Ted Johnson

Q1 SID: 19335618

SID^2: 373866123441924

d_1 d_2 d_3 d_4 d_5 d_6 d_7 d_8 d_9 d_{10} d_{11} d_{12} d_{13} d_{14} d_{15}

3 7 8 6 1 2 4 9 0 5

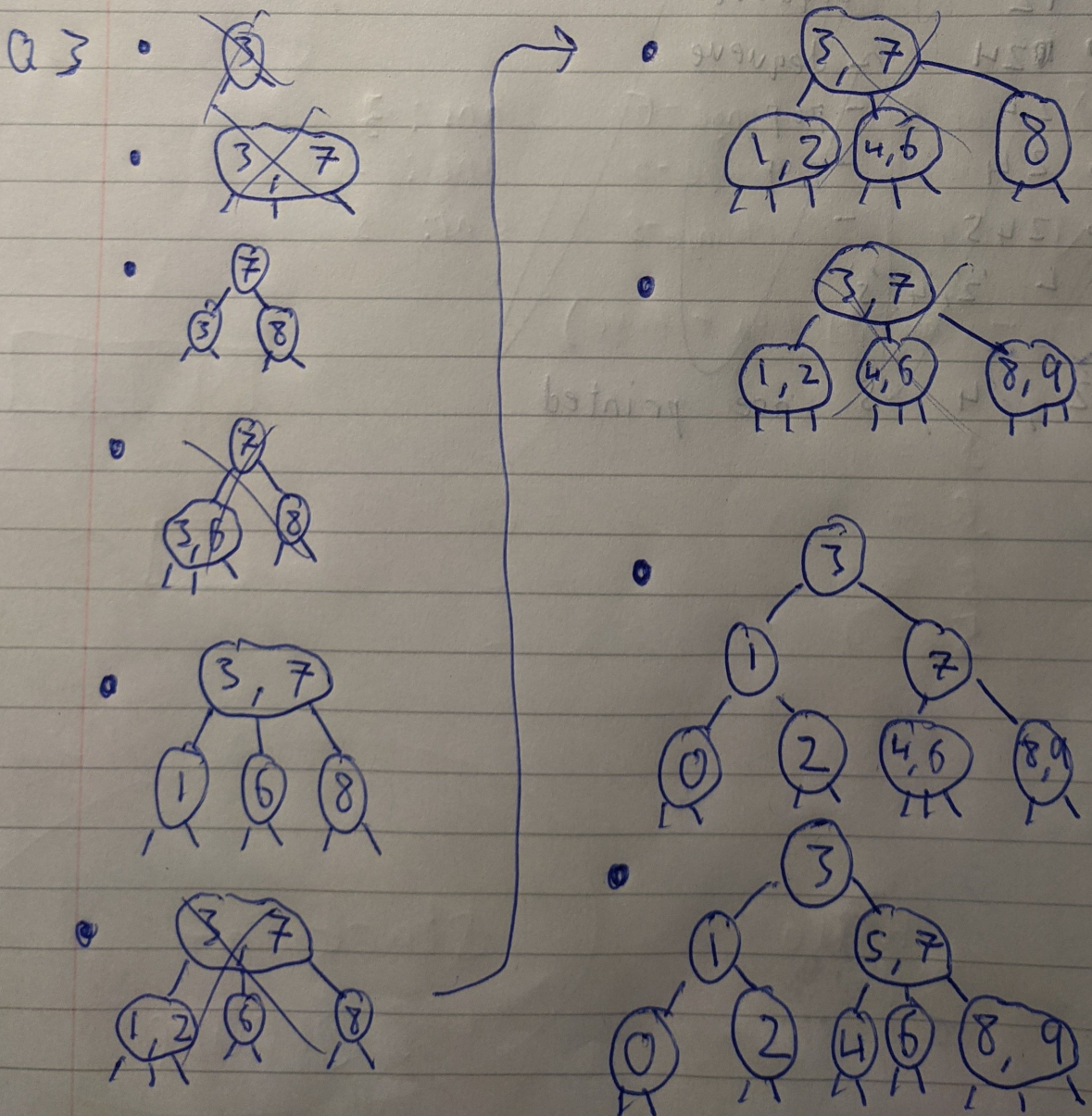
u_1 u_2 u_3 u_4 u_5 u_6 u_7 u_8 u_9 u_{10}

Q2

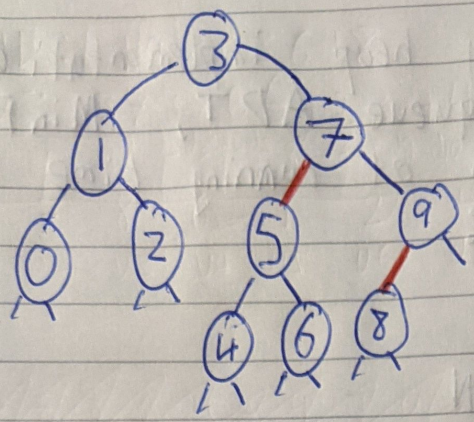
	buffer	output
• 3 - pop	\	3
• 7 - \	7	3
• 8 - dequeue	8	3, 7
• 6 - pop	8	3, 7, 6
• 1 - \	8, 1	3, 7, 6
• 2 - dequeue	1, 2	3, 7, 6, 8
• 4 - dequeue	2, 4	3, 7, 6, 8, 1
• 9 - pop	2, 4	3, 7, 6, 8, 1, 9
• 0 - pop	2, 4	3, 7, 6, 8, 1, 9, 0
• 5 - \	2, 4, 5	3, 7, 6, 8, 1, 9, 0.

Output: 3, 7, 6, 8, 1, 9, 0, 2, 4, 5
(on seperate lines of course)

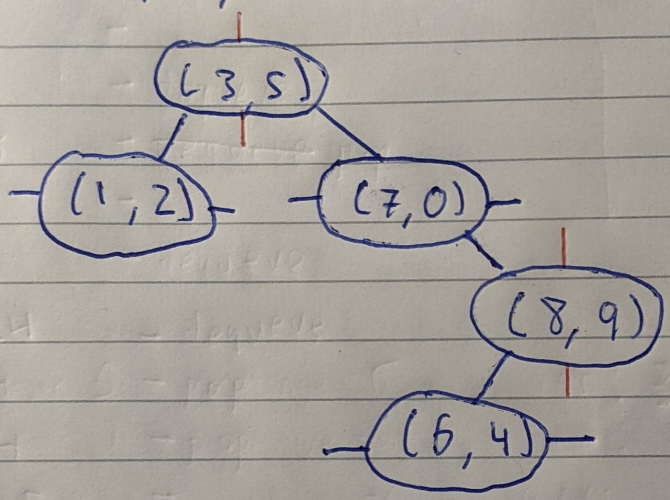
Q3



Q4



Q5 Points: (3,5), (7,0), (8,9), (6,4), (1,2)



Q6 Big-O (or O) notation is used to give an asymptotic upper bound for a function. Big-Omega (or Ω) notation is used to give an asymptotic lower bound for a function.

For example, $O(n^2)$ asymptotically bounds any function with a lower order-of-growth from above. Therefore, function n and $\log_2 n$ are encompassed.

However, $\Omega(n^2)$ is the opposite. This would asymptotically bound any function with a higher order-of-growth from below, such as n^5 or 2^n.

Q7 Assuming MinPQ is implemented using a binary heap, then MinPQ has the following order-of-growth of running time with a size of N:

insert: Log N
delete min: Log N

It also has order-of-growth of space of N.

The method findKthLargest ~~tfies~~ takes an array of integers nums of length N and an integer k. We will use the mathematical approach to approximate the running time when N is large. To do this, we will use tilde notation and cost models.

Line 1, 2 and 9 are executed once. They can be safely ignored due to the cost model 2: Lower terms can be ignored.
This is because lines 3-8 are executed N times. Lines 5 and 7 both call functions which have an order-of-growth of Log k as previously discussed. Line 6 has a ~~order-of-growth.~~ constant order-of-growth.

Therefore, the running cost of Lines 5-7 is 2 Log k, or ignoring the constant, Log k. They are executed N times, giving findKthLargest an approximate running cost of N Log k.

The memory used by findKthLargest is simply k, which is the size of the binary heap implemented MinPQ ADT.