CS 101 Fall 2022 - Quiz 1-A

9/19/2022 - 20 Minutes **Name:** **ID number:**

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1. (5 points) Notes of discussion

I promise that I will complete this QUIZ independently and will not use any electronic products or paper-based materials during the QUIZ, nor will I communicate with other students during this QUIZ.

True or False: I have read and understood the notes. ◯ True ◯ False

2. (8 points) True or False

Determine whether the following statements are true or false.

(a)	(b)	(c)	(d)

(a) (2') Linked list is more efficient than array when we want to frequently modify elements in the middle.

(b) (2') Linked list is more efficient than array when we only want to find some element with specific value.

(c) (2') We want to maintain a database which stores students' names and ids and we only import all the data when students get admitted. After that, dropout seldom happens and transferring student never appears. We should use array instead of linked list.

(d) (2') When we want to manage local variables in function calls where we need to delete them after use, queue is a good choice due to its FIFO policy.

3. (4 points) Queue

Suppose there is an initially empty queue of capacity 7 which is implemented by a **circular array**. Please **fill in the table** below to show the array after the following operations being operated on the queue, and write down the index of the `front` and the `back` of the queue (the `front` is at index 0 initially).

```
push(1), push(3), push(5), pop(),
push(7), push(9), push(1), pop(),
push(3), push(5), push(7), pop()
```

Index	0	1	2	3	4	5	6
Element							

The `front` of the queue is at index _____.

The `back` of the queue is at index _____.

4. (8 points) Reverse-Polish Notation

Please recall the algorithm we learned in our lecture to evaluate a reverse-Polish notation using a specific data structure. The pseudocode (with some incomplete lines) of this algorithm is given below. Assume the input is guaranteed to be a legal reverse-Polish expression.

```
1: function EVALUATE-REVERSE-POLISH-NOTATION(expression)
2:     Let D be an initially empty ____(1)____
3:     for each element x in expression do
4:         if x is a number then
5:             ____(2)____
6:         else
7:             Pop a from D and then pop b from D
8:             ____(3)____
9:             Push c to D
10:        end if
11:    end for
12:    return the last element popped from D
13: end function
```

(a) (2') Choose one of the following data structures to fill in the blank (1):

◯ Stack ◯ Queue

(b) (2') Fill in the blank (2):

(c) (2') Choose one of the following statements to fill in the blank (3):

◯ $c \leftarrow a\ x\ b$ ◯ $c \leftarrow b\ x\ a$

Note: For example, if the element x is the exponentiation operator `^`, then a `^` b stands for a^b and b `^` a stands for b^a.

(d) (2') Please evaluate the following expression and write down your result directly.

`8 2 3 ^ / 2 3 * + 5 1 * -`