



DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

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WORKSHEET 8

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Branch: CSE

Section/Group: NTPP 603/B

Semester: 06

Date of Performance: 20/03/2025

Subject Name: AP Lab II

Subject Code: 22CSP-351

1. Aim:

- a) Max Units on a Truck
- b) Min Operations to Make Array Increasing
- c) Remove Stones to Maximize Total

2. Source Code:

a.

```
class Solution {
public:
    int maximumUnits(vector<vector<int>>& boxTypes, int truckSize) {
        int ans = 0;

        ranges::sort(boxTypes, ranges::greater{},
            [](const vector<int>& boxType) { return boxType[1]; });

        for (const vector<int>& boxType : boxTypes) {
            const int boxes = boxType[0];
            const int units = boxType[1];
            if (boxes >= truckSize)
                return ans + truckSize * units;
            ans += boxes * units;
            truckSize -= boxes;
        }

        return ans;
    }
};
```



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b.

```
class Solution {
public:
    int minOperations(vector<int>& nums) {
        int ans = 0;
        int last = 0;

        for (const int num : nums) {
            ans += max(0, last - num + 1);
            last = max(num, last + 1);
        }

        return ans;
    }
};
```

c.

```
class Solution {
public:
    int minStoneSum(vector<int>& piles, int k) {
        int ans = accumulate(piles.begin(), piles.end(), 0);
        priority_queue<int> maxHeap;

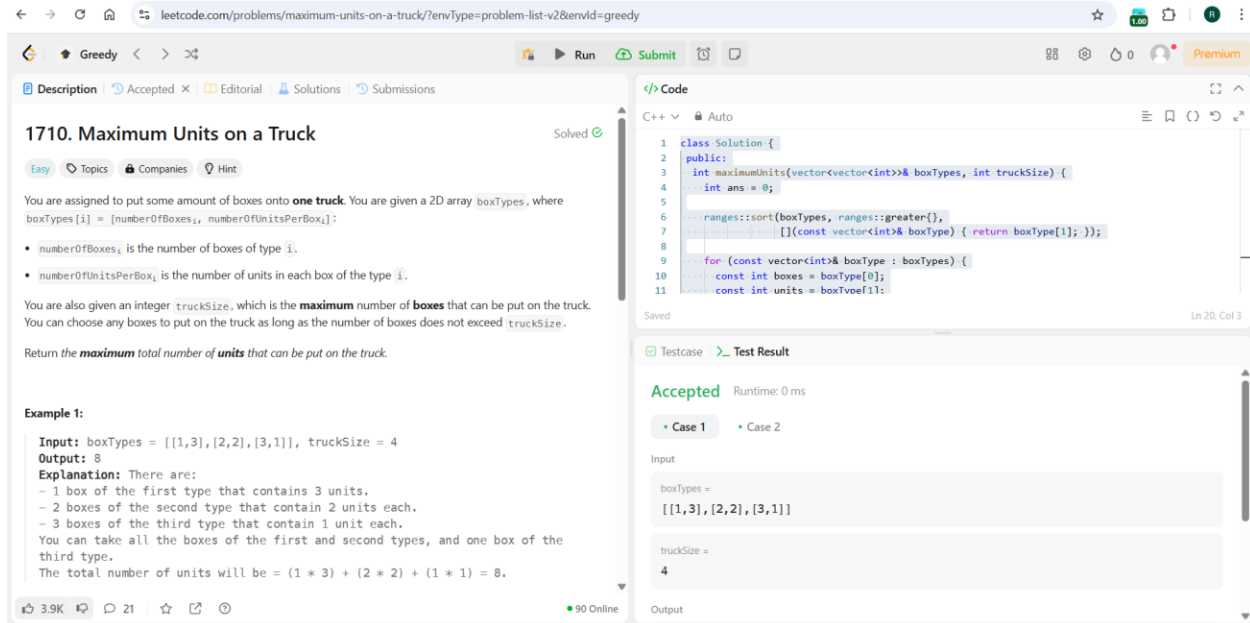
        for (const int pile : piles)
            maxHeap.push(pile);

        for (int i = 0; i < k; ++i) {
            const int maxPile = maxHeap.top();
            maxHeap.pop();
            maxHeap.push(maxPile - maxPile / 2);
            ans -= maxPile / 2;
        }

        return ans;
    }
};
```

Screenshot of Outputs:

a.



1710. Maximum Units on a Truck Solved

Easy Topics Companies Hint

You are assigned to put some amount of boxes onto **one truck**. You are given a 2D array `boxTypes`, where `boxTypes[i] = [numberOfBoxesi, numberOfUnitsPerBoxi]`:

- `numberOfBoxesi` is the number of boxes of type `i`.
- `numberOfUnitsPerBoxi` is the number of units in each box of the type `i`.

You are also given an integer `truckSize`, which is the **maximum** number of **boxes** that can be put on the truck. You can choose any boxes to put on the truck as long as the number of boxes does not exceed `truckSize`.

Return the **maximum** total number of **units** that can be put on the truck.

Example 1:

Input: `boxTypes = [[1,3],[2,2],[3,1]]`, `truckSize = 4`
Output: 8
Explanation: There are:
 - 1 box of the first type that contains 3 units.
 - 2 boxes of the second type that contain 2 units each.
 - 3 boxes of the third type that contain 1 unit each.
 You can take all the boxes of the first and second types, and one box of the third type.
 The total number of units will be $(1 * 3) + (2 * 2) + (1 * 1) = 8$.

3.9K 21 90 Online

```

1 class Solution {
2 public:
3     int maximumUnits(vector<vector<int>>& boxTypes, int truckSize) {
4         int ans = 0;
5
6         ranges::sort(boxTypes, ranges::greater{});
7         for (const vector<int>& boxType : boxTypes) {
8             const int boxes = boxType[0];
9             const int units = boxType[1];
10
11             if (truckSize >= boxes) {
12                 ans += boxes * units;
13                 truckSize -= boxes;
14             } else {
15                 ans += truckSize * units;
16                 truckSize = 0;
17             }
18         }
19         return ans;
20     }
21 }

```

Accepted Runtime: 0 ms

Case 1 Case 2

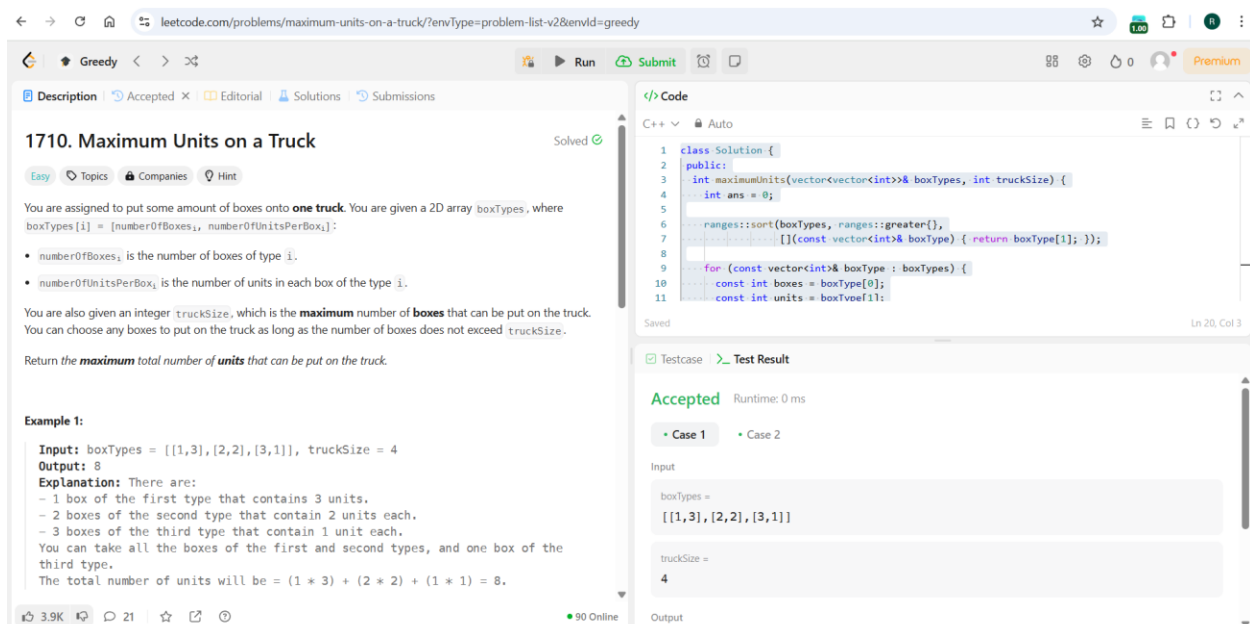
Input

`boxTypes =`
`[[1,3],[2,2],[3,1]]`

`truckSize =`
`4`

Output

b.



1710. Maximum Units on a Truck Solved

Easy Topics Companies Hint

You are assigned to put some amount of boxes onto **one truck**. You are given a 2D array `boxTypes`, where `boxTypes[i] = [numberOfBoxesi, numberOfUnitsPerBoxi]`:

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Return the **maximum** total number of **units** that can be put on the truck.

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Input: `boxTypes = [[1,3],[2,2],[3,1]]`, `truckSize = 4`
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 The total number of units will be $(1 * 3) + (2 * 2) + (1 * 1) = 8$.

3.9K 21 90 Online

```

1 class Solution {
2 public:
3     int maximumUnits(vector<vector<int>>& boxTypes, int truckSize) {
4         int ans = 0;
5
6         ranges::sort(boxTypes, ranges::greater{});
7         for (const vector<int>& boxType : boxTypes) {
8             const int boxes = boxType[0];
9             const int units = boxType[1];
10
11             if (truckSize >= boxes) {
12                 ans += boxes * units;
13                 truckSize -= boxes;
14             } else {
15                 ans += truckSize * units;
16                 truckSize = 0;
17             }
18         }
19         return ans;
20     }
21 }

```

Accepted Runtime: 0 ms

Case 1 Case 2

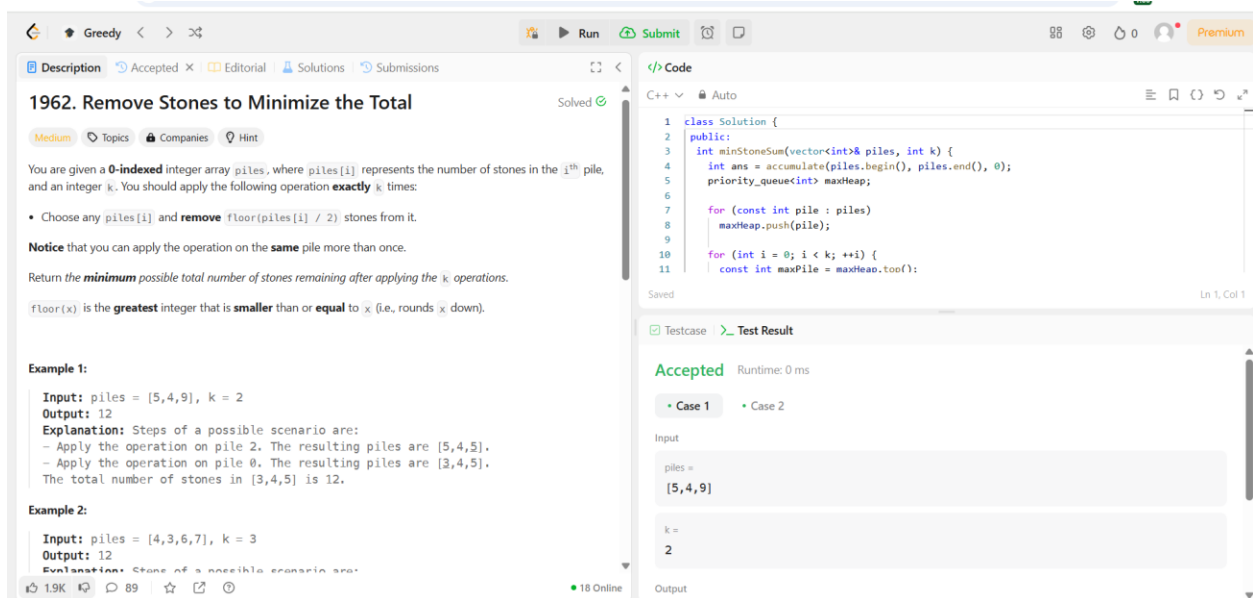
Input

`boxTypes =`
`[[1,3],[2,2],[3,1]]`

`truckSize =`
`4`

Output

C.



The screenshot shows a LeetCode problem page for "1962. Remove Stones to Minimize the Total". The problem is categorized as "Medium" and is solved using a Greedy approach. The description states: "You are given a 0-indexed integer array piles, where piles[i] represents the number of stones in the ith pile, and an integer k. You should apply the following operation exactly k times: Choose any piles[i] and remove floor(piles[i] / 2) stones from it. Notice that you can apply the operation on the same pile more than once. Return the minimum possible total number of stones remaining after applying the k operations. floor(x) is the greatest integer that is smaller than or equal to x (i.e., rounds x down)." Example 1: Input: piles = [5,4,9], k = 2; Output: 12; Explanation: Steps of a possible scenario are: - Apply the operation on pile 2. The resulting piles are [5,4,5]. - Apply the operation on pile 0. The resulting piles are [3,4,5]. The total number of stones in [3,4,5] is 12. Example 2: Input: piles = [4,3,6,7], k = 3; Output: 12; Explanation: Steps of a possible scenario are: - Apply the operation on pile 2. The resulting piles are [4,3,3,7]. - Apply the operation on pile 3. The resulting piles are [4,3,3,4]. - Apply the operation on pile 0. The resulting piles are [2,3,3,4]. The total number of stones in [2,3,3,4] is 12. The code section shows a C++ solution using a max heap to always remove the largest pile's stones. The test result shows "Accepted" with a runtime of 0 ms.

1962. Remove Stones to Minimize the Total Solved

Medium Topics Companies Hint

You are given a 0-indexed integer array `piles`, where `piles[i]` represents the number of stones in the `ith` pile, and an integer `k`. You should apply the following operation **exactly** `k` times:

- Choose any `piles[i]` and **remove** `floor(piles[i] / 2)` stones from it.

Notice that you can apply the operation on the **same** pile more than once.

Return the **minimum** possible total number of stones remaining after applying the `k` operations.

`floor(x)` is the **greatest** integer that is **smaller** than or **equal** to `x` (i.e., rounds `x` down).

Example 1:

Input: `piles = [5,4,9]`, `k = 2`
Output: 12
Explanation: Steps of a possible scenario are:
- Apply the operation on pile 2. The resulting piles are `[5,4,5]`.
- Apply the operation on pile 0. The resulting piles are `[3,4,5]`.
The total number of stones in `[3,4,5]` is 12.

Example 2:

Input: `piles = [4,3,6,7]`, `k = 3`
Output: 12
Explanation: Steps of a possible scenario are:
- Apply the operation on pile 2. The resulting piles are `[4,3,3,7]`.
- Apply the operation on pile 3. The resulting piles are `[4,3,3,4]`.
- Apply the operation on pile 0. The resulting piles are `[2,3,3,4]`.
The total number of stones in `[2,3,3,4]` is 12.

1.9K 89 18 Online

```
1 class Solution {
2 public:
3     int minStoneSum(vector<int>& piles, int k) {
4         int ans = accumulate(piles.begin(), piles.end(), 0);
5         priority_queue<int> maxHeap;
6
7         for (const int pile : piles)
8             maxHeap.push(pile);
9
10        for (int i = 0; i < k; ++i) {
11            const int maxPile = maxHeap.top();
```

Testcase Test Result

Accepted Runtime: 0 ms

Case 1 Case 2

Input

piles =
[5,4,9]

k =
2

Output

3. Learning Outcomes

(i) Learned about Greedy Programming.