



The Coin Change Problem

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Problem

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You have m types of coins available in infinite quantities where the value of each coin is given in the array $C = [c_0, c_1, \dots, c_{m-1}]$. Can you determine the number of ways of making change for n units using the given types of coins? For example, if $m = 4$, and $C = [8, 3, 1, 2]$, we can make change for $n = 3$ units in three ways: $\{1, 1, 1\}$, $\{1, 2\}$, and $\{3\}$.

Given n , m , and C , print the number of ways to make change for n units using any number of coins having the values given in C .

Input Format

The first line contains two space-separated integers describing the respective values of n and m .

The second line contains m space-separated integers describing the respective values of c_0, c_1, \dots, c_{m-1} (the list of distinct coins available in infinite amounts).

Constraints

- $1 \leq c_i \leq 50$
- $1 \leq n \leq 250$
- $1 \leq m \leq 50$
- Each c_i is guaranteed to be distinct.

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

There are four ways to make change for $n = 4$ using coins with values given by $C = [1, 2, 3]$:

1. $\{1, 1, 1, 1\}$
2. $\{1, 1, 2\}$
3. $\{2, 2\}$
4. $\{1, 3\}$

Thus, we print **4** as our answer.

Sample Input 1

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

Sample Output 1

```
5
```

Explanation 1

There are five ways to make change for $n = 10$ units using coins with values given by $C = [2, 5, 3, 6]$:

1. $\{2, 2, 2, 2, 2\}$
2. $\{2, 2, 3, 3\}$
3. $\{2, 2, 6\}$
4. $\{2, 3, 5\}$
5. $\{5, 5\}$

Thus, we print **5** as our answer.

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Submissions: [37185](#)

Max Score: 60

Difficulty: Hard

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Java 7



```
1 import java.io.*;
2 import java.util.*;
3 import java.text.*;
4 import java.math.*;
5 import java.util.regex.*;
6
7 public class Solution {
8
9     static long getWays(long n, long[] c){
10         // Complete this function
11     }
12
13     public static void main(String[] args) {
14         Scanner in = new Scanner(System.in);
```

```
15     int n = in.nextInt();
16     int m = in.nextInt();
17     long[] c = new long[m];
18     for(int c_i=0; c_i < m; c_i++){
19         c[c_i] = in.nextLong();
20     }
21     // Print the number of ways of making change for 'n' units using coins having the values given by 'c'
22     long ways = getWays(n, c);
23 }
24 }
25 }
```

Line: 1 Col: 1

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