Programming assignment 5.

Due date: Friday, December 1 2017 at 03:30pm

Remember:

You can remove all the variables from the workspace by writing "clear"

Look up the description of all the functions in MATLAB by typing doc in the command window.

Create three functions named **build_MaxHeap(a)**, **max_heapify(a,i), heap_sort(a)**.

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(a)** 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_heap(a)). 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 downto 1, Can  we start from n/2 instead of n? Why????
        % you have the pseudocode for max_heapify in the heap binary pdf file on beachboard
        a = max_heapify(a,i);
    end
```

   3.2 Remove the root (remove the first element in a): In order to do that, follow the instructions in the heap binary pdf file on beachboard.

4. Determine the **average-running time** of **heap_sort** function for **n=10000**, and **100** repetitions.
5. Compare your answer with the average-running time of quicksort and selection sort (you need implement it).