For the early-out ("Smart") Bubble Sort that takes advantage of the observation that if no swaps are made, then the array must be in order …

what is the best-case number of array item comparisons in terms of n? O(_______)
for what kind of data sets does it occur? __________________________________

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Given the initial order of ints in an array as: 8, 0, 1, 6, 7, 9, 5, 3 what is the order of the elements after 3 iterations of the selection sort algorithm covered in class and one of the HW exercises?

____  ____  ____  ____  ____  ____  ____  ____ The complexity of selection sort is O(_______)

In a collection of 45 coins, 1 coin is counterfeit and weighs 0.1 ounce less than the genuine coins. The genuine coins all weigh a known amount (say, 1.0 ounce). Find a good lower bound on the number of balance scale weighings needed to identify the fake coin.

_______________________

Instead of a balance scale in the above question, you had a sensitive bathroom scale (a scale that you can weigh only one set of objects at a time). Find a good lower bound on the number of times you need to use this device to identify the fake coin out of 45 coins.

_______________________

Use the letters to the right to answer the following questions:  [A) Merge sort  B) Quicksort]

Worst case complexity is O(n log₂ n) _____ Usually more efficient for RAM-based arrays _____
Standard in-place recursive versions are not a stable sort _____ Worst case complexity is O(n²) _____
Generally better to use an insertion sort on small arrays/partitions _____ Is asymptotically optimal _____
because insertion sort handles nearly sorted arrays efficiently _____

If you have an algorithm such that when you double the number of elements it increases the number of comparisons by slightly more than double (2.x times) for sufficiently large n (say n >= 16), this algorithm is most likely in what complexity class? O(_______________)

If you write a program which contains an array initialized with n random unsorted elements that you sort using Merge sort and then perform 2048 binary searches on this sorted array, what is the overall run time complexity of the program in terms of n? O(_______________)

What if you quadruple the number of binary searches? O(_______________)

According to the Lower Bound Theorem, the best (most efficient) worst case complexity for comparison-based search is \( \Theta(_______________) \)
Known as an accomplished juggler believe it or not.

Co-developer of awk.

The speedup of a program using multiple processors in parallel computing is limited by the time needed for the sequential fraction of the program.

Number of transistors that can be placed inexpensively on an integrated circuit doubles approximately every two years.

His regular expression pattern matching algorithms used in egrep, fgrep, and lex.

Of the finite state automata below where:
v₀ is the start node. w is a terminal node. A node labeled with both v₀ and w is both a start and terminal node.

A)

B)

C)

D)

E)

F) None of the above

Which finite state automaton correctly recognizes only words of the language a(ba)ⁿ for n ≥ 1? _____

Which finite state automaton correctly recognizes only words of the language (ab)ⁿ for n ≥ 0? _____

Which finite state automaton correctly recognizes only words of the language abⁿa for n ≥ 0? _____

Which finite state automaton correctly recognizes only words of the language aⁿbⁿ for n ≥ 0? _____

A regular expression cannot be written to correctly recognize only valid strings that are palindromes or only valid strings in the form aⁿbaⁿ because regular expressions cannot ________________________________.

S is the start symbol. a and b are terminal symbols.

A) \[ S \rightarrow aSa \mid bSb \]
   \[ S \rightarrow a \mid b \mid \varepsilon \]

B) \[ S \rightarrow aShS \]
   \[ S \rightarrow a \mid b \]

C) \[ S \rightarrow aSa \]
   \[ S \rightarrow b \]

D) \[ S \rightarrow Sab \]
   \[ S \rightarrow ab \]

E) \[ S \rightarrow aShb \]
   \[ S \rightarrow ab \]

F) \[ S \rightarrow abS \]
   \[ S \rightarrow ba \]

G) None of the above

Which context-free grammar correctly recognizes only words of the language aⁿbⁿ for n ≥ 1? _____

Which context-free grammar correctly recognizes only words of the language (ab)ⁿ for n ≥ 1? _____

Which context-free grammar correctly recognizes only words of the language aⁿbaⁿ for n ≥ 0? _____