CSE 4304-Data Structures Lab. Winter 2022
Date: November 7, 2022.
Topic: Hashing

Instructions:
- Task naming format: fullID_L05_T01_1A.c/CPP
- **Solutions with less efficient approaches will be considered for partial marks.**

Task 1

Given two arrays of integers, your task is to find whether array-2 is a subset of array-1 or not. Both arrays are unsorted and consist of distinct elements.

There will be two lines of input representing the arrays. Both lines end with -1 representing the end of that array.

Output:
- 'Yes': if array-2 is a subset of array-1
- 'No': if array-2 is not a subset of array-1

Sample Input	**Sample Output**
12 14 9 7 22 1 6 45 39 5 -1 7 5 6 -1	Yes
1 2 9 88 41 0 17 11 6 -1 100 52 2 8 -1	No

Constraint: $O(n^2)$ solution will not be accepted.

Note: Explore the 'unordered map' STL (https://www.geeksforgeeks.org/unordered_map-in-cpp-stl/)

Task 2

Given a collection of integers and a number 'target', find the pairs of integers whose summation is equal to 'target'. The elements of the collection may not be unique.

The first line provides the collection of integers, where -1 denotes the end of the input. The following line will contain the target value.

Output:
- Print the pairs whose summation equals 'target'.
- If none of the pairs adds up to 'target', print 'No pairs found'.

Sample Input	Sample Output
2 5 4 12 9 1 3 17 11 8 -1 13	(8,5), (12,1), (9,4), (11,2)
2 5 4 2 0 1 3 -1 4	(2,2), (3,1), (4,0)
2 5 4 2 0 2 7 -1 6	(4,2)
2 5 4 12 9 1 3 17 11 8 5 -1 13	(8,5), (12,1), (9,4), (11,2), (5,8)
4 -2 2 7 9 1 3 1 0 -1 7	(4,3), (7,0), (9,-2)
2 5 4 12 9 1 3 17 11 8 10 -1 100	No pairs found

Note: The elements/pairs can appear in any order.

Task-3

Implement the 'Rabin-Karp String Matching Algorithm' using the concept of the rolling-hash function. Test your program for different test cases. Make sure you understand how this algorithm is improving the traditional approach.

Task-4

Given two strings ***needle*** and ***haystack***, return the index of the first occurrence of ***needle*** in ***haystack***, or -1 if ***needle*** is not part of ***haystack***.

Sample Input	Sample Output
Haystack = ["sadbutsad"] Needle = ["sad"]	0 **Explanation:** "sad" occurs at index 0 and 6. The first occurrence is at index 0, so the output is 0.
Haystack = ["leetcode"] Needle = ["leeto"]	-1 **Explanation:** "leeto" did not occur in "leetcode", so the output is -1.

Note: Apply Rabin Karp Hashing Technique.

Task 5:

Given a sentence and a word, your task is to print the words that consist of the same unique character set.

The first line of input will contain the sentence, and the second line will contain the word. Print the word(s) that consist of the same unique character set (length doesn't matter)

Input	Output
You may know the answer but it is not yam or maaayaaay or yammy may	May, maayaaay, yammy, yam
student will act like students and it is studentish dont write studnet by mistake student	student students studnet
abcd abd acd bad baad baacd aabbccdd accc aadd abbe aaag aabbcd	abcd baacd aabbccdd

Note: Design a hash function where the hash value of two words having the same unique character set should be equal.