

## Hashing

$\Theta = 10^5$

1	2	1	3	2
---	---	---	---	---

number = 1

```
int f(number, arr)
{
```

    cnt = 0

```
    for (i = 0; i < n; i++)
```

```
        if (arr[i] == number)
```

```
            cnt = cnt + 1;
```

```
}
```

$\Theta$

1	→	2
3	→	1
4	→	0
2	→	2
10	→	0
...		
12	→	0

$(5 \times O(N))$

$O(\Theta \times N)$

cnt = cnt + 1;

$O(9 \times 10^4)$

$O(10^5)$

}

return cnt;

}

Hashing → pre storing / fetching

adman 12

1	2	1	3	2
---	---	---	---	---

n=13

ans 93

0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	2	3	4	5	6	7	8	9	10	11	12

pre calculation

0

1	→	2
3	→	1
4	→	0
2	→	2
0	→	0
...		
12	→	0

```

#include<bits/stdc++.h>
using namespace std;

int main() {
    int n;
    cin >> n;
    int arr[n];
    for(int i = 0; i < n; i++) {
        cin >> arr[i];
    }

    // precompute
    int hash[13] = {0};
    for(int i = 0; i < n; i++) {
        hash[arr[i]] += 1;
    }

    int q;
    cin >> q;
    while(q--) {
        int number;
        cin >> number;
        // fetch
        cout << hash[number] << endl;
    }
    return 0;
}

```

1	5
2	1 3 2 1 3
3	5
4	1
5	4
6	2
7	3
8	12

≡ output.txt ×

≡ output.txt

1	2
2	0
3	1
4	2
5	0
6	

```
#include<bits/stdc++.h>
using namespace std;

int main() {
    int n;
    cin >> n;
    int arr[n];
    for(int i = 0;i<n;i++) {
        cin >> arr[i];
    }

    // precompute
    int hash[13] = {0};
    for(int i = 0;i<n;i++) {
        hash[arr[i]] += 1;
    }

    int q;
    cin >> q;
    while(q--) {
        int number;
        cin >> number;
        // fetch
        cout << hash[number] << endl;
    }
    return 0;
}
```

```

3
4 int main() {
5     string s;
6     cin >> s;
7
8     //pre compute
9     int hash[26] = {0};
10    for(int i = 0; i < s.size(); i++) {
11        hash[s[i] - 'a']++;
12    }
13    int q;
14    cin >> q;
15    while(q--) {
16        char c;
17        cin >> c;
18        // fetch
19        cout << hash[c - 'a'] << endl;
20    }
21    return 0;
22 }

```

```

1 abcdabehf
2 5
3 a
4 g
5 h
6 b
7 c

```

≡ output.txt ×

≡ output.txt

```

1 2
2 1
3 1
4 2
5 1
6

```

```
int main() {  
    string s;  
    cin >> s;  
  
    //pre compute  
    int hash[26] = {0};  
    for(int i = 0; i < s.size(); i++) {  
        hash[s[i] - 'a']++;  
    }  
    int q;  
    cin >> q;  
    while(q--) {  
        char c;  
        cin >> c;  
        // fetch  
        cout << hash[c - 'a'] << endl;  
    }  
    return 0;  
}
```