DAA Tutorial - 1

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1) Write algorithms in iterative & recursive form Pseudocode
i) Insertion Sort

a) Iterative - Input : sortable array - Output : sorted array

```
i = 1
while i < length(array):
    x = array[i]
    j = i - 1
    while j >= 0 and array[j] > x:
        array[j+1] = array[j]
        j = j - 1
    array[j+1] = x
    i = i + 1
end
```

b> Recursive function: Input - array of size n
Output - sorted array

```
function InsertionSort(array A, int n):
    if n > 0 :
        InsertionSort(A, n-1)
        a = A[n]
        k = n-1
        while k>=0 and A[k] > a :
            A[k+1] = A[k]
            k = k-1

        A[k+1] = a
    end function
```

ii] Bubble Sort

a> Iterative: Input - array of size n
Output - sorted array

```
for i = 0 to n-1 :
    for j = 0 to n-1-i :
        if A[j] > A[j+1] :
            temp = A[j]
            A[j] = A[j+1]
            A[j+1] = temp
```

b> Recursive algorithm (function)
Input : array A of size n
Output : Sorted array

```
function BubbleSort (array A , int n) :

    if n == 1 :
        return

    for i = 0 to n-1 :
        if A[i] > A[i+1] :
            temp = A[i]
            A[i] = A[i+1]
            A[i+1] = temp

    n = n-1
    BubbleSort (A , n)
end function
```

iii] Selection Sort

a> Iterative Input - array of size n
Output - sorted array

```
for i = 1 to n :

    min = i
    for j = i+1 to n :
        if A[j] < A[min] :
            min = j

    temp = A[min]
    A[min] = A[i]
    A[i] = temp
end
```

b> Recursive function : Input - array of size n
Output - sorted array

We need two functions. One finds the index of minimum element and other gives the actual selection sort algo

```
function get_min (array A, int i, int j):
    if i == j :
        return i

    min = get_min (A , i+1 , j)

    if A[i] < A[min] :
        min = i

    return min
end function

function SelectionSort (array A, int len, int pos):

    if len == pos :
        return

    min = get_min (A , pos , len - 1)

    if not min == pos :
        temp = A[pos]
        A[pos] = A[min]
        A[min] = temp

    SelectionSort (A , len , pos+1)
end function
```