# **Count pairs in array whose sum is divisible by K**

* Given an array **A[]** and positive integer **K**, the task is to count total number of pairs in the array whose sum is divisible by **K**.
* Note : This question is generalised version of [this](https://www.geeksforgeeks.org/count-pairs-array-whose-sum-divisible-4/)
* **Examples:**
* **Input :** A[] = {2, 2, 1, 7, 5, 3}, K = 4
* **Output :** 5
* **Explaination :**
* There are five pairs possible whose sum
* is divisible by '4' i.e., (2, 2),
* (1, 7), (7, 5), (1, 3) and (5, 3)
* **Input :** A[] = {5, 9, 36, 74, 52, 31, 42}, K = 3
* **Output :** 7
* **Naive Approach**: The simplest approach is to iterate through every pair of the array but using two nested for loops and count those pairs whose sum is divisible by ‘K’. Time complexity of this approach is O(N2).
* **Efficient Approach**: An efficient approach is to use Hashing technique. We will separate elements into buckets depending on their (value mod K). When a number is divided by K then the remainder may be 0, 1, 2, upto (k-1). So take an array say **freq[]** of size K (initialized with Zero) and increase the value of freq[A[i]%K] so that we can calculate the number of values giving remainder j on division with K.

**// Java program to count pairs**

**// whose sum divisible by 'K'**

import java.util.\*;

class Count {

public static int countKdivPairs(int A[], int n, int K)

{

// Create a frequency array to count

// occurrences of all remainders when

// divided by K

int freq[] = new int[K];

// Count occurrences of all remainders

for (int i = 0; i < n; i++)

++freq[A[i] % K];

// If both pairs are divisible by 'K'

int sum = freq[0] \* (freq[0] - 1) / 2;

// count for all i and (k-i)

// freq pairs

for (int i = 1; i <= K / 2 && i != (K - i); i++)

sum += freq[i] \* freq[K - i];

// If K is even

if (K % 2 == 0)

sum += (freq[K / 2] \* (freq[K / 2] - 1) / 2);

return sum;

}

public static void main(String[] args)

{

int A[] = { 2, 2, 1, 7, 5, 3 };

int n = 6;

int K = 4;

System.out.print(countKdivPairs(A, n, K));

}

}