In this article, we are going to discuss a new problem based on string manipulation. Different types of coding problems are based on string, so here we are with one of the important questions of the day.

In this question we have to check whether the frequency of characters in a string makes a Fibonacci series or not. To solve this problem statement we have to first understand the Fibonacci series. Fibonacci series is a series of numbers in which each number is equal to the sum of its two previous numbers in the series. 1, 1, 2, 3, 5, 8, 13, 21..... etc. Here, we see that 2 is 1 + 1, 8 is 5 + 3 and so on.

Let's move to solve this question and try to solve it. We have to count the frequency of each character and then check whether the frequency follows the fibonacci series or not.

Now, understand the problem with a few examples.

**Example 1:**

Suppose the given string is "ssdgeee". Let’s first count the frequency of each character. In this case the frequency of s is 2, d is 1, g is 1,and e is 3. Here, the frequencies are 2, 1, 1, and 3 which makes the fibonacci series 1, 1, 2, 3. So it will return YES.

**Example 2:**

Here is another example to demonstrate this problem statement. Let “addcccbb” be the input string.Then the frequency of a is 1, d is 2, c is 3,and b is 2. Here, the frequencies are 1, 2, 3 and 2 which makes the series 1, 2, 2, 3 which is not a fibonacci series. So, in this case the output is NO.

Let’s learn how to solve the problem statement.

**Approach 1:Using map**

Let’s first solve this question using map. We are going to see first the algorithm followed by its explanation and then the program code of this approach.

**Algorithm**

**Step 1:** Create an empty map which stores the frequency of each character of the string.

**Step 2:** Using a loop, go through the given string and count the frequency of each character of the string.

**Step 3:** Create an array to stores the frequency value which we got in last step.

**Step 4:** Next, sort the array which contains the frequency values.

**Step 5:** Now, create a boolean variable to check if the sorted array is a fibonacci series or not.

**Step 6:** Print YES if the boolean value is true, otherwise print NO.

This is the algorithm to solve this problem statement let’s understand this.

**Explanation**

In this approach, we are using an empty map. First, we count the frequency of each character from the input string. Then, we sort the values of frequency which helps us to determine whether the string makes a Fibonacci sequence or not.

**Program**

|  |
| --- |
| #include <iostream>  #include <string>  #include <map>  using namespace std;  int main() {      string s = "aabc";      map<char, int> freq;      for (char c : s) {          freq[c]++;      }      int f[freq.size()];      int i = 0;      for (auto p : freq) {          f[i] = p.second;          i++;      }      int n = freq.size();      bool isFibonacci = true;      sort(f, f + freq.size());      if(f[0] != 1 || f[1] != 1)          isFibonacci = false;      else{          for (int j = 2; j < n; j++) {              if (f[j] != f[j-1] + f[j-2]) {                  isFibonacci = false;                  break;              }          }      }        if (isFibonacci) {          cout << "YES" << endl;      } else {          cout << "NO" << endl;      }        return 0;  } |

**Output**

|  |
| --- |
| YES |

We learn to solve the given problem statement using Map, now let's try to solve it using integer vectors.

**Approach 2: Using vector**

In this approach we are using vector of integer type to solve the given statement. We will see first algorithm, followed by explanation and c++ program.

**Algorithm**

**Step 1:** Create an integer vector of  size 128(for all ASCII values) which stores the frequency of each character of the string and initialize with 0.

**Step 2:** Use a loop, to go through the string and increase the frequency of characters which are present in the string.

**Step 3:** Delete all the elements which have value 0.

**Step 4:** Now, sort the vector which helps to get the series in order.

**Step 5:** Check whether the series is a Fibonacci series or not.

**Step 6:** Print “YES” or “NO” according to the problem statement as output.

**Explanation**

In this approach, we are using an integer vector to store the frequency of the characters of the input string. After getting the frequency we sort the vector and then check whether it is a fibonacci series or not.

**Program**

|  |
| --- |
| #include <iostream>  #include <string>  #include <vector>  #include <algorithm>  using namespace std;  int main() {      string s ="sdgg";      vector<int> freq(128, 0);        for (char c : s) {          freq[c]++;      }        freq.erase(remove(freq.begin(), freq.end(), 0), freq.end());      sort(freq.begin(), freq.end());      bool isFibonacci = true;      int n = freq.size();      if(freq[0] != 1 || freq[1] != 1)          isFibonacci = false;      else{          for (int j = 2; j < n; j++) {              if (freq[j] != freq[j-1] + freq[j-2]) {                  isFibonacci = false;                  break;              }          }      }        if (isFibonacci) {          cout << "YES" << endl;      } else {          cout << "NO" << endl;      }        return 0;  } |

**Output**

|  |
| --- |
| YES |

We are successfully learned to solve the problem statement mentioned in this article.

**Conclusion**

In this article we get to know about the problem to check whether the frequency of characters in a string makes a Fibonacci Sequence or not. We learn about the Fibonacci sequence. We understand the problem statement and solve it. We also learn to code the problem statement in c++ language.