Lesson:

Problems based on Recursion - 6

Pre-Requisites

- Recursion basics
- Working rules of recursive functions

List of Concepts Involved

- Given an array of n integers and a target value x.Print whether x exists in the array or not.
- Given an array arr of size N and a target value x. The task is to find all the indices of the integer x in the array.

Problem 1 Given an array of n integers and a target value x. Print whether x exists in the array or not.

Input1 : n = 8 , x = 14 , array = [4 , 12 , 54 , 14 , 3 , 8 , 6 , 1]
Output1 : Yes

Input2 : n = 1 , x = 9 , array = [2]
Output2 : No

Coding link:
https://pastebin.com/mqH13nRa

Explanation:

- In the "Exist" function we have 4 parameters, the array, length of the array, a target value and the current index.
- The return type for this function is "boolean", it returns true if the target value exists in the array else after full search, if the target is not available we have to return false.
- We do not know currently whether we have the target value existing in the array or not. All we know is the current value.
- The base case or terminating condition is that if the current index 'idx' overshoots the length of the array that means we have no further element to check on for the target existence.
- If the base case is not hit, we can check for the current value if that matches the target value. If yes we can return true from then and there because we have found at least one occurrence of what we are looking for.
- If not, that means we need to look in the remaining array. Since the current index value is not of our use the remaining array is from idx+1 to n-1.
- So in the recursive call we passed the parameters, a , n , tgt , idx+1.

Problem 2 Given an array arr of size N and a target value tgt. The task is to find all the indices of the given target value in the array.

Input: arr = {1, 2, 9, 2, 2, 9}, tgt = 2
Output: 1 3 4

Element 2 is present at indices 1, 3, 4 (0 based indexing)

Input: arr[] = {8, 8, 8}, tgt = 8
Output: 0 1 2

Code Link
https://pastebin.com/jcnx8aAP

Explanation:

- We have created a "Allindex" function which will return all indices of the given target value in the array so its return type is array.
- In this function we have 3 parameters, the array, a target value and the current index.
- The return type for this function is "array of int type", it returns the array containing all indices of the given target value, if the target is not available in the given array it will return an empty array.
- We do not know currently whether we have the target value existing in the array or not. All we know is the current value.
- The base case or terminating condition is that if the current index 'idx' overshoots the length of the array that means we have no further element to check on for the target existence. So, If the start index reaches the length of the array, then return empty array.

- Else keep the first element of the array with yourself and pass the rest of the array to recursion.
    - If the element at the start index is not equal to target then just simply return the answer which came from recursion.
    - Else if the element at start index is equal to target then shift the elements of the array (which is the answer of recursion) one step to the right and then put the start index in the front of the array (which came through recursion).

Upcoming Class Teasers

- Problems based on recursion.