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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:
```

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```
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]
print('\nDP Matrix : \n')
for i in range(len(coins)):
    for j in range(target + 1):
        print(dp[i][j], end="\t")
    print()

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='')
```

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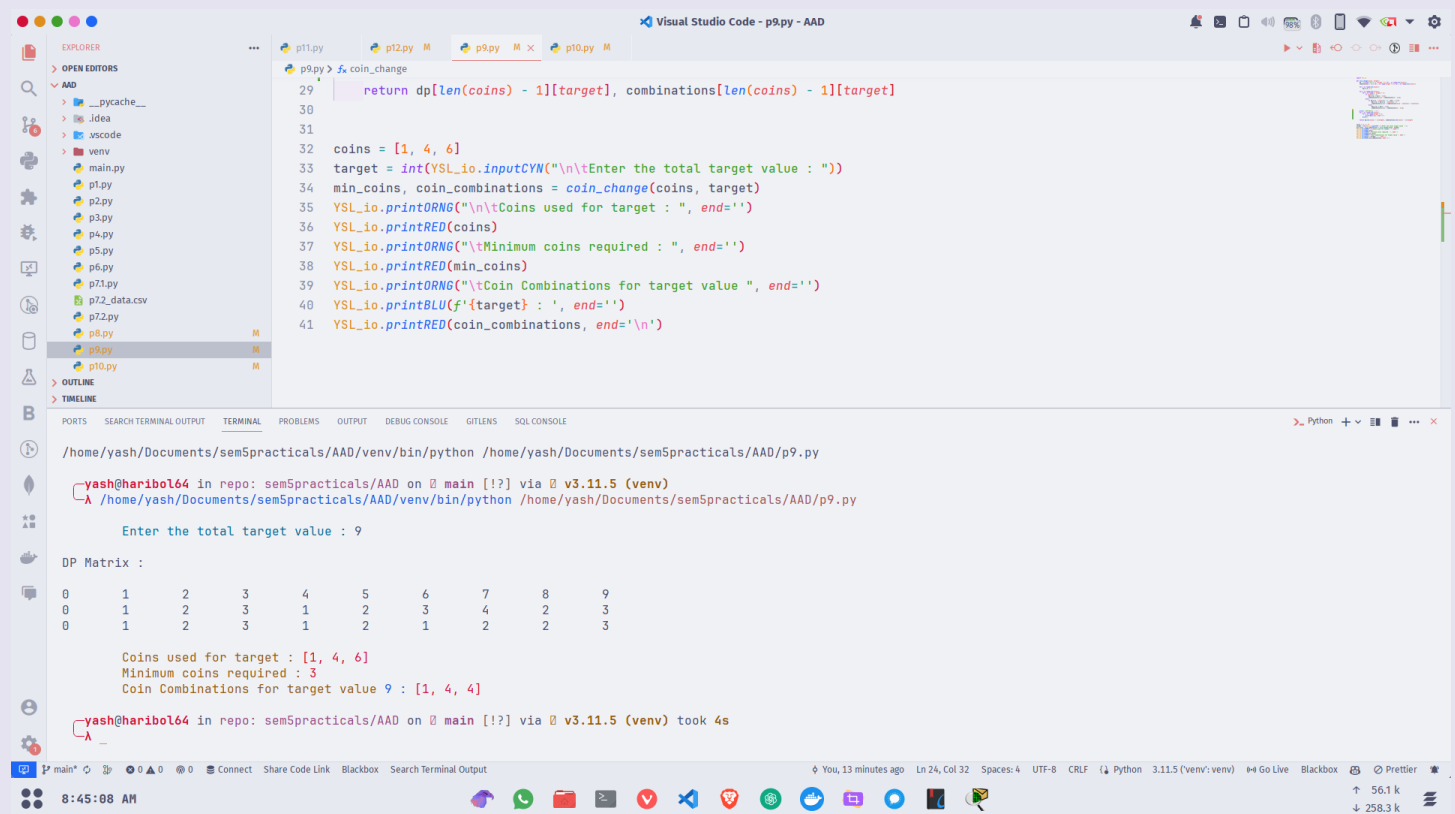
```
YSL_io.printRED(min_coins)

YSL_io.printORNG("\tCoin Combinations for target value ", end='')

YSL_io.printBLU(f'{target} : ', end='')

YSL_io.printRED(coin_combinations, end='\n')
```

Screenshot:



The screenshot shows the Visual Studio Code editor with a Python file named `p9.py` open. The script implements a dynamic programming solution for the coin change problem. The terminal output shows the execution of the script, which prompts the user to enter a target value (9). The output displays the DP Matrix, the coins used for the target, the minimum number of coins required (3), and the coin combinations for the target value (9).

```
29     return dp[len(coins) - 1][target], combinations[len(coins) - 1][target]
30
31
32     coins = [1, 4, 6]
33     target = int(YSL_io.inputCYN("\n\tEnter the total target value : "))
34     min_coins, coin_combinations = coin_change(coins, target)
35     YSL_io.printORNG("\n\tCoins used for target : ", end='')
36     YSL_io.printRED(coins)
37     YSL_io.printORNG("\t\tMinimum coins required : ", end='')
38     YSL_io.printRED(min_coins)
39     YSL_io.printORNG("\t\tCoin Combinations for target value ", end='')
40     YSL_io.printBLU(f'{target} : ', end='')
41     YSL_io.printRED(coin_combinations, end='\n')
```

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

DP Matrix :

0  1  2  3  4  5  6  7  8  9
0  1  2  3  1  2  3  4  2  3
0  1  2  3  1  2  1  2  2  3

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 4s
```