

## Coin Change Permutation in C++

```
#include <iostream>
#include <vector>

using namespace std;

int main() {
    vector<int> coins = {2, 3, 5};
    int tar = 7;
    vector<int> dp(tar + 1, 0);
    dp[0] = 1; // Base case: 1 way to make amount 0
    (using no coins)

    for (int amt = 1; amt <= tar; amt++) {
        for (int coin : coins) {
            if (coin <= amt) {
                int ramt = amt - coin;
                dp[amt] += dp[ramt];
            }
        }
    }

    cout << dp[tar] << endl; // Output the number of
    permutations to make the target amount

    return 0;
}
```

### Initial dp Array

Before processing:

dp = [1, 0, 0, 0, 0, 0, 0, 0] // (Indexes represent amounts from 0 to 7)

### Dry Run with Iteration Table

Iterating over amt from 1 to 7

amt	Coin Used	dp[amt] = dp[amt] + dp[amt - coin]	Updated dp
1	2 (skipped)	-	[1, 0, 0, 0, 0, 0, 0, 0]
	3 (skipped)	-	
	5 (skipped)	-	
2	2	dp[2] += dp[0] = 1	[1, 0, 1, 0, 0, 0, 0, 0]
	3, 5 (skipped)	-	
3	2	dp[3] += dp[1] = 0	[1, 0, 1, 0, 0, 0, 0, 0]
	3	dp[3] += dp[0] = 1	[1, 0, 1, 1, 0, 0, 0, 0]
	5 (skipped)	-	
4	2	dp[4] += dp[2] = 1	[1, 0, 1, 1, 1, 0, 0, 0]
	3	dp[4] += dp[1] = 0	[1, 0, 1, 1, 1, 0, 0, 0]
	5 (skipped)	-	
5	2	dp[5] += dp[3] = 1	[1, 0, 1, 1, 1, 1, 0, 0]
	3	dp[5] += dp[2] = 1	[1, 0, 1, 1, 1, 2, 0, 0]
	5	dp[5] += dp[0] = 1	[1, 0, 1, 1, 1, 3, 0, 0]
6	2	dp[6] += dp[4] = 1	[1, 0, 1, 1, 1, 3, 1, 0]
	3	dp[6] += dp[3] = 1	[1, 0, 1, 1, 1, 3, 2, 0]
	5	dp[6] += dp[1] = 0	[1, 0, 1, 1, 1, 3, 2, 0]
7	2	dp[7] += dp[5] = 3	[1, 0, 1, 1, 1, 3, 2, 3]
	3	dp[7] += dp[4] = 1	[1, 0, 1, 1, 1, 3, 2, 4]
	5	dp[7] += dp[2] = 1	[1, 0, 1, 1, 1, 3, 2, 5]

### Final dp Array

	<p>After processing all amounts:</p> <p><code>dp = [1, 0, 1, 1, 1, 3, 2, 5]</code></p> <p><b>Final Output</b></p> <p>5</p> <p>This means <b>there are 5 different permutations to form amount 7 using {2, 3, 5}</b>:</p> <ol style="list-style-type: none"><li>1. <b>2 + 2 + 3</b></li><li>2. <b>2 + 3 + 2</b></li><li>3. <b>3 + 2 + 2</b></li><li>4. <b>2 + 5</b></li><li>5. <b>5 + 2</b></li></ol>
<p>Output:-</p> <p>5</p>	