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1. Selection Sort

input: integer array not sorted

output: array sorted

```
function insertionSort (array as parameter){
    Initialize queue = new PriorityQueue();                                  => O(1)
    for(int i = 0; i< length of array; i++)                                  => O(n)
        add array[i] into queue                                              => O(n)

    for(int i=0; i<length of array; i++)                                     => O(n)
        remove each element of queue and add back to array.                  => O(n^2)
}
T(n) = O(1) + O(n) + O(n) + O(n) + O(n^2) = O(n^2);
```

2. Insertion Sort

input: integer array not sorted

output: array sorted

```
function selectionSort (array as parameter){
    Initialize queue  = new SortedPriorityQueue();                 => O(1)
    for(int i = 0; i< length of array; i++)                        => O(n)
        add array[i] into queue  in decreasing order               => O(n^2)

    for(int i=0; i<length of array; i++)                           => O(n)
        remove each element of queue and add back to array.        => O(n)
}
T(n) = O(1) + O(n) + O(n^2) + O(n) + O(n) = O(n^2);
```

3. Heap Sort

input: integer array not sorted

output: array sorted

```
function heapSort (array as parameter){
    Initialize heap = new MinHeap();                        => O(1)
    for(int i =0; i< length of array; i++)                  => O(n)
        add array[i] into heap                              => O(nlogn)

    for(int i=0; i<length of array; i++)                    => O(n)
        remove each element of heap and add back to array.  => O(nlogn)
}
```

T(n) = O(1) + O(n) + O(nlogn) + O(n) + O(nlogn) = O(nlogn);

4. Can you comment which one is faster?

Heap Sort is faster than Selection Sort and Insertion Sort

5. Do you think if we use array or LinkedList, we could speed the program up?

No, although adding 1 element is O(1), searching to remove 1 element is O(n).

Therefore, adding 1 array of n elements into LinkedList is O(n) and searching to remove n elements is O(n^2)

6. Does the array initial order have any effect on the speed?

Yes, it does. The proof is each time we run 3 sorts of 1 random array, it gives different time to finish the sorts.