Smart Packing

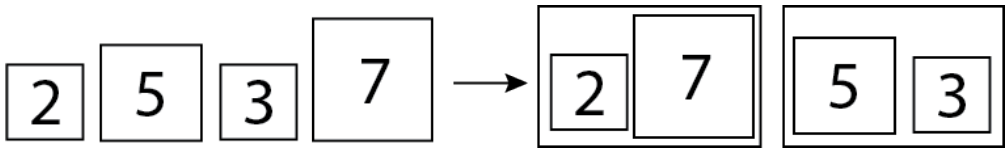
Problem Code: PACKING

Design Challenge

Task Description

There are n items of different weights to be shipped. The i-th item has weight w_i kilograms. You are asked to pack them using some boxes of the same type. Each box can hold at most W kilograms of items. For safety reasons, each box can hold at most 2 items. What is the minimum number of boxes needed to ship all items?

See below for an example. You have $n = 4$ items of weights [2, 5, 3, 7] kilograms. Each box can hold $W = 9$ kilograms. You may pack the 2kg item with the 7kg item, and the 5kg item with the 3kg item. You need 2 boxes in total, which is the minimum possible number of boxes.



Constraints

$w_i \leq W$. $W, w_i > 0$.

Examples

Case 1: $W = 9$, weights are [2, 5, 3, 7]

Answer: 2

As explained above.

Case 2: $W = 6$, weights are [1, 2, 3, 4, 5]

Answer: 3

Pack the 1kg item with the 5kg item, and the 2kg item with the 4kg. Use a third box to ship the 3kg item.

Case 3: $W = 100$, weights are [1, 2, 3, 4, 5]

Answer: 3

Though you have strong boxes, remember at most 2 items can be packed in one box.

Requirements

Time: $o(n^2)$ (little o) **Space:** $O(n)$