

Interviews

Data Structure





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3Sum Leetcode Solution

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Problem Statement

Given an array of n integers, are there elements a, b, c in nums such that a + b + c = 0? Find all unique triplets in the array which gives the sum of zero.

Notice: that the solution set must not contain duplicate triplets.

Example

#1

[-1,0,1,2,-1,4]

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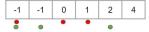
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Approach 1 (Brute Force + Binary Search)



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of c, which is -(a+b).

if we take all the possible (a,b) pairs, we can get all pairs of a,b using 2 nested for loops. after that, we can use binary search to know if c=-(a+b) exists in the given array or not.

if it exists then the triplet (a,b,-(a+b)) will be a possible triplet. in this way, we will get all the possible triplets with a+b+c=0, but we need to find the unique triplets,

for that we can insert all these possible triplets in some data structure(i.e. set) to get unique triplets.



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Data Structure

```
vector<vector<int>> threeSum(vector<int>& nums) {
     set<vector<int>> s;//to get unique triplets
     sort(nums.begin(),nums.end());
     int n=nums.size();
     vector<int> temp;
     temp.resize(3);
     for(int i=0;i< n;i++)
       for(int j=i+1;j< n;j++)
          if(binary search(nums.begin()+j+1,nums.end(),-nums[i]-nu
             temp[0]=nums[i],temp[1]=nums[i],temp[2]=-nums[i]-num
            sort(temp.begin(),temp.end());
            //to get triplet in an order, will be easy to check if
            //duplicate exists or not
            s.insert(temp);
     vector<vector<int>> ans;
     for(auto triplet: s)
       ans.push back(triplet);
     return ans:
void display ans(vector<vector<int>> temp)
```

```
HILLINGHIN, J
  vector<int> v{-1,0,1,2,-1,-4};
  display ans(threeSum(v));
```



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```
-1 -1 2
-1 0 1
```

Java Program

```
import java.util.*;
class Rextester{

static boolean binary_search(int I,int r,int[]nums, int x)
    {
        while(I<=r)
        {
            int mid=(I+r)/2;
            if(nums[mid]==x) return true;
            else if(nums[mid]>x) r=mid-1;
            else I=mid+1;
        }
        return false;
    }
}
```

```
for(int i=0;i<n;i++)
{
    for(int j=i+1;j<n;j++)
```



```
Home Tutorials Interviews Data Structure
```

```
t.add(nums[i]);
           t.add(nums[j]);
           t.add(-(nums[i]+nums[j]));
           ans.add(t);
        while(j+1<n && nums[j+1]==nums[j]) j++;
      while(i+1<n && nums[i+1]==nums[i]) i++;
   return ans;
public static void main(String args[])
   int[] nums={-1,0,1,2,-1,-4};
   for(List<Integer> list: threeSum(nums))
      for(int x: list)
      System.out.print(x+ " ");
      System.out.println();
```



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Time Complexity

O(N*N*log(N)): we are using two nested for loops to get all the possible (a,b) pair and a Binary search to know if -(a+b) exists in the array or not.

Space Complexity

O(N): we are using a set to get unique triplets.

Approach 2 (Two Pointer)

A better approach to do the same task is two pointers, the basic idea is we select a and then use two pointers to find b and c such that a+b+c=0.

we need to move the two pointers such that we get b+c= a.
using tricky implementation we can avoid the use of set(which was
used to get unique
triplets in approach 1)

Implementation for 3Sum Leetcode Solution

C++ Program



vector<vector<int>> threeSum(vector<int>& nums) {
 vector<vector<int>> ans;
 sort(nums.begin(),nums.end());



```
int j=i+1,k=n-1;//two pointers
  while(j<n && j<k)
     if(nums[i]+nums[k] == -nums[i])
       ans.push back({nums[i],nums[j],nums[k]});
       while(k!=0 && nums[k]==nums[k-1]) k--;//to avoid duplic
       while(j!=n-1 && nums[j]==nums[j+1]) j++;
       j++,k--;
     else if(nums[i]+nums[k] > -nums[i])
       while(k!=0 && nums[k]==nums[k-1]) k--;
       k--;
     else
       while(j!=n-1 && nums[j]==nums[j+1]) j++;
       j++;
  while(i!=n-1 && nums[i]==nums[i+1]) i++;
for(auto triplet: ans)
  sort(triplet.begin(),triplet.end());
return ans;
```

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```
cout<<triplet[0]<<" "<<triplet[1]<<" "<<triplet[2]<<"\n";
```



```
display_ans(threeSum(v));
return 0;
}
-1 -1 2
-1 0 1
```

Java Program

```
import java.util.*;
class Rextester{
  public static List<List<Integer>> threeSum(int[] nums) {
    List<List<Integer>> ans=new ArrayList<List<Integer>>();
    Arrays.sort(nums);
    int n=nums.length;
    for(int i=0;i<n;i++)</pre>
```

```
{ //System.out.println(p+" "+q);
List<Integer> t=new ArrayList<Integer>();
t.add(nums[i]);
```



```
while(p+1 < q \& nums[p+1] = = nums[p]) p++;
           while(q-1>p && nums[q-1]==nums[q]) q--;
           p++; q--;
        else if(nums[p]+nums[q] < -nums[i]) p++;
        else q--;
      while(i+1<n && nums[i+1]==nums[i]) i++;
   return ans;
public static void main(String args[])
   int[] nums={-1,0,1,2,-1,-4};
   for(List<Integer> list: threeSum(nums))
      for(int x: list)
      System.out.print(x+ " ");
      System.out.println();
```

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Time Complexity

 $O(N^2)$: we are using one for loops to get values of a, and for every value of a, we find the pair b,c (such that a+b+c=0) using two pointer approach that takes O(N) time. so total time complexity is of the order of $O(N^2)$.

See also

Longest subsequence such that difference between adjacents is one

Space Complexity

O(N): we are using a vector to store the answer.

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