma_3 = 1 + 8 = 9$
$p_2 + \sigma_2 = 5 + 5 = 10$
$p_3 + \sigma_1 = 8 + 1 = 9$
$p_4 + \quad = 9 + \quad = 9$

$= 10$

V $\sigma_5 = \text{Max}$

$p_1 + \sigma_4 = 1 + 10 = 11$
$p_2 + \sigma_3 = 5 + 8 = 13$
$p_3 + \sigma_2 = 8 + 5 = 13$
$p_4 + \sigma_1 = 9 + 1 = 10$
$p_5 \quad = 10 + \quad = 10$

$= 13$

VI $\sigma_6 = \text{Max}$

$p_1 + \sigma_5 = 1 + 13 = 14$
$p_2 + \sigma_4 = 5 + 10 = 15$
$p_3 + \sigma_3 = 8 + 8 = 16$
$p_4 + \sigma_2 = 9 + 5 = 14$
$p_5 + \sigma_1 = 10 + 1 = 11$
$p_6 \quad = 17 \quad = 17$

$= 17$

VII $\sigma_7 = \text{Max}$

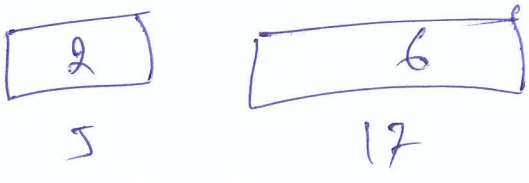
$p_1 + \sigma_6 = 1 + 17 = 18$
$p_2 + \sigma_5 = 5 + 13 = 18$
$p_3 + \sigma_4 = 8 + 10 = 18$
$p_4 + \sigma_3 = 9 + 8 = 17$
$p_5 + \sigma_2 = 10 + 5 = 15$
$p_6 + \sigma_1 = 17 + 1 = 18$
$p_7 + \quad = 17 \quad = 17$

$= 18$

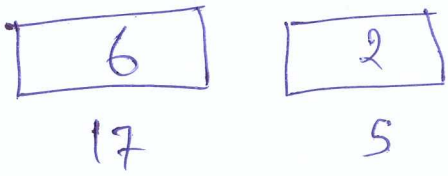
VIII $\sigma_{16} = M_{ax}$

$p_1 + \sigma_7 = 1 + 18 = 19$.
$p_2 + \sigma_6 = 5 + 17 = 22$
$p_3 + \sigma_5 = 8 + 13 = 21$
$p_4 + \sigma_4 = 9 + 10 = 19$
$p_5 + \sigma_3 = 10 + 8 = 18$
$p_6 + \sigma_2 = 17 + 5 = 22$ $= 22$
$p_7 + \sigma_1 = 17 + 1 = 18$
$p_8 = 20$ $= 20$

$p_2 + \sigma_6$



$p_6 + \sigma_2$



Find the pieces using

Traversy Bark