

## 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,  $p_1, p_2, \dots, p_n$ , 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  $p_1, p_2, \dots, p_n$  are all integers.

**Input** The input has the following format. The input starts with  $n$ . Then,  $p_1, p_2, \dots, p_n$  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
```

The following is the output with white characters shown.

```
18(enter)
1(space)6(space)-1(enter)
```

Alternatively, the second line can be replaced with “6 1 -1”, “2 2 3 -1”, “2 3 2 -1”, or “3 2 2 -1”. That is, any sequence of piece lengths giving the maximum revenue will be considered to be correct.

See the lab guidelines for submission/grading, etc., which can be found in Files/Labs.