

Name - Yash Lakhtariya
Enrollment number - 21162101012
Branch - CBA Batch - 51
AAD Practical 9

Institute of Computer Technology
B. Tech Computer Science and Engineering

Sub: Algorithm Analysis and Design

Practical 9

Problem : You are working at the cash counter at a fun-fair, and you have three types of coins available to you in infinite quantities (coins are Rs. 1, Rs. 4 and Rs. 6). You are required to calculate the minimum numbers of coins required for changing the value of Rs. 9. Design the algorithm for the same and implement using the programming language of your choice.

Code :

```
import YSL_io

def coin_change(coins, target):
    dp = [[float('inf')] * (target + 1) for _ in range(len(coins))]
    combinations = [[[[] for _ in range(target + 1)] for _ in
range(len(coins))]

    for i in range(len(coins)):
        dp[i][0] = 0

    for i in range(len(coins)):
        for j in range(1, target + 1):
            if coins[i] > j:
```

Name - Yash Lakhtariya
Enrollment number - 21162101012
Branch - CBA Batch - 51
AAD Practical 9

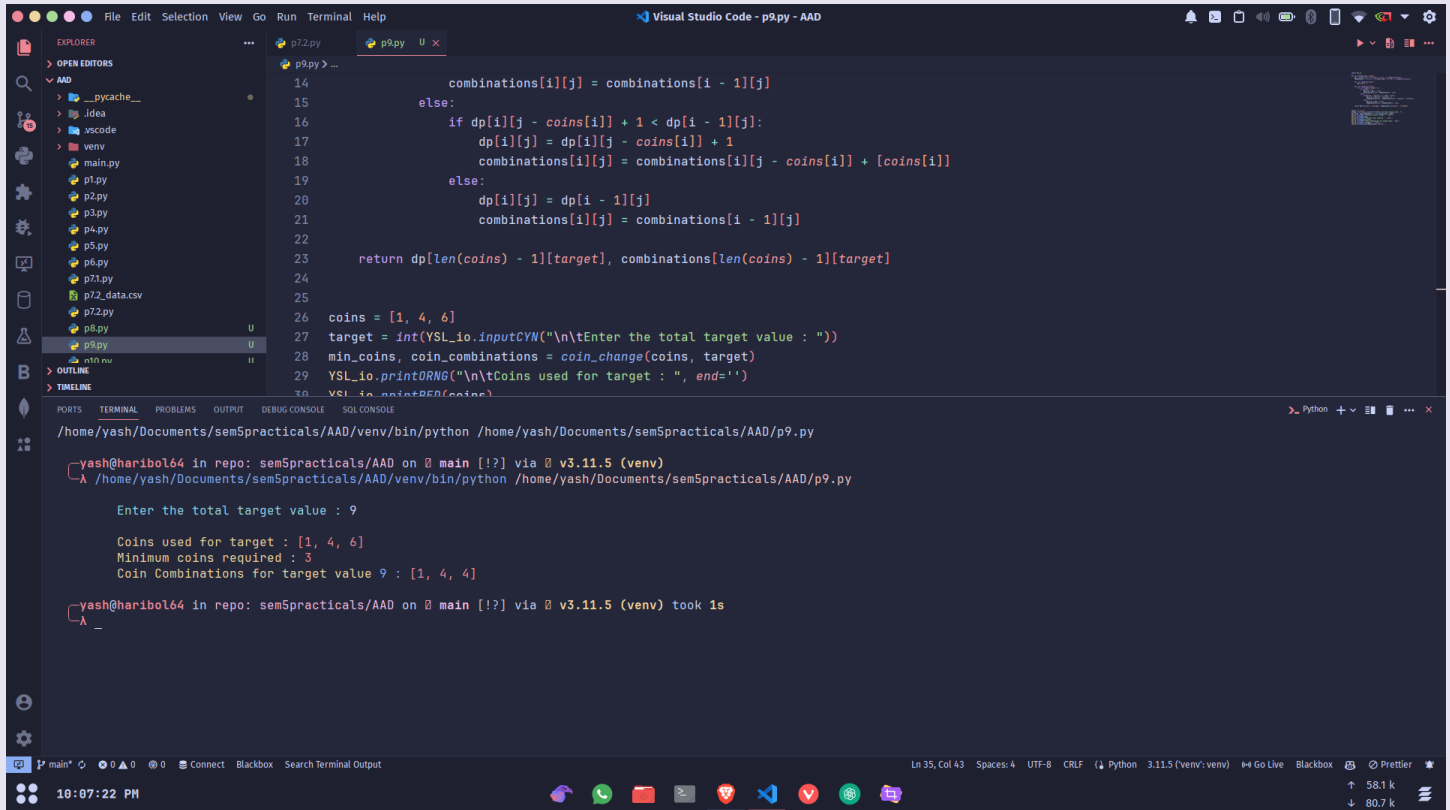
```
dp[i][j] = dp[i - 1][j]
combinations[i][j] = combinations[i - 1][j]
else:
if dp[i][j - coins[i]] + 1 < dp[i - 1][j]:
dp[i][j] = dp[i][j - coins[i]] + 1
combinations[i][j] = combinations[i][j - coins[i]] + [coins[i]]
else:
dp[i][j] = dp[i - 1][j]
combinations[i][j] = combinations[i - 1][j]

return dp[len(coins) - 1][target], combinations[len(coins) - 1][target]

coins = [1, 4, 6]
target = int(YSL_io.inputCYN("\n\tEnter the total target value : "))
min_coins, coin_combinations = coin_change(coins, target)
YSL_io.printORNG("\n\tCoins used for target : ", end='')
YSL_io.printRED(coins)
YSL_io.printORNG("\tMinimum coins required : ", end='')
YSL_io.printRED(min_coins)
YSL_io.printORNG("\tCoin Combinations for target value ", end='')
YSL_io.printBLU(f'{target} : ', end='')
YSL_io.printRED(coin_combinations, end='\n')
```

Name - Yash Lakhtariya
Enrollment number - 21162101012
Branch - CBA Batch - 51
AAD Practical 9

Screenshot:



The screenshot displays the Visual Studio Code editor with a Python file named `p9.py` open. The code implements a dynamic programming solution for the coin change problem. The `combinations` array is initialized with `-1` for all values. The `dp` array is also initialized with `-1`. The `coins` array is `[1, 4, 6]`. The `target` is `9`. The `min_coins` and `coin_combinations` are calculated using the `coin_change` function. The output shows the minimum coins required is 3 and the coin combinations for target value 9 are `[1, 4, 4]`.

```
14 combinations[i][j] = combinations[i - 1][j]
15 else:
16     if dp[i][j - coins[i]] + 1 < dp[i - 1][j]:
17         dp[i][j] = dp[i][j - coins[i]] + 1
18         combinations[i][j] = combinations[i][j - coins[i]] + [coins[i]]
19     else:
20         dp[i][j] = dp[i - 1][j]
21         combinations[i][j] = combinations[i - 1][j]
22
23 return dp[len(coins) - 1][target], combinations[len(coins) - 1][target]
24
25
26 coins = [1, 4, 6]
27 target = int(YSL_io.InputCYN("\n\tEnter the total target value : "))
28 min_coins, coin_combinations = coin_change(coins, target)
29 YSL_io.PrintORNG("\n\tCoins used for target : ", end='')
30 YSL_io.PrintPBN(coins)
```

Terminal Output:

```
/home/yash/Documents/sem5practicals/AAD/venv/bin/python /home/yash/Documents/sem5practicals/AAD/p9.py
yash@haribol64 in repo: sem5practicals/AAD on main [!?] via v3.11.5 (venv)
/home/yash/Documents/sem5practicals/AAD/venv/bin/python /home/yash/Documents/sem5practicals/AAD/p9.py

Enter the total target value : 9

Coins used for target : [1, 4, 6]
Minimum coins required : 3
Coin Combinations for target value 9 : [1, 4, 4]

yash@haribol64 in repo: sem5practicals/AAD on main [!?] via v3.11.5 (venv) took 1s
_
```