

## Rifiuti da riciclare (riciclo)

Tommaso had the wonderful idea of founding a recycling company, which provides garbage collection services in his area. Garbage is gathered by trucks and then taken to the company's recycling center.

In order to do so, Tommaso purchased  $N$  trucks that, once a week, go around to collect the trash to be recycled. The  $i$ -th truck ( $0 \leq i < N$ ) has a maximum load of  $T_i$  kg. Every week, Tommaso carefully plans the itinerary of the trucks towards the recycling center, so that every truck travels **only once**.



Figure 1: Tommaso learning to use the forklift.

Garbage comes in pallets, so that it's easier to arrange them into the trucks. Garbage can be of  $M$  different types, numbered from 0 to  $M - 1$ , and pallets have a different weight depending on the type of garbage they contain. Specifically, garbage of type  $i$  is packed in pallets of weight  $2^i$ , and Tommaso has to collect  $P_i$  pallets of that type.

A given truck can carry a subset of the pallets only if their cumulative weight doesn't exceed its maximum load. Obviously, the same pallet cannot be carried by more than one truck.

Tommaso wants to take the **maximum possible number** of pallets to the recycling center, but **he does not need to maximize the total weight**: the value of pallets is the same even though their weight is different, due to their different content. Help him compute the maximum number of pallets he can collect.

## Implementation

You should submit a single file, with a `.cpp` extension.

📎 Among the attachments in this task you will find a template `riciclo.cpp` with a sample implementation.

You will have to implement the following function:

```
C++ | long long riciclo(int N, int M, vector<int> T, vector<int> P);
```

- Integer  $N$  is the number of trucks owned by Tommaso.
- Integer  $M$  is the number of garbage types.
- Array  $T$ , indexed from 0 to  $N - 1$ , contains integers  $T_0, T_1, \dots, T_{N-1}$  (the maximum load of each truck).
- Array  $P$ , indexed from 0 to  $M - 1$ , contains integers  $P_0, P_1, \dots, P_{M-1}$  (the number of pallets of type  $i$  and weight  $2^i$  for  $0 \leq i < M$ ).
- The function must return the maximum number of pallets that Tommaso can carry to the recycling center, provided that he plans the trucks' trips optimally.

The grader will call function `riciclo` and print the return value on the output file.

## Sample grader

Among this task's attachments you will find a simplified version of the grader used during evaluation, which you can use to test your solutions locally. The sample grader reads data from `stdin`, calls the function that you should implement and writes back on `stdout` using the following format.

The input file is made up of 3 lines, containing:

- Line 1: space-separated integers  $N$  and  $M$ .
- Line 2: the  $N$  space-separated integers  $T_0, T_1, \dots, T_{N-1}$ .
- Line 3: the  $M$  space-separated integers  $P_0, P_1, \dots, P_{M-1}$ .

The output file is made up of a single line containing the return value of function `riciclo`.

## Constraints

- $1 \leq N \leq 10^6$ .
- $1 \leq M \leq 30$ .
- $1 \leq T_i \leq 10^9$  for each  $i = 0, \dots, N - 1$ .
- $0 \leq P_i \leq 10^9$  for each  $i = 0, \dots, M - 1$ .

## Scoring

Your program will be tested on a number of testcases grouped in subtasks. In order to obtain the score associated to a subtask, you need to correctly solve all the testcases it contains.

- **Subtask 1** [ 0 points]: Sample cases.
- **Subtask 2** [ 9 points]:  $N = 1$ .
- **Subtask 3** [ 5 points]:  $N \leq 5$ , the sum of the  $P_i$ 's is at most 5.
- **Subtask 4** [ 9 points]:  $N \leq 100, P_i \leq 100$ .
- **Subtask 5** [ 9 points]:  $N \leq 1000, P_i \leq 1000$ .
- **Subtask 6** [31 points]:  $N \leq 10^5$ .
- **Subtask 7** [37 points]: No additional constraints.

## Examples

stdin	stdout
2 3 4 3 1 2 1	3
4 3 1 1 1 1 6 4 2	4
1 4 5 0 0 0 1	0

## Explanation

In the **first sample case**, Tommaso owns two trucks, with maximum load of respectively  $T_0 = 4$  kg and  $T_1 = 3$  kg. There are 4 pallets:

- 1 pallet of type 0 and weight  $2^0 = 1$ ;
- 2 pallets of type 1 and weights  $2^1 = 2$ ;
- 1 pallet of type 2 and weight  $2^2 = 4$ .

One possible solution consists in carrying the pallet of weight 4 on the first truck, and carrying the pallet of weight 1 and one pallet of weight 2 on the second, for a total of 3 pallets. On the other hand, one can notice that it's impossible to carry all 4 pallets.

In the **second sample case** there are 4 trucks, each with a maximum load of at most 1 kg, and:

- 6 pallets of type 0 and weight  $2^0 = 1$ ;
- 4 pallets of type 1 and weight  $2^1 = 2$ ;
- 2 pallets of type 2 and weight  $2^2 = 4$ .

Each truck can only carry a single pallet of weight 1, thus the answer is 4.

In the **third sample case**, the only pallet has weight  $2^3 = 8$ , which is strictly greater than the maximum load of the only truck ( $T_0 = 5$ ). Therefore, Tommaso can't take any pallet to the recycling center.