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

0	2	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

0	2	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	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

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	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

```c
#include<stdio.h>

int main()
{
    int n;
    scanf("%d",&n);
    int arr[n];
    for(int i=0;i<n;i++)
    {
        scanf("%d",&arr[i]);
    }
    int count[10];
    memset(count,0,sizeof(count));
    for(int i=0;i<n;i++)
    {
        count[arr[i]]++;
    }
    for(int i=0;i<10;i++)
    {
        printf("Count of %d is %d\n",i,count[i]);
    }
    return 0;
}
```

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

```c
#include<stdio.h>
int main()
{
    int n, x, i;
    //printf("Enter the value of x: ");
    scanf("%d",&x);
    //printf("Enter the number of elements in the array: ");
    scanf("%d",&n);
    //printf("Enter the elements of array\n");
    int a[n];

    for(i=0; i<n; i++){
        scanf("%d",&a[i]);
    }

    int hash[100000] = {0};
    for(i=0; i<n; i++){
        hash[a[i]]++;
    }
    int ans = 0;
    for(int i=0; i<n; i++){
        int t = x - a[i];
        if((t>0) && hash[t]){
        ans++;
        }
    }
    ans >>= 1;
    printf("Number of Pairs having sum %d are %d", x, ans);
    return 0;
}
```