

Challenge: Number of Ways to Represent N Dollars

In this lesson you will write an algorithm to solve a famous dynamic programming problem, finding the number of ways to represent an amount using bills and coins.

We'll cover the following ^

- Problem statement
- Input
- Output
- Coding challenge

Problem statement

Given a list of currency bills, you are required to count the number of ways in which you can represent a certain amount. For example, if you have only two kinds of bills, \$10 and \$20, and you want to represent \$30, there are only two ways:

- 3 bills of \$10
- 1 bill of \$20 and 1 bill of \$10.

Input

You will get a list of currency `bills` and the `amount` you are required to make as input. You have to count the number of ways the `amount` can be made using the currency bills provided in the `bills` list.

```
bills = [10, 20]
amount = 30
```

Output

Your program should return the count of the number of ways `amount` can be represented using dollar bills given to you in the list `bills`.

```
countways([10, 20], 30) = 2
```

Coding challenge

As you design the algorithm take special care that you do not overcount. \$30 can be represented with \$20+\$10 as well as \$10+\$20, but these are the same thing. Therefore, you should not count both cases.

A simple recursive solution will timeout for large inputs, thus, you should try to write a dynamic programming algorithm. Start with a recursive solution and build up to a dynamic solution. Your solution may use a top-down or bottom-up approach. Set `stressTesting` to `False` to test your simple recursive solution.

```
def countways(bills, amount):  
    # write your code here  
  
    return 0  
stressTesting = True
```



Hint 1 of 2



At each step you can pick any of the bills (as we did for the staircase problem in chapter 2)



In the next lesson, we will discuss some solutions to this problem.