Problem 3: Knapsack

(Hard)

(Adapted from Singapore's National Olympiad in Informatics 2018 Preliminary Round, Task 2)

There is a housewife who recently won a prize to "shop for free as long as your shopping basket is not full" in a department store.

This housewife is given a shopping basket that can carry a maximum weight of S kilograms.

There are N item types in the department store, and the ith item is worth V_i dollars, weighs W_i kilograms, and there are K_i copies (of exactly the same value and weight) of such item i.

For example, there are $N = 3$ item types: meat, milk, and bread, of which there are: 1 pack of meat, 3 bottles of milk, and 4 loaves of bread (see the last sample test case).

What items should the housewife take to maximise the total value of the items in her shopping basket?

Input Format

The first line of input contains two positive integers, S and N.

The following N lines of input will each contain three integers, where the ith line contains V_i, W_i and K_i, the value in dollars, weight in kilograms and quantity of the ith item, respectively.

Constraints

- $1 \leq S \leq 2000$
- $1 \leq N \leq 100$
- $1 \leq V_i \leq 10^6$
- $1 \leq W_i \leq S$
- $1 \leq K_i \leq 10$

The time limit for this problem is 2 seconds.

Output Format

Your program should print one integer representing the maximum total value in dollars of the items that this housewife can take while ensuring the total weight does not exceed S kilograms.

Sample Input 1

```
15 5
4 12 1
2 1 1
10 4 1
1 1 1
2 2 1
```

Sample Output 1

```
15
```

Explanation 1

The housewife can take one of items 2, 3, 4, 5 giving a total weight of 1 + 4 + 1 + 2 = 8 and a total value of 2 + 10 + 1 + 2 = 15.

Sample Input 2

```
20 3
5000 15 1
100 1 3
50 1 4
```

Sample Output 2

```
5400
```

Explanation 2

The housewife take one of item 1, three of item 2 and two of item 3 for a total weight of 15 × 1 + 1 × 3 + 1 × 2 = 20 and a total value of 5000 × 1 + 100 × 3 + 50 × 2 = 5400.

Hint

Mreb-Bar Xancfnpx Ceboyrz, jvgu n gjvfg.