

23. You are given a string s. s[i] is either a lowercase English letter or '?'. For a string t having length m containing only lowercase English letters, we define the function cost(i) for an index i as the number of characters equal to t[i] that appeared before it, i.e. in the range [0, i - 1]. The value of t is the sum of cost(i) for all indices i. For example, for the string t = "aab":

cost(0) = 0

cost(1) = 1

cost(2) = 0

Hence, the value of "aab" is 0 + 1 + 0 = 1. Your task is to replace all occurrences of '?' in s with any lowercase English letter so at the value of s is minimized.

Aim: the aim of the program is string s. s[i] is either a lowercase English letter or '?'. For a string t having length m containing only lowercase English letters, we define the function cost(i) for an index i as the number of characters equal to t[i] that appeared before it, i.e. in the range [0, i - 1]. The value of t is the sum of cost(i) for all indices i. For example, for the string t = "aab":

Program:

```
def min_value_string(s):  
    def cost(i, t):  
        return sum(1 for j in range(i) if t[j] == t[i])  
    def value(t):  
        return sum(cost(i, t) for i in range(len(t)))  
    letters = 'abcdefghijklmnopqrstuvwxyz'  
    min_value = float('inf')  
    result = ""  
    for c in letters:  
        t = s.replace('?', c)  
        curr_value = value(t)  
        if curr_value < min_value:  
            min_value = curr_value  
            result = t  
    return result  
s = "a?b?c?"  
result = min_value_string(s)  
print(result)
```

output:

```
adbdcd
```

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=== Code Execution Successful ===
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time complexity: $O(n)$