CSE100 Algorithm Design and Analysis — Lab 12, Fall 2020
Last update: November 9, 2020 — Deadline: Friday, Nov 20, 5:00pm

Dynamic Programming: Rod Cutting

Description In this assignment you are asked to implement a dynamic programming algorithm for the Rod Cutting Problem (chapter 15.1). In the Rod Cutting problem, you are given an integer $n \geq 1$, along with a sequence of positive prices, $p_1, p_2, ..., p_n$, where p_i is the market price of rod of length i. The goal is to figure out a best way of cutting the given rod of length n to generate the maximum revenue. You can assume that the given prices $p_1, p_2, ..., p_n$ are all integers.

Input The input has the following format. The input starts with n. Then, $p_1, p_2, ..., p_n$ follow, one per each line.

Output In the first line, output the maximum revenue (r_n), followed by an enter key. In the second line, sequentially output the length of each piece in your optimal cutting, and output -1, followed by a space key; separate two adjacent numbers by a space key.

Examples of input and output

Input

```
7
1
5
8
9
10
17
17
```

Output

```
18
1 6 -1
```

Important The optimal solution may be achieved by different cuts. For example, the second line above can be replaced with "6 1 -1", "2 2 3 -1", "2 3 2 -1", or "3 2 2 -1". Therefore, any sequence of piece lengths giving the maximum revenue will be considered to be correct. We updated the local grader, `Grader.sh` file, to reflect the possibility of many optimal answers. Make sure you are using the new `Grader.sh` available from `lab12.zip`