

Basic Hashing / Frequency Counting

- Question:
 - You will be given an array of integers from 0 to 9. You have to find the frequency of each number occurring in the array from 0 to 9.
 - For eg. Input array = [1,2,9,1,4,1,3,1,5,7,8,8]
 - Output:
 - 0 -> 0
 - 1 -> 4
 - 2 -> 1
 - 3 -> 1
 - 4 -> 1
 - 5 -> 1
 - 6 -> 0
 - 7 -> 1
 - 8 -> 2
 - 9 -> 1

Solutions

- One of the solution is to sort the array.
 - [1,2,9,1,4,1,3,1,5,7,8,8] <- unsorted array
 - [1,1,1,1,2,3,4,5,7,8,8,9] <- sorted array
- Hashing Solution
 - Create another array named count array of size 10 and initialise all values with zeros.
 - count_arr = [0,0,0,0,0,0,0,0,0,0]
 - 0th index value in count array indicates count of 0
 - 1st value in count array indicates count of 1
 - 2nd value in count array indicates count of 2
 - ...
 - 9th value in count array indicated count of 9

solution

1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---

0	0	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution



1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---

0	1	0	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution



1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---

0	1	1	0	0	0	0	0	0	0
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution



1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---

0	1	1	0	0	0	0	0	0	1
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution



1	2	9	1	4	1	3	1	5	7	8	8
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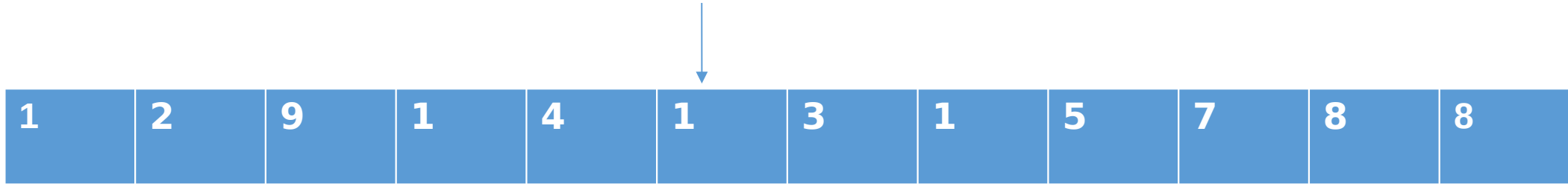
0	2	1	0	0	0	0	0	0	1
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution



solution

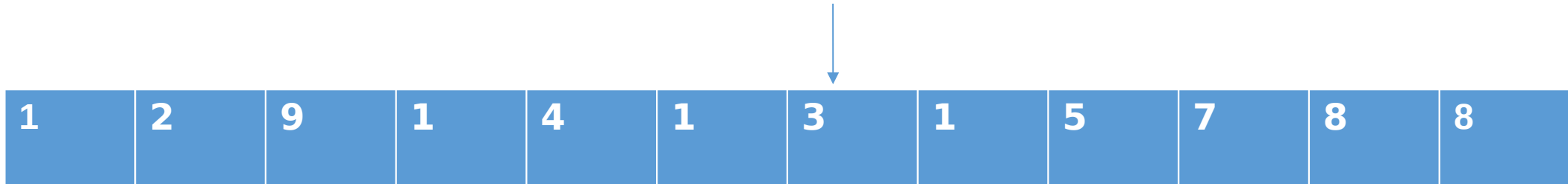


1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---

0	3	1	0	1	0	0	0	0	1
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution




1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---

0	3	1	1	1	0	0	0	0	1
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0	1	2	3	4	5	6	7	8	9
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solution



1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---

0	4	1	1	1	0	0	0	0	1
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution



1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---

0	4	1	1	1	1	0	0	0	1
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution

1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---



0	4	1	1	1	1	0	1	0	1
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution

1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---



0	4	1	1	1	1	0	1	1	1
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

solution

1	2	9	1	4	1	3	1	5	7	8	8
---	---	---	---	---	---	---	---	---	---	---	---



0	4	1	1	1	1	0	1	2	1
---	---	---	---	---	---	---	---	---	---

0	1	2	3	4	5	6	7	8	9
---	---	---	---	---	---	---	---	---	---

Code

```
1  #include<stdio.h>
2
3  int main()
4  ▼ {
5      int n;
6      scanf("%d",&n);
7      int arr[n];
8      for(int i=0;i<n;i++)
9      {
10         scanf("%d",&arr[i]);
11     }
12     int count[10];
13     memset(count,0,sizeof(count));
14     for(int i=0;i<n;i++)
15     {
16         count[arr[i]]++;
17     }
18     for(int i=0;i<10;i++)
19     {
20         printf("Count of %d is %d\n",i,count[i]);
21     }
22     return 0;
23 }
```


Question

Program to find the number of pairs in the array having sum x given array has distinct elements and $a[i] < 100000$?

For eg.

Input array = {80,20,0,4,1,40,60,100}

$x = 100$

Output = total 3 pairs (80,20), (40,60), (0,100)

Solutio

Note - usually memory constraints of online competitive programming questions allow array of size upto 10^7 and not more than that.

Question: Find total memory required for

```
1  #include<stdio.h>
2  int main()
3  {
4      int n, x, i;
5      //printf("Enter the value of x: ");
6      scanf("%d",&x);
7      //printf("Enter the number of elements in the array: ");
8      scanf("%d",&n);
9      //printf("Enter the elements of array\n");
10     int a[n];
11
12     for(i=0; i<n; i++){
13         scanf("%d",&a[i]);
14     }
15
16     int hash[100000] = {0};
17     for(i=0; i<n; i++){
18         hash[a[i]]++;
19     }
20     int ans = 0;
21     for(int i=0; i<n; i++){
22         int t = x - a[i];
23         if((t>0) && hash[t]){
24             ans++;
25         }
26     }
27     ans >>= 1;
28     printf("Number of Pairs having sum %d are %d", x, ans);
29     return 0;
30 }
```