Algorithms

DP Homework 2

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Teaching, Training and Coaching for more than a decade!

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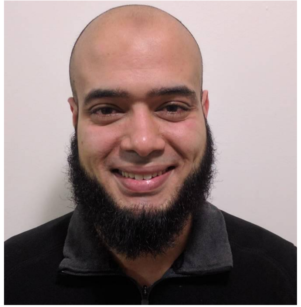
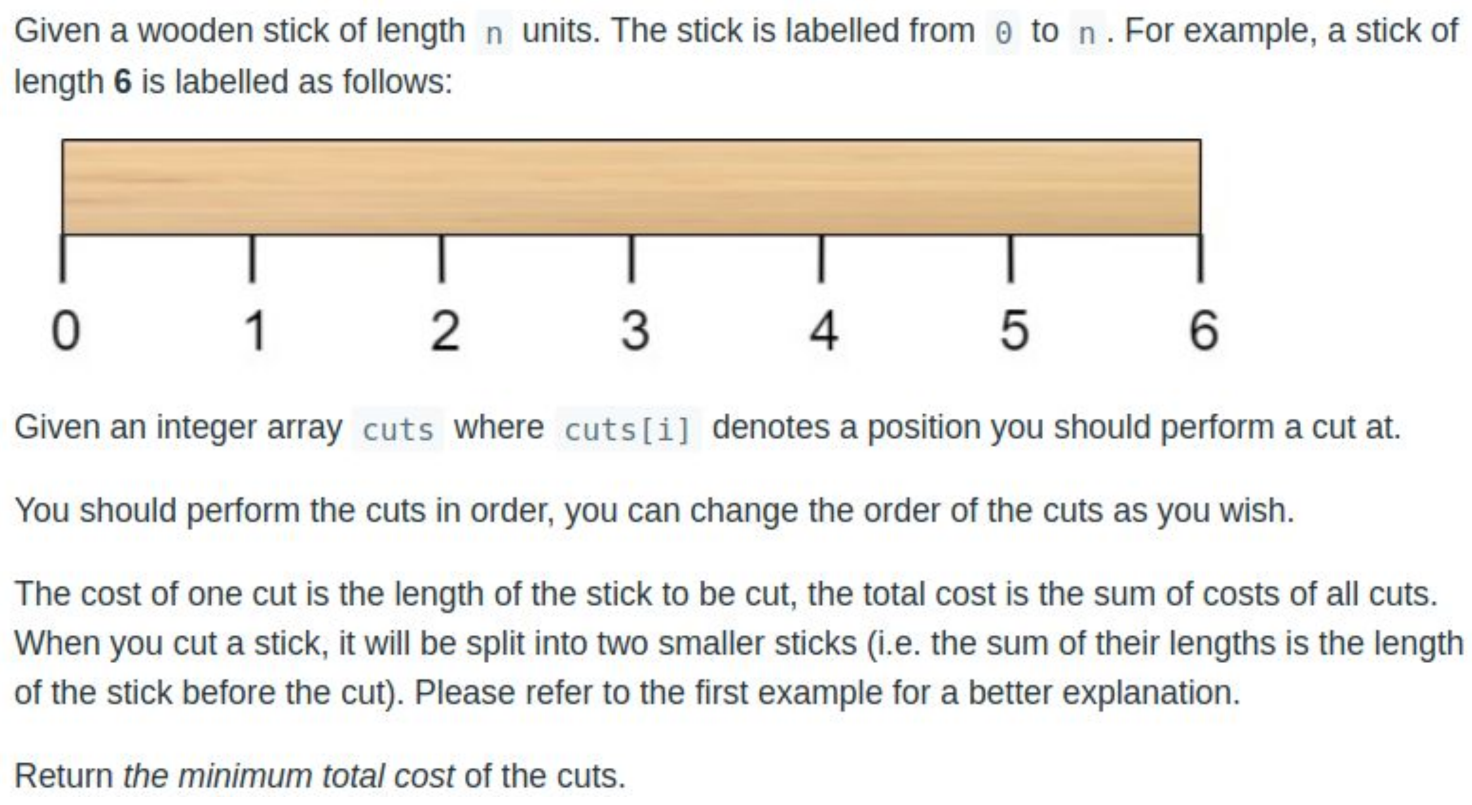


Problem #1: LeetCode 1547 - Minimum Cost to Cut a Stick



Given a wooden stick of length `n` units. The stick is labelled from `0` to `n`. For example, a stick of length **6** is labelled as follows:

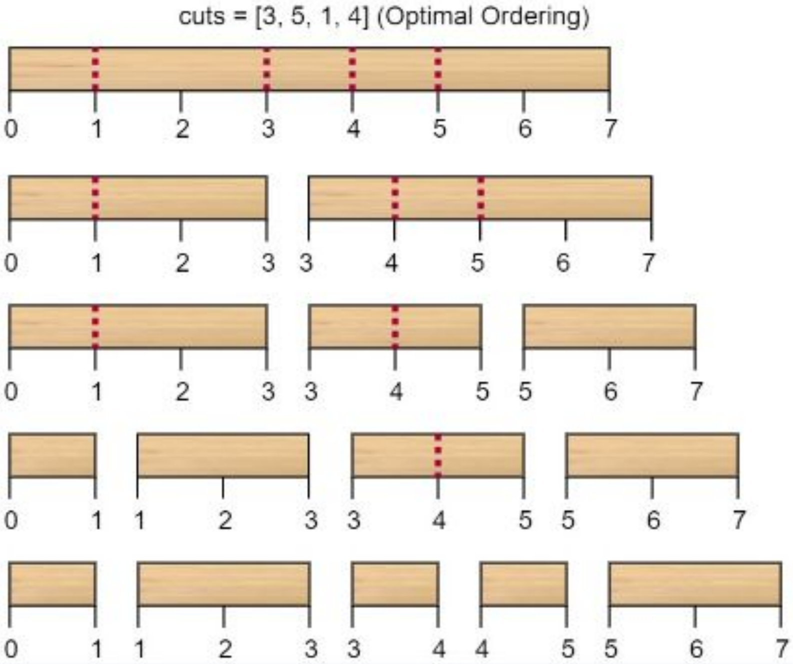
Given an integer array `cuts` where `cuts[i]` denotes a position you should perform a cut at.

You should perform the cuts in order, you can change the order of the cuts as you wish.

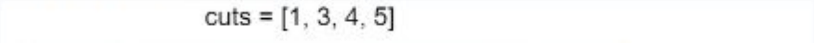
The cost of one cut is the length of the stick to be cut, the total cost is the sum of costs of all cuts. When you cut a stick, it will be split into two smaller sticks (i.e. the sum of their lengths is the length of the stick before the cut). Please refer to the first example for a better explanation.

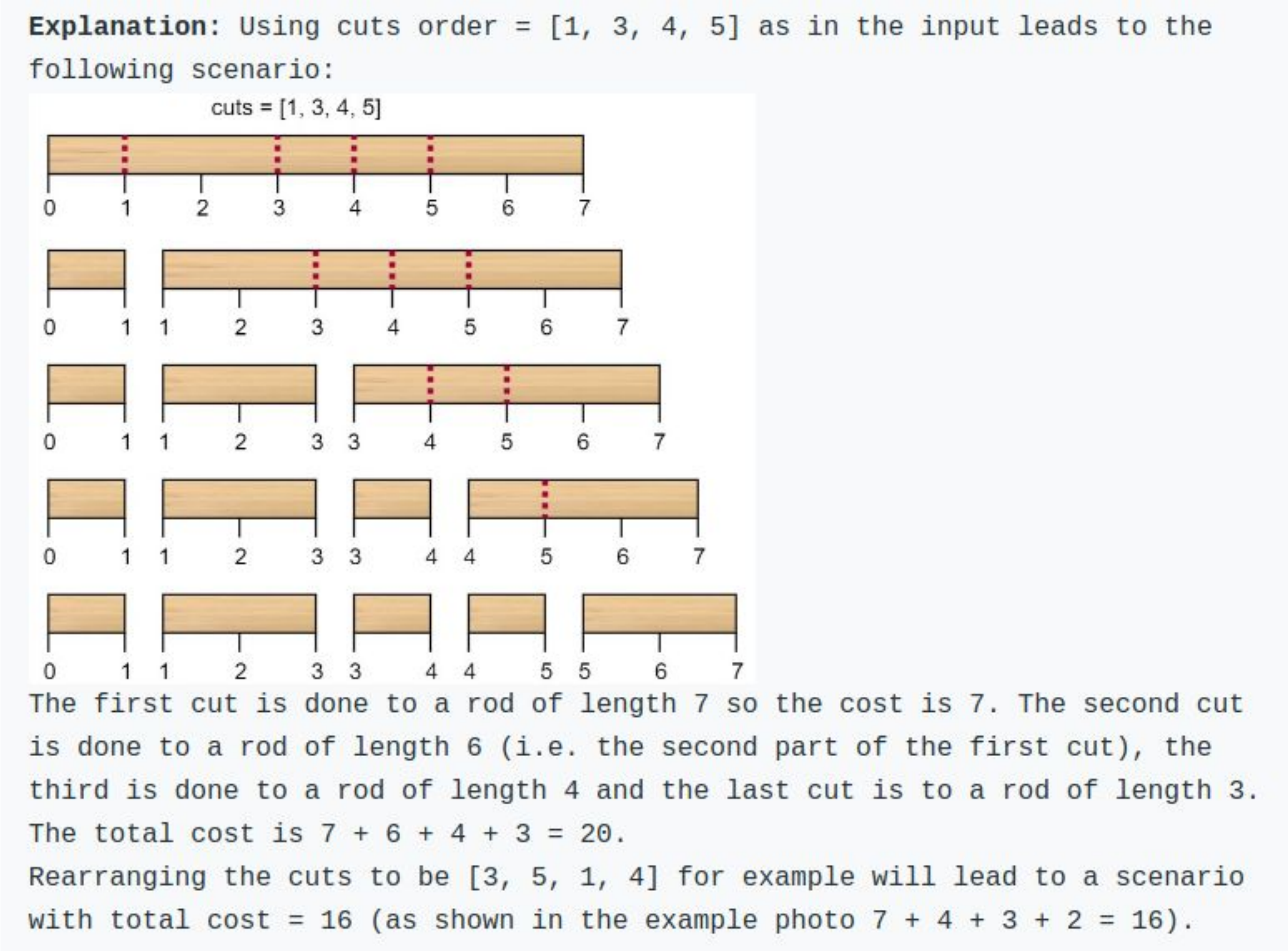
Return *the minimum total cost* of the cuts.

Example 1:



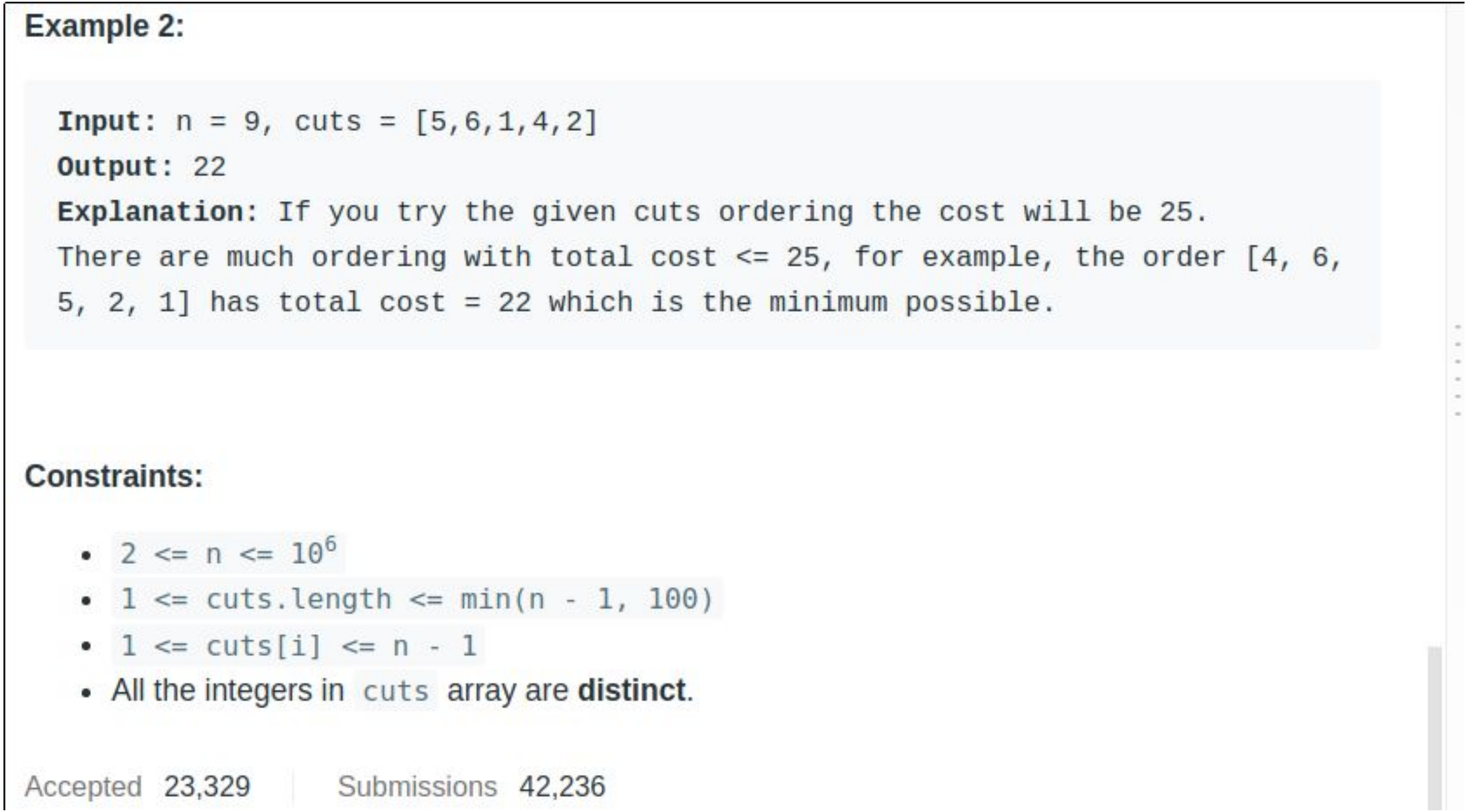
```
Input: n = 7, cuts = [1,3,4,5]
Output: 16
Explanation: Using cuts order = [1, 3, 4, 5] as in the input leads to the
following scenario:
```





Explanation: Using cuts order = [1, 3, 4, 5] as in the input leads to the following scenario:

The first cut is done to a rod of length 7 so the cost is 7. The second cut is done to a rod of length 6 (i.e. the second part of the first cut), the third is done to a rod of length 4 and the last cut is to a rod of length 3. The total cost is 7 + 6 + 4 + 3 = 20.
Rearranging the cuts to be [3, 5, 1, 4] for example will lead to a scenario with total cost = 16 (as shown in the example photo 7 + 4 + 3 + 2 = 16).



Example 2:

```
Input: n = 9, cuts = [5,6,1,4,2]
Output: 22
Explanation: If you try the given cuts ordering the cost will be 25.
There are much ordering with total cost <= 25, for example, the order [4, 6,
5, 2, 1] has total cost = 22 which is the minimum possible.
```

Constraints:

- `2 <= n <= 10`^{6}
- `1 <= cuts.length <= min(n - 1, 100)`
- `1 <= cuts[i] <= n - 1`
- All the integers in `cuts` array are **distinct**.

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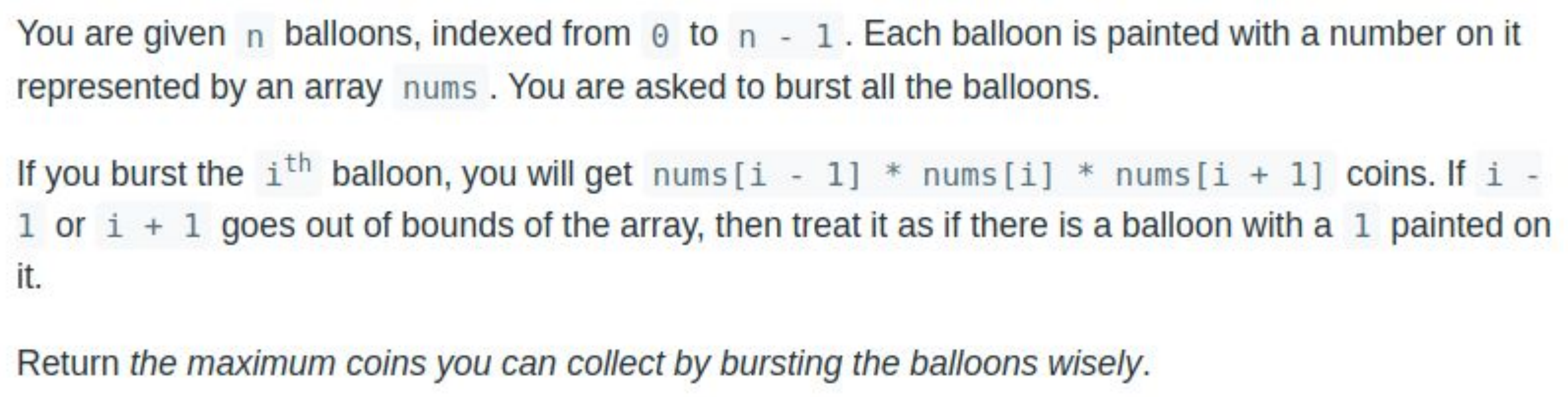
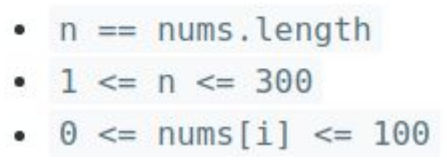
Problem #2: LeetCode 312 - Burst Balloons



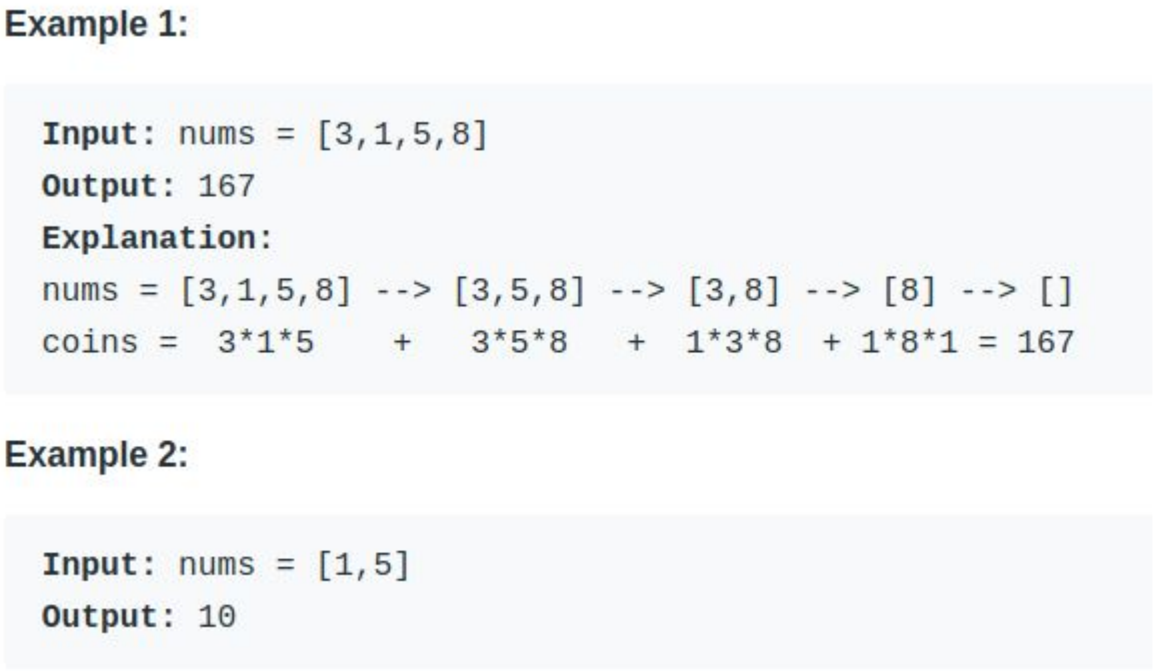
You are given `n` balloons, indexed from `0` to `n - 1`. Each balloon is painted with a number on it represented by an array `nums`. You are asked to burst all the balloons.

If you burst the `i`th balloon, you will get `nums[i - 1] * nums[i] * nums[i + 1]` coins. If `i - 1` or `i + 1` goes out of bounds of the array, then treat it as if there is a balloon with a `1` painted on it.

Return *the maximum coins you can collect by bursting the balloons wisely*.



- `n == nums.length`
- `1 <= n <= 300`
- `0 <= nums[i] <= 100`



Example 1:

```
Input: nums = [3,1,5,8]
Output: 167
Explanation:
nums = [3,1,5,8] --> [3,5,8] --> [3,8] --> [8] --> []
coins =  3*1*5    +   3*5*8   +  1*3*8  + 1*8*1 = 167
```

Example 2:

```
Input: nums = [1,5]
Output: 10
```

"Acquire knowledge and impart it to the people."

"Seek knowledge from the Cradle to the Grave."