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ROLL NO.: 118

BATCH: B3

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## ASSIGNMENT 4

CODE:

```
#include <iostream>
```

```
#include <vector>
```

```
#include <chrono>
```

```
using namespace std;
```

```
using namespace std::chrono;
```

```
auto start = high_resolution_clock::now();
```

```
void fillTable(const vector<int>& coins,int amt,vector<vector<int>>& table)
```

```
{
```

```
    for(int i=0;i<coins.size();i++)
```

```
    {
```

```
        table[i].resize(amt);
```

```
        for(int j=1;j<=amt;j++)
```

```
        {
```

```
            if(i==0)
```

```
            {
```

```
                table[i][j-1]=j;
```

```
            }
```

```
            else
```

```
            {
```

```
int rem = j % coins[i];
```

```
int div = j / coins[i];
```

```
int remcoin = (rem == 0 )?0:table[i-1][rem-1];
```

```
table[i][j-1] = div + remcoin;
```

```
    }
```

```
  }
```

```
}
```

```
}
```

```
void printCombination(int amt, const std::vector<int>& coins)
```

```
{
```

```
    cout<<"\nCombination is : ";
```

```
    for(int i=coins.size()-1;i>=0;i--)
```

```
    {
```

```
        int ncoins = amt / coins[i];
```

```
        amt = amt % coins[i];
```

```
        cout<< "\n(" << ncoins << "*" << coins[i] <<")\t";
```

```
    }
```

```
}
```

```
void printTable(vector<vector<int>>& table, const vector<int>& coins)
```

```
{
```

```
    cout << "\t" ;
```

```
    for(int i=1;i<=table[0].size();i++)
```

```

    {
        cout<<i<<"\t";
    }
    cout<<endl;

    for(int i=0;i<table.size();i++)
    {
        cout << coins[i] << "\t" ;
        for(int j=0;j<table[i].size();j++)
        {
            cout<<table[i][j]<<"\t";
        }
        cout<<endl;
    }
}

int main()
{
    const vector<int> coins={1,2,5,10};
    vector<vector<int>> table;
    table.resize(coins.size());
    int amount=0;
    cout<<"Enter the amount: ";
    cin>>amount;

    fillTable(coins,amount,table);
    printTable(table,coins);

    cout << "\nMinimum coins required : " << table[coins.size()-1][amount-1];
}

```

```
printCombination(amount,coins);
```

```
auto stop = high_resolution_clock::now();
```

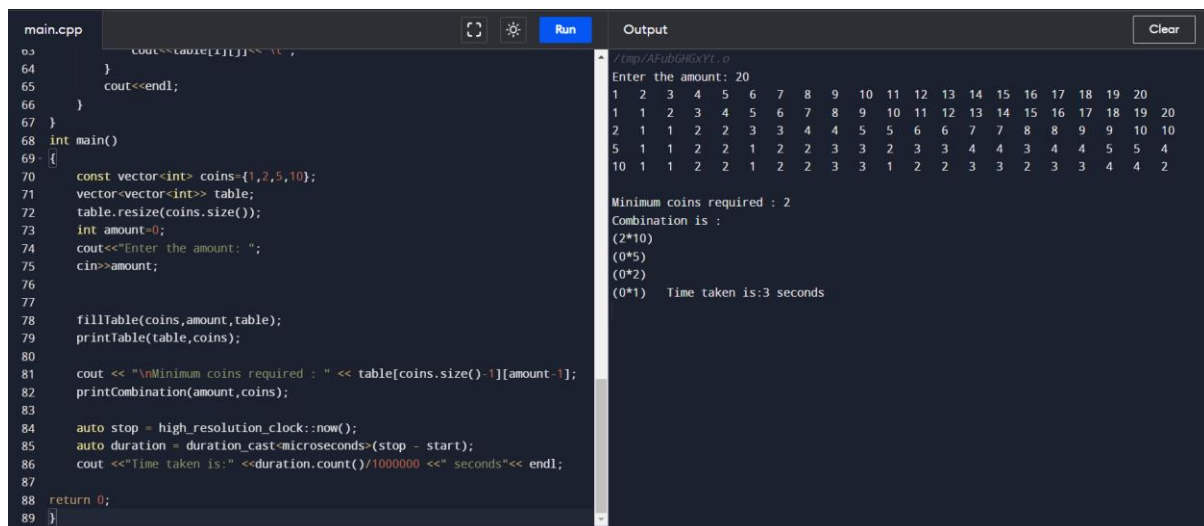
```
auto duration = duration_cast<microseconds>(stop - start);
```

```
cout <<"Time taken is:" <<duration.count()/1000000 <<" seconds"<< endl;
```

```
return 0;
```

```
}
```

OUTPUT:



The screenshot shows a C++ IDE with two panels. The left panel displays the source code in `main.cpp`, and the right panel shows the program's output.

**Source Code (main.cpp):**

```
63     cout<<table[i][j]<<" ";  
64 }  
65 cout<<endl;  
66 }  
67 }  
68 int main()  
69 {  
70     const vector<int> coins={1,2,5,10};  
71     vector<vector<int>> table;  
72     table.resize(coins.size());  
73     int amount=0;  
74     cout<<"Enter the amount: ";  
75     cin>>amount;  
76  
77  
78     fillTable(coins,amount,table);  
79     printTable(table,coins);  
80  
81     cout << "\nMinimum coins required : " << table[coins.size()-1][amount-1];  
82     printCombination(amount,coins);  
83  
84     auto stop = high_resolution_clock::now();  
85     auto duration = duration_cast<microseconds>(stop - start);  
86     cout <<"Time taken is:" <<duration.count()/1000000 <<" seconds"<< endl;  
87  
88     return 0;  
89 }
```

**Output:**

```
/tmp/AFuBGHGxYt.o  
Enter the amount: 20  
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20  
1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20  
2 1 1 2 2 3 3 4 4 5 5 6 6 7 7 8 8 9 9 10 10  
5 1 1 2 2 1 2 2 3 3 2 3 3 4 4 3 4 4 5 5 4  
10 1 1 2 2 1 2 2 3 3 1 2 2 3 3 2 3 3 4 4 2  
  
Minimum coins required : 2  
Combination is :  
(2*10)  
(0*5)  
(0*2)  
(0*1) Time taken is:3 seconds
```