Assignment 4

Problem statement :
Write function to do heap sort.

You will enter 12 numbers in random order.
Create an array to enter the numbers.
Make a Heap for the numbers
Then use heap sort to sort them

1. Print the numbers before you make a heap
2 Print the numbers after you make a heap
3. Print the numbers after the sort is complete

Solution :
In the current example, we consider the below array as input:

6	12	7	5	11	9	4	1	3	2	8	10

Algorithm for max_heapification :

```
Max_heapify (Array a, I, n)
Left⇐2i
Right⇐2i + 1
If (Left<n && a[Left]>a[i])
        Then largest = Left
        Else largest = Right
If(Right<n && a[Right]>a[largest])
        Then largest = Right
If (largest != i)
        Then a[largest]⟷a[i]
        Else Return
Max_heapify(Array a, largest,n)
```

Tracing through the above algorithm for various values of I for the input array :

When i=6

6	12	7	5	11	9	4	1	3	2	8	10

L (↓ over 10)
i (↑ under 9)

When i=5

6	12	7	5	11	10	4	1	3	2	8	9

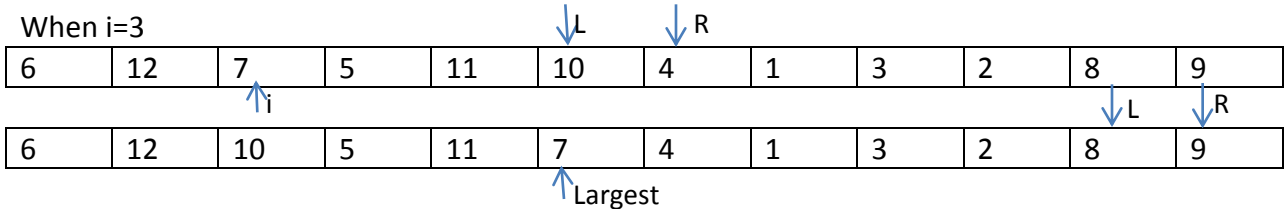
L (↓ over 2), R (↓ over 8)
i (↑ under 11)

When i=4

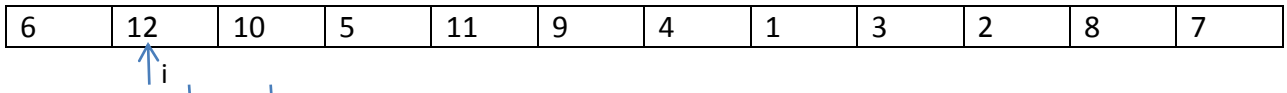
6	12	7	5	11	10	4	1	3	2	8	9

L (↓ over 1), R (↓ over 3)
i (↑ under 5)

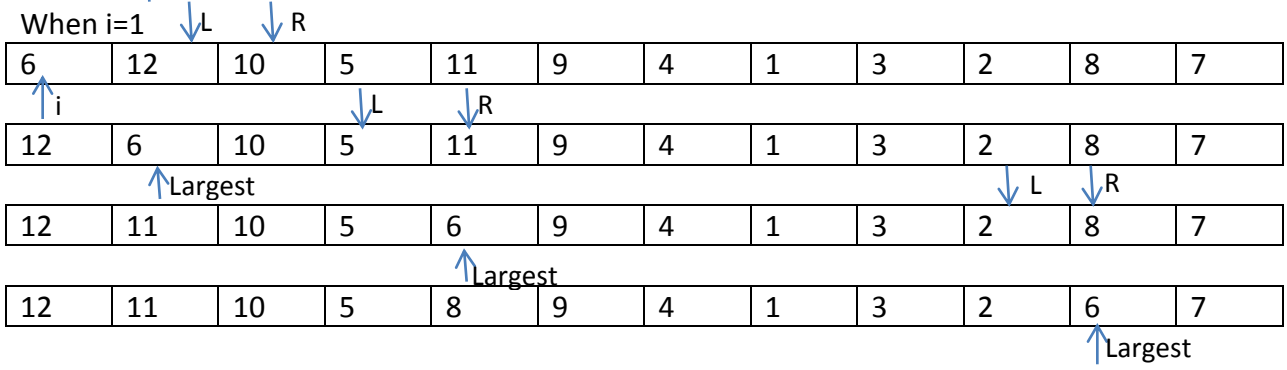
When i=3



When i=2



When i=1



<u>Algorithm for Heap sort :</u>

```
Heapsort(A)
{
        BuildHeap(A);
        for (i = length(A) downto 2)
        {
                Swap(A[1], A[i]);
                heap_size(A) -= 1;
                Heapify(A, 1);
        }
}
```

<u>Expected result after Heap sort:</u>

1	2	3	4	5	6	7	8	9	10	11	12