Welcome, Prashik.

D - Knapsack 1

Editorial (/contests/dp/tasks/dp_d/editorial)

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Time Limit: 2 sec / Memory Limit: 1024 MB

Score : 100 points

Problem Statement

There are N items, numbered $1, 2, \ldots, N$. For each i ($1 \leq i \leq N$), Item i has a weight of w_i and a value of v_i.

Taro has decided to choose some of the N items and carry them home in a knapsack. The capacity of the knapsack is W, which means that the sum of the weights of items taken must be at most W.

Find the maximum possible sum of the values of items that Taro takes home.

Constraints

- All values in input are integers.
- $1 \leq N \leq 100$
- $1 \leq W \leq 10^5$
- $1 \leq w_i \leq W$
- $1 \leq v_i \leq 10^9$

Input

Input is given from Standard Input in the following format:

N W
w_1 v_1
w_2 v_2
:
w_N v_N

Output

Print the maximum possible sum of the values of items that Taro takes home.

Sample Input 1 Copy

```
3 8
3 30
4 50
5 60
```

Sample Output 1 Copy

```
90
```

Items 1 and 3 should be taken. Then, the sum of the weights is $3 + 5 = 8$, and the sum of the values is $30 + 60 = 90$.

Sample Input 2 Copy

```
5 5
1 1000000000
1 1000000000
1 1000000000
1 1000000000
1 1000000000
```

Sample Output 2 Copy

```
5000000000
```

The answer may not fit into a 32-bit integer type.

Sample Input 3 Copy

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```
6 15
6 5
5 6
6 4
6 6
3 5
7 2
```

Copy

Sample Output 3

Copy

```
17
```

Copy

Items 2, 4 and 5 should be taken. Then, the sum of the weights is $5 + 6 + 3 = 14$, and the sum of the values is $6 + 6 + 5 = 17$.

Language C++ 20 (gcc 12.2)

Source Code

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```
1  #include<bits/stdc++.h>
2  using namespace std;
3  int n,w;
4  int wi[101];
5  int vi[101];
6  int dp[101][100100];
7  int rec(int level,int wt_remain){
8    if(level==n){
9      return 0;
10   }
11   if(dp[level][wt_remain]!=-1){
12     return dp[level][wt_remain];
13   }
14   int ans=rec(level+1,wt_remain);//not take
15   if(wi[level]<=wt_remain){//take
16     ans=max(ans,vi[level]+rec(level+1,wt_remain-wi[level]));
17   }
18   return dp[level][wt_remain]=ans;
19 }
20 int main(){
21   cin>>n>>w;
22   memset(dp,-1,sizeof(dp));
23   for(int i=0;i<n;i++){
24     cin>>wi[i]>>v[i];
25   }
```

* at most 512 KiB

* Your source code will be saved as Main.*extension*.

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