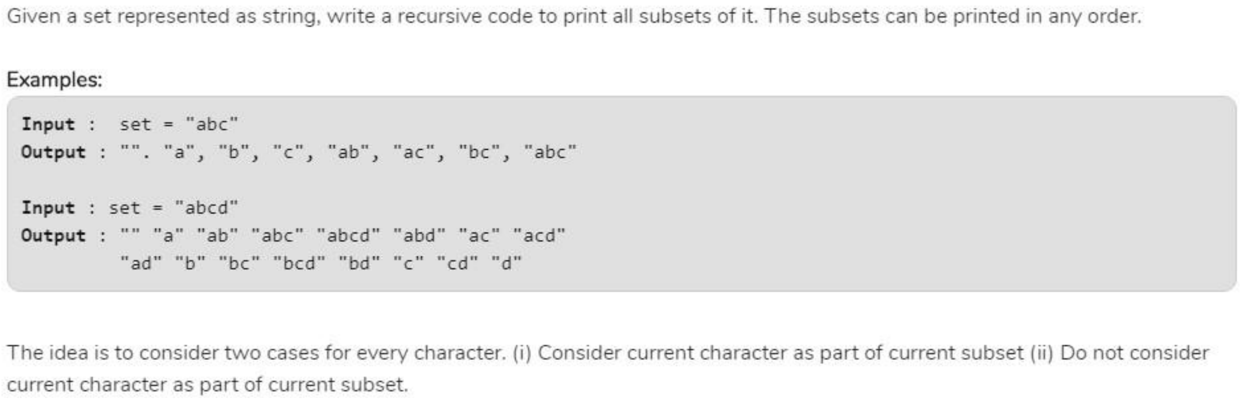
Recursion

Explanation of subset generation problem

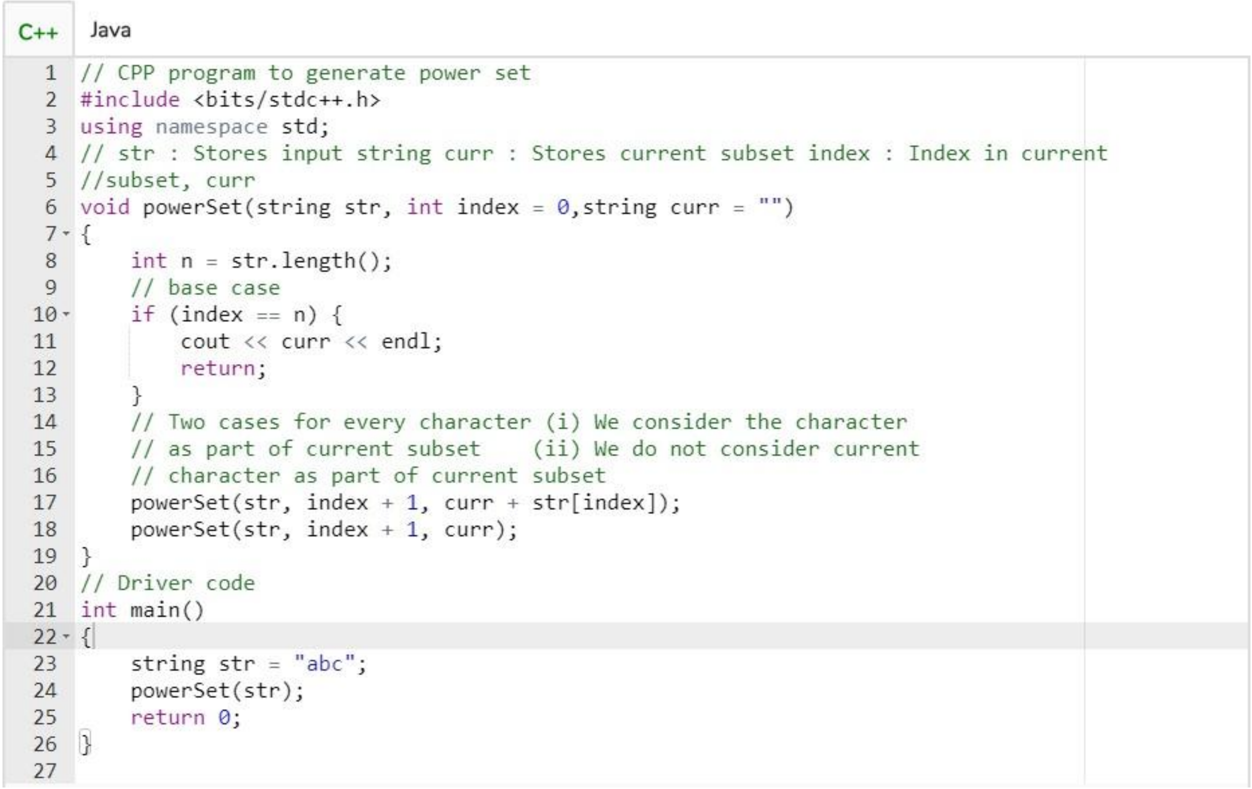


Given a set represented as string, write a recursive code to print all subsets of it. The subsets can be printed in any order.

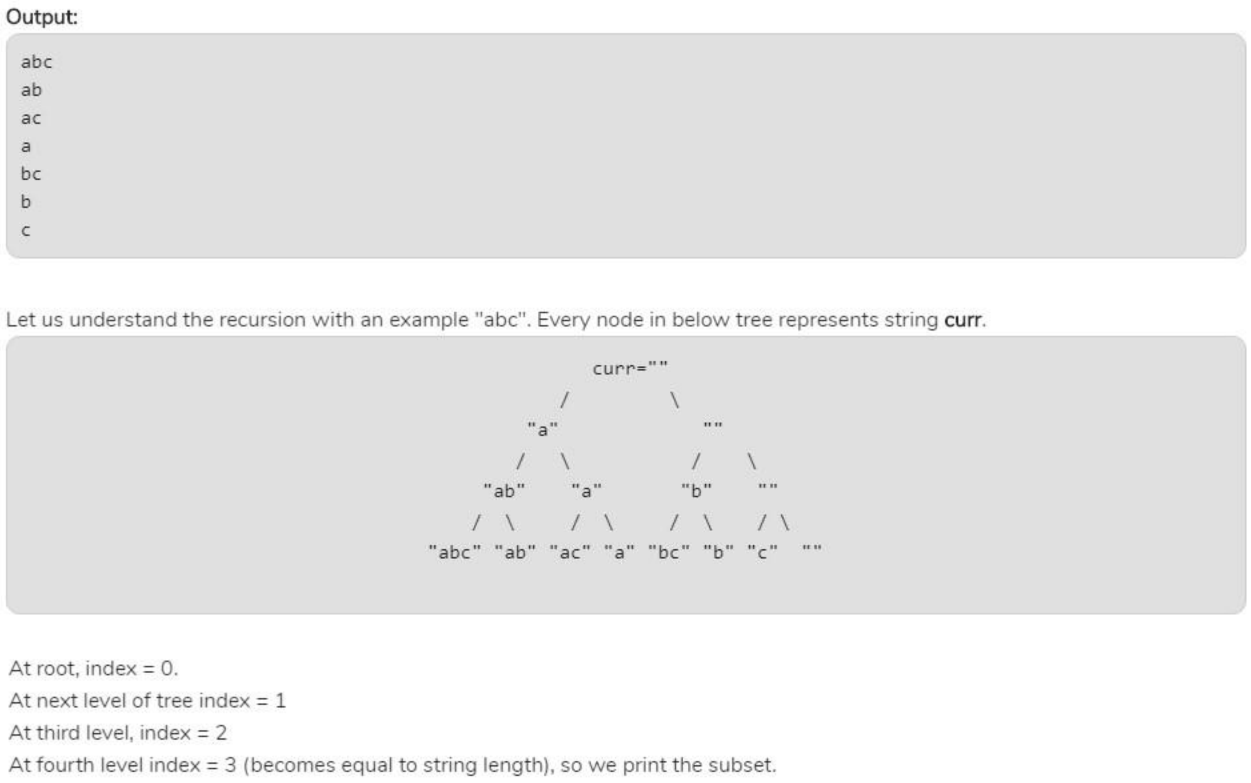
Examples:

```
Input :  set = "abc"
Output : "". "a", "b", "c", "ab", "ac", "bc", "abc"

Input : set = "abcd"
Output : "" "a" "ab" "abc" "abcd" "abd" "ac" "acd"
         "ad" "b" "bc" "bcd" "bd" "c" "cd" "d"
```

The idea is to consider two cases for every character. (i) Consider current character as part of current subset (ii) Do not consider current character as part of current subset.



```cpp
// CPP program to generate power set
#include <bits/stdc++.h>
using namespace std;
// str : Stores input string curr : Stores current subset index : Index in current
//subset, curr
void powerSet(string str, int index = 0,string curr = "")
{
    int n = str.length();
    // base case
    if (index == n) {
        cout << curr << endl;
        return;
    }
    // Two cases for every character (i) We consider the character
    // as part of current subset    (ii) We do not consider current
    // character as part of current subset
    powerSet(str, index + 1, curr + str[index]);
    powerSet(str, index + 1, curr);
}
// Driver code
int main()
{
    string str = "abc";
    powerSet(str);
    return 0;
}

```



Output:

```
abc
ab
ac
a
bc
b
c
```

Let us understand the recursion with an example "abc". Every node in below tree represents string **curr**.

```
                    curr=""
                 /          \
              "a"              ""
            /   \            /    \
         "ab"     "a"       "b"     ""
        /  \      /  \     /  \    / \
    "abc" "ab" "ac" "a" "bc" "b" "c"  ""
```

At root, index = 0.

At next level of tree index = 1

At third level, index = 2

At fourth level index = 3 (becomes equal to string length), so we print the subset.