The Coin Change Problem

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In this problem you will be given a list of coin denominations and a target amount. Determine the number of ways the target amount can be arrived at using the denominations available.

Input Format

- 2 space-separated integers
  - n and m: target amount, number of denominations
  - $1 \leq n \leq 250$
  - $1 \leq m \leq 50$
- m space-separated integers
  - c_i: unique coin denominations
  - $1 \leq c_i \leq 50$

Hints

- *Solve overlapping subproblems using Dynamic Programming (DP):*
  You can solve this problem recursively but will not pass all the test cases without optimizing to eliminate the overlapping subproblems. Think of a way to store and reference previously computed solutions to avoid solving the same subproblem multiple times.
- Consider the degenerate cases:
  - How many ways can you make change for 0 cents?
  - How many ways can you make change for > 0 cents if you have no coins?
- If you're having trouble defining your solutions store, then think about it in terms of the base case $(n = 0)$.
- The answer may be larger than a 32-bit integer.

Output Format

Print a long integer denoting the number of ways we can get a sum of n from the given infinite supply of M types of coins.

Sample Input 0

```
4 3
1 2 3
```

Sample Output 0

```
4
```

Explanation 0

Given coins of denominations `[1, 2, 3]` and a target amount of 4, the following 4 sets of coins meet the goal: `[1, 1, 1, 1]`, `[1, 1, 2]`, `[2, 2]` and `[1, 3]`.

Sample Input 1

```
10 4
2 5 3 6
```

Sample Output 1

```
5
```

Explanation 1

Given coins of denominations `[2, 5, 3, 6]` and a target amount of 10, the following 5 sets of coins meet the goal: `[2, 2, 2, 2, 2]`, `[2, 2, 3, 3]`, `[ 2, 2, 6]`, `[2, 3, 5]`, `[5, 5]`

Medium Submitted 42074 times
Max Score 60

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Current Buffer (saved locally, editable) C++14

```
#include <iostream>
#include <vector>
#include <iterator>
#include <algorithm>
#include <numeric>
#include <functional>
using namespace std;
typedef unsigned long long int uint64;

inline uint64 CoinChangeProblem(int &targetAmt, int &denomination, vector<int> &coins)
{
    vector<uint64> targetVec(targetAmt+1);
    sort(coins.begin(), coins.end());
    for(auto idx = 0; idx<denomination; ++idx)
    {
        if(idx == 0)
            targetVec[idx] = coins[idx];
        for(auto i=0; i< targetAmt+1; ++i)
        {
            int amt = i;
            if(amt>=coins[idx])
                targetVec[amt] +=targetVec[amt-coins[idx]];
```

```
        }

    }
    for(auto &it: targetVec)
        cout<<it<<" ";
    return targetVec[targetAmt];
}

int main()
{
    int targetAmt, denomination;
    cin>>targetAmt;             // target amount,
    cin>>denomination;          // number of denominations

    vector<int> coins; coins.reserve(denomination);
    copy_n(istream_iterator<int>(cin), denomination, back_inserter(coins));

    cout<<CoinChangeProblem(targetAmt, denomination, coins)<<endl;
    return 0;
}

```

Line: 26 Col: 5

Upload Code as File | Test against custom input | Run Code | Submit Code

Testcase 0 ✖ | Testcase 1 ✖

Your code did not pass this test case.

Input (stdin)

```
10 4
2 5 3 6
```

Your Output (stdout)

```
2 0 2 2 2 4 6 4 8 8 10 10
```

Expected Output

```
5
```

Compiler Message

```
Wrong Answer
```