Find minimum number of coins

Problem Statement: Given a value V, if we want to make a change for V Rs, and we have an infinite supply of each of the denominations in Indian currency, i.e., we have an infinite supply of { 1, 2, 5, 10, 20, 50, 100, 500, 1000} valued coins/notes, what is the minimum number of coins and/or notes needed to make the change.

Examples:

Example 1:

Input: V = 70

Output: 2

Explaination: We need a 50 Rs note and a 20 Rs note.

Example 2:

Input: V = 121

Output: 3

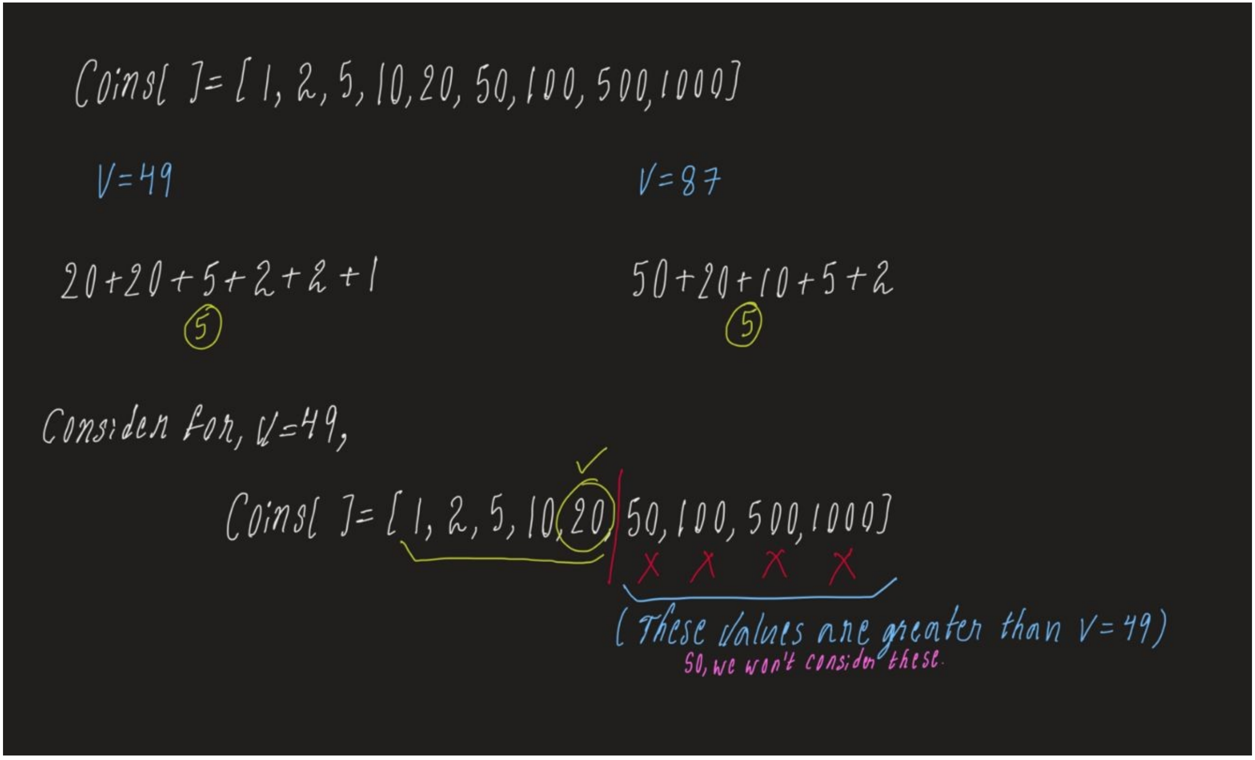
Explaination: We need a 100 Rs note, a 20 Rs note and a 1 Rs coin.

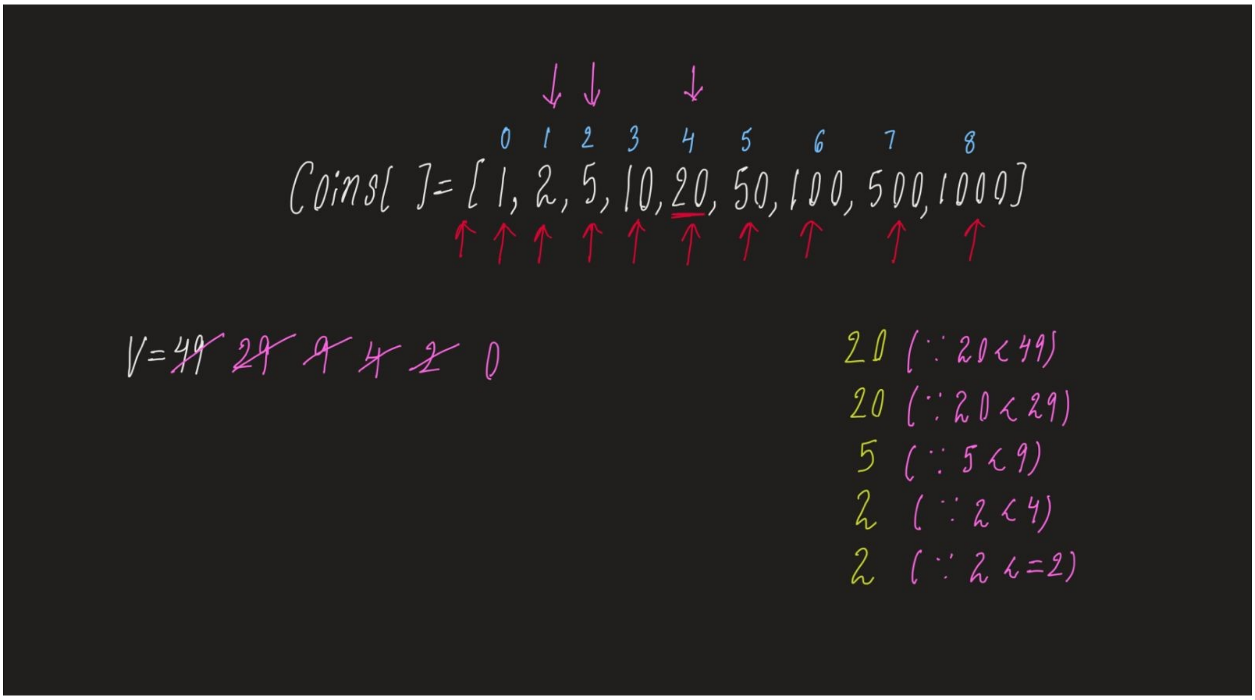
Solution:

***Disclaimer**: Don't jump directly to the solution, try it out yourself first.*

Solution: Greedy Algorithm

Approach: We will keep a pointer at the end of the array i. Now **while(V >= coins[i])** we will reduce V by coins[i] and add it to the ans array.
We will also ignore the coins which are greater than V and the coins which are less than V. We consider them and reduce the value of V by coins[I].


Coins[ ]= [1, 2, 5, 10, 20, 50, 100, 500, 1000]
V=49
V=87
20+20+5+2+2+1
5
50+20+10+5+2
5
Consider for, V=49,
Coins[ ]= [1, 2, 5, 10, 20, 50, 100, 500, 1000]
✓
X X X X
(These values are greater than V=49)
So, we won't consider these.


0 1 2 3 4 5 6 7 8
Coins[ ]= [1, 2, 5, 10, 20, 50, 100, 500, 1000]
V= ~~49~~ ~~29~~ ~~9~~ ~~4~~ ~~2~~ 0
20 (∵ 20<49)
20 (∵ 20<29)
5 (∵ 5<9)
2 (∵ 2<4)
2 (∵ 2<=2)

Code:

- C++ Code
- Java Code
- Python Code

```
#include<bits/stdc++.h>


using namespace std;
int main() {
  int V = 49;
  vector < int > ans;
  int coins[] = {1, 2, 5, 10, 20, 50, 100, 500, 1000};
  int n = 9;
  for (int i = n - 1; i >= 0; i--) {
    while (V >= coins[i]) {
      V -= coins[i];
      ans.push_back(coins[i]);
    }
  }
  cout<<"The minimum number of coins is "<<ans.size()<<endl;
  cout<<"The coins are "<<endl;
  for (int i = 0; i < ans.size(); i++) {
    cout << ans[i] << " ";
  }

  return 0;
}
```

Output:

```
The minimum number of coins is 5

The coins are

20 20 5 2 2
```

Time Complexity:O(V)

Space Complexity:O(1)