Lab 10 – Practice Dynamic Programming (p1)

CS208 Algorithm Design and Analysis

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Q1: Rod-cutting problem

A company buys long steel rods and cuts them into shorter rods, and then sell them.
Rods of different lengths have different prices, and the cut is free.
Given a length n, your goal is to the find the optimal revenue.

Length i (inch)	1	2	3	4	5	6	7	8	9	10
Price p_i (dollar)	1	5	8	9	10	17	17	20	24	30

E.g., **7 = 2 + 2 + 3** is an optimal way to cut a rod of length 7, and the optimal revenue is **5 + 5 + 8 = 18**

Think: What is the optimal substructure?

Q1: Rod-cutting problem

Let the revenue be r_i for $i = 1, 2, \ldots, 10$

Length i (inch)	1	2	3	4	5	6	7	8	9	10
Price p_i (dollar)	1	5	8	9	10	17	17	20	24	30

$r_1 = 1$, from solution 1 = 1 (no cut)

$r_2 = 5$, from solution 2 = 2 (no cut)

$r_3 = 8$, from solution 3 = 3 (no cut)

$r_4 = 10$, from solution 4 = 2 + 2 = $r_2 + r_2$

$r_5 = 13$, from solution 5 = 2 + 3 = $r_2 + r_3$

$r_6 = 17$, from solution 6 = 6 (no cut)

$r_7 = 18$, from solution 7 = 1 + 6 = $r_1 + r_6$ or 7 = 2 + 2 + 3 = $r_2 + r_2 + r_3$

$r_8 = 22$, from solution 8 = 2 + 6 = $r_2 + r_6$

$r_9 = 25$, from solution 9 = 3 + 6 = $r_3 + r_6$

$r_{10} = 30$, from solution 10 = 10 (no cut)

Grading

- To be graded in a week
- Total point: 1