

Sorry!

Time	Increment	Actors	Movies	Unique Movies

c) Quicksort is much faster than Insertion sort.

2)a. Quicksort now takes  $\Theta(n^2)$ . Since the pivot is the last element for each element, it will need to compare every term before it to the pivot each time. The list is sorted, so there will never be a term moving to the other side of the pivot. For example, the first time would be  $n(n-1)$ , then  $(n-1)(n-2)$ ...etc. The summation of this pattern ends up equaling  $n^2$ .

b. For a sorted array, Quicksort would now take  $\Theta(n \log n)$ . This is because that is the best case as in this example. The pivot will compare itself to each element (on other side), then sub-divide into smaller segments, which will then scan the portion near it, etc.

$$T(N) = T(N/2) + T(N/2) + O(N) \rightarrow N \log N.$$

3) A quicksort is not a stable sort. Depending on where the pivot is placed, and the locations of the repeat elements, quicksort will not keep their respective location.

For example: 1, 7, 2, 4, 2, 5, 6

If the pivot was chosen as 4 (the median 3), then it will compare:

(1,4)-good

(7,4)-need to swap

(4,6)-good

(4,6)-good

(4,2)-need to swap

swaps 7 and 2.

now the order is 1, 2, 2, 4, 7, 5, 6

This proves that quick sort is not a stable sort.