

Programming assignment 6.

Due date: Monday, November 12 2018 at 11:59pm

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NOTE: You are **NOT** allowed to define a new array in any part of the code.

Create the following functions: **build_MaxHeap**, **max_heapify**, **heap_sort**.

1. Request the user to enter a positive integer, and call it **n**.
2. Generate **n** random integers between **-10000 to 10000** and save them in array **a**.
3. Call **heap_sort** function to sort the array. In order to sort the array using heapsort, you need to follow the below steps:
 - 3.1 Build a max-heap (call the function **build_Maxheap**). In order to build the max-heap follow the below pseudocode:

```
% new_a is the output of the function, if you are using any other programming language, please write %  
return new_a at the end of your code.  
a = build_MaxHeap(a)  
  
    n = length(a);  
    for i=n:-1:1    % i= n, n-1, n-2,..., 1, Can we start from n/2 instead of n? Why???  
        a(1:i) = max_heapify(a,i); % a(1:i) = contains a[1] a[2] ...a[i] (You could have a flag for  
                                the i too! (Assume that i is the index of the last element of the array! 😊))  
  
    end
```

3.2 Keep removing the roots (first element in a) one by one until the tree/array becomes empty.

4. Determine the **average-running time** of **heap_sort** function for **n=1000**, and **100** repetitions.
5. Compare your answer with the average-running time of selection sort (you need implement it).