

RECITATION 1 (4:10 pm to 5pm):

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Q1) INSERTION SORT.

- Write down the algorithm for INSERTION SORT.
- Mention the state of the input array after each iteration.
Input Array: 22, 15, 1, 55, 9, 11, 22

Q2) Suppose that for inputs of size n on a particular computer, insertion sort runs in $8n^2$ steps and merge sort runs in $64 n \lg n$ steps. For which values of " n " does insertion sort beat merge sort?

Q3) For each function $f(n)$ and time t in the following table, determine the largest size n of a problem that can be solved in time t , assuming that the algorithm to solve the problem takes $f(n)$ microseconds. (TEXTBOOK QUESTION).

1 second = 10^6 microseconds.

	1 second	1 minute	1 hour	1 day
$\lg n$	2^{10^6}	$2^{(60 \cdot 10^6)}$	$2^{(60 \cdot 60 \cdot 10^6)}$	$2^{(24 \cdot 60 \cdot 60 \cdot 10^6)}$
\sqrt{n}	10^{36}	$(10^{60 \cdot 10^6})^2$	10	
n				
$n \lg n$				
n^2				
n^3				
2^n				
$n!$				

$$\begin{aligned}
 10^6 &= \lg n \\
 2^{10^6} &= n \\
 10^6 &= \sqrt{n} \quad |^2 \\
 10^{36} &= n
 \end{aligned}$$

Q1 a)

$n = A.length$

for $j = 2$ to n

key = $A[j]$

$i = j - 1$

while $i > 0$ and $A[i] > key$

$A[i+1] = A[i]$

$i = i - 1$

$A[i+1] = key$

b) 22 15 1 55 9 11 22

22 22 1 55 9 11 22

15 22 1 55 9 11 22

15 22 22 55 9 11 22

15 15 22 55 9 11 22

1 15 22 55 9 11 22

1 15 22 55 55 11 22

1 15 22 22 55 11 22

1 15 15 22 55 11 22

1 1 15 22 55 11 22

1 9 15 22 55 11 22

T B D

Q2) $8n^2 = 4n \lg n$

$n = 8 \lg n$

$\frac{n}{8} = \lg n$

$2^{\frac{n}{8}} = n$

$2^n = 64n$