Lab W1D2

Question 1. Comparing Algorithms. Problem: Find the THIRD largest in an array.

Algorithm 1 : Idea – Use three loops one after another. First loop will find Max. Second loop will find Second Max, Third loop will find third max. Note that it is possible First max == second Max == Third Max as in

7, 20, 18, 4, 20, 19, 20, 3.

and your program should return 20 in this case.

Algorithm 2 : Idea – Use one loop. Maintain three variable max, preMax and prePreMax such that max will have the maximum value, preMax will have the second largest and prePreMax will have the third largest value.

Algorithm 3 : Idea – Use an ordered dictionary.

In this lab, **for every algorithm** you will

(a) write **the pseudo code**. (**Must follow the notations and conventions used in today's Lecture**)
(b) determine the worst-case time complexity by counting as in Slide 15 Lesson 2.
(c) Perform an **empirical** time comparison by implementing using Java, similar to what you did in W1D1.

Draw a chart to compare all algorithms.

Question 2. Consider the following functions to determine the relationships that exist among the complexity classes they belong.

10, 1, n^3, $n^{1/3}$, log(log n), n^2, $n^{1/2}$, logn , log n^n, n^k (k > 3), $n^{1/k}$ (k > 3), nlogn, ln n, 2^n, 3^n, n^n, $n^{1/2}$ logn, $n^{1/3}$ logn, n!.

Notation clarification. log(log n) = loglog n ≠ $\log^2 n$ = $(\log n)^2$.

The partial table is given. ***Your task is to complete the table*.** The table is in the **strict ascending order**. (if you have any questions, please ask.

10, 1	$\Theta(1)$
log n	Θ(log n)
$n^{1/2}$	$\Theta(n^{1/2})$