CSE 214
Homework #4
Hash Table

Homework guideline:
Use Java hashmap or hashtable class. Follow the documentations below,
Hashmap: https://docs.oracle.com/javase/8/docs/api/java/util/HashMap.html
Hashtable: https://docs.oracle.com/javase/8/docs/api/java/util/Hashtable.html

Submission guideline:
Submit the homework through blackboard. Before submission make sure your codes do not have any error, unexecutable code and/or late submission will not receive any credit. Submit your Java code (.java files only) as a single .zip archive. Include a README text file to give the TA's instructions on how to run your code. The .zip file name should be in the
following format: < firstname >_< lastname >_< id > _hw< num >.zip
For example, if John Doe with student ID 123456789 is submitting the third homework, the submitted file should be named john_doe_123456789_hw3.zip

Number Distribution:

(1) 20
(2) 30

Total Marks: 50
Homework posted on: November 12, 2017
Submission Date: November 20, 2017 (11:59 PM)

(1) Given an array of integers, find two numbers such that they add up to a specific target number. The function twoSum should return indices of the two numbers such that they add up to the target, where index1 must be less than index2. You may assume that each input would have exactly one solution.

Input: Take two integers as input. N and T, where N is the number of elements in the array and T is the target number. Next, take N integers as input and store them in the array.

Output: The output should contain the two indices, index1 and index2 in the following format:
[index1, index2]
If there is no pair that sum to T, output [-1, -1]

Expected Time Complexity: O(n)

Sample Input

```
4 9
2 7 11 15
```

Sample Output

```
[0, 1]
```

(2) Harry was digging a hole to find hidden treasure in his grandmother's backyard. There he discovered an old piece of paper with N integers written on it. From the game of numbers, Harry has learnt that a trio of numbers is *special* if and only if their sum is divisible by a mythical constant M.

Harry tries to find out how many **distinct** triplets of numbers, from the piece of paper, have their sum divisible by M. Unfortunately, this problem is hard for him to crack and he needs your help.

Input
Take two integers as input, N and M, representing the number of integers in the sequence and the mythical constant respectively. Next, take N integers as input (duplicate integers are allowed).

Output
The output should contain only one integer, the number of distinct triplets which have their sum divisible by M.

Sample Input
```
10 5
1 10 4 3 2 5 0 1 9 5
```

Sample Output
```
26
```

Expected Time Complexity: $O(n^2)$

Explanation

There are 26 special trios for the above sample input: (0, 1, 2); (0, 1, 8); (0, 2, 5); (0, 2, 6); (0, 2, 9); (0, 3, 7); (0, 5, 8); (0, 6, 8); (0, 8, 9); (1, 2, 7); (1, 3, 4); (1, 5, 6); (1, 5, 9); (1, 6, 9); (1, 7, 8); (2, 4, 8); (2, 5, 7); (2, 6, 7); (2, 7, 9); (3, 4, 5); (3, 4, 6); (3, 4, 9); (5, 6, 9); (5, 7, 8); (6, 7, 8); (7, 8, 9);

For the first trio (0, 1, 2): 1+10+4 = 15
15 is divisible by 5
For the second trio (0, 1, 8): 1+10+9 = 20
20 is divisible by 5
…

Note: Here we only show the **positions** (in input) of numbers in each trio.

Grading Rubrics:

(1) Each of your code will be tested for 10 test cases. For problem 1 each test case has 2 points and for problem 2 each test case has 3 points. You will lose points for failing test cases.
(2) Unexecutable code will receive 0.
(3) If the complexity of your code is more than what is expected you will lose 60% marks (the complexity of reading input from file or from console is not included).
(4) Not following the guideline for naming your zip file correctly will cost you 5 points.
(5) Try opening and extracting your zip files before submitting. If your zip file doesn't open after submission, you won't be graded.
(6) **No late submissions or email submissions** will be accepted for this assignment, so make sure to submit the assignment well before the deadline.
(7) We will check your code for plagiarism, if you are caught for copying code you will get 0 and a warning (for the first time). If you are caught for plagiarism twice you will be charged for academic dishonesty.