UNITED INTERNATIONAL UNIVERSITY
Department of Computer Science and Engineering (CSE)

Course Title: Data Structure & Algorithm Lab Lab II   **Course Code: CSE2218**

Trimester & Year: Fall 2021   **Section: D**   **Credit Hours: 1.0**   **AZ**

ASSIGNMENT 01: Divide and Conquer

Q1: Maximum Subarray Implementation

Given an integer array `nums`, find the contiguous subarray (containing at least one number) which has the largest sum and return *its **sum***.

A **subarray** is a **contiguous** part of an array.

Example 1:

```
Input: nums = [-2,1,-3,4,-1,2,1,-5,4]

Output: 6

Explanation: [4,-1,2,1] has the largest sum = 6.
```

Example 2:

```
Input: nums = [1]

Output: 1
```

Example 3:

```
Input: nums = [5,4,-1,7,8]

Output: 23
```

Constraints:

- $1 <= nums.length <= 10^5$
- $-10^4 <= nums[i] <= 10^4$

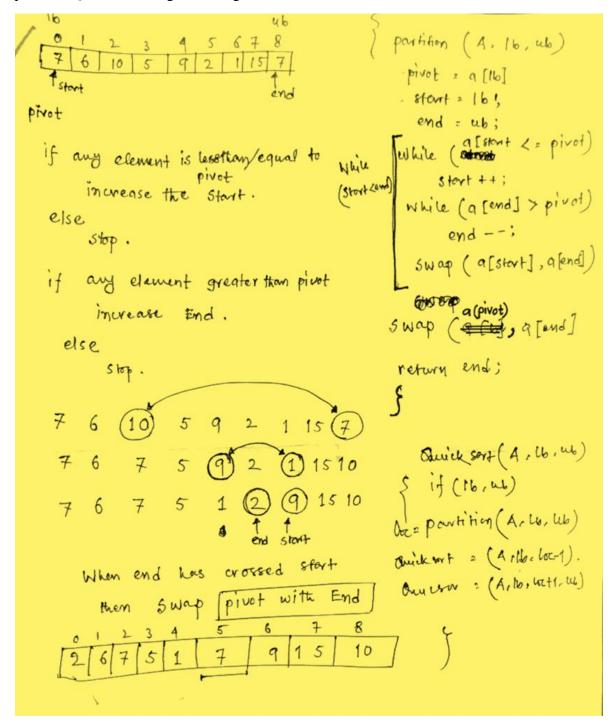**UNITED INTERNATIONAL UNIVERSITY**
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Q2: QuickSort

Implement QuickSort using following Pseudocode:

This is a handwritten explanation and pseudocode of mine. You can find similar in online to assist you in coding

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Q3: Kth Largest Element in an Array

Given an integer array `nums` and an integer `k`, return *the kth largest element in the array*.

Note that it is the kth largest element in the sorted order, not the kth distinct element.

Example 1:

```
Input: nums = [3,2,1,5,6,4], k = 2

Output: 5
```

Example 2:

```
Input: nums = [3,2,3,1,2,4,5,5,6], k = 4

Output: 4
```

Constraints:

- `1 <= k <= nums.length <= ` 10^4
- `-` 10^4 ` <= nums[i] <= ` 10^4

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Q4: Reverse Pairs

Given an integer array `nums`, return *the number of **reverse pairs** in the array.*

A reverse pair is a pair `(i, j)` where `0 <= i < j < nums.length` and `nums[i] > 2 * nums[j]`.

Example 1:

Input: nums = [1,3,2,3,1]

Output: 2

Example 2:

Input: nums = [2,4,3,5,1]

Output: 3

Constraints:

- `1 <= nums.length <= 5 * 10`^{4}
- $-2^{31} <=$ `nums[i]` $<= 2^{31} - 1$