

## Ch. 13 CSE3110 - Iterative Algorithm 1: CRT Questions

Zephram Gilson

### Questions 1, 3, 4, 5, 6, & 7

1. A **stack** is a data structure that operates based on LIFO (Last-In, First-Out) principle, where only the top element/the "last in" element is the only one that can be accessed.

On the other hand, an **array** is a different type of data structure that is a collection of elements, each identified by a unique index, allowing direct and/or random access to any element.

3. Output would be:

8 13

8 12

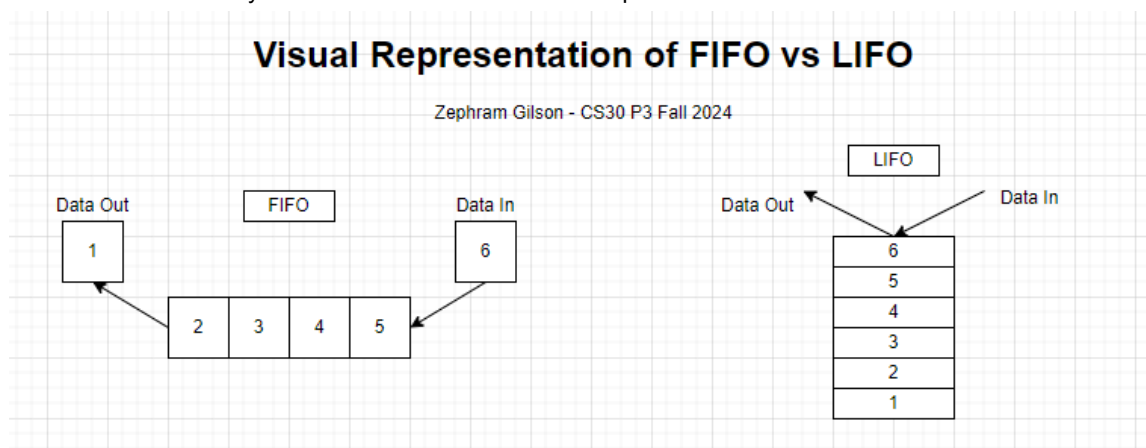
4. The "hot plate" problem in the restaurant is analogous to a **stack** because of the **LIFO** (Last-In, First-Out) principle of a **stack** data structure. In the restaurant, when new, freshly washed plates are added to the pile, they are placed on top of the stack of plates. This is analogous to the **push** operation in a stack. When customers take plates, they take the topmost plate from the pile. This is analogous to the **pop** operation in a stack. The most recently added plates (the warm, freshly washed ones) are the first ones to be taken by customers. Plates that were added earlier (the cooler plates) remain at the bottom of the stack and are less likely to be used unless all the plates above them are removed. The "hot plate" issue arises because the stack structure ensures that **newer items (warm plates) are always accessed first, while older items (cooler plates) remain deeper in the stack.**

5. Output would be:

5 8

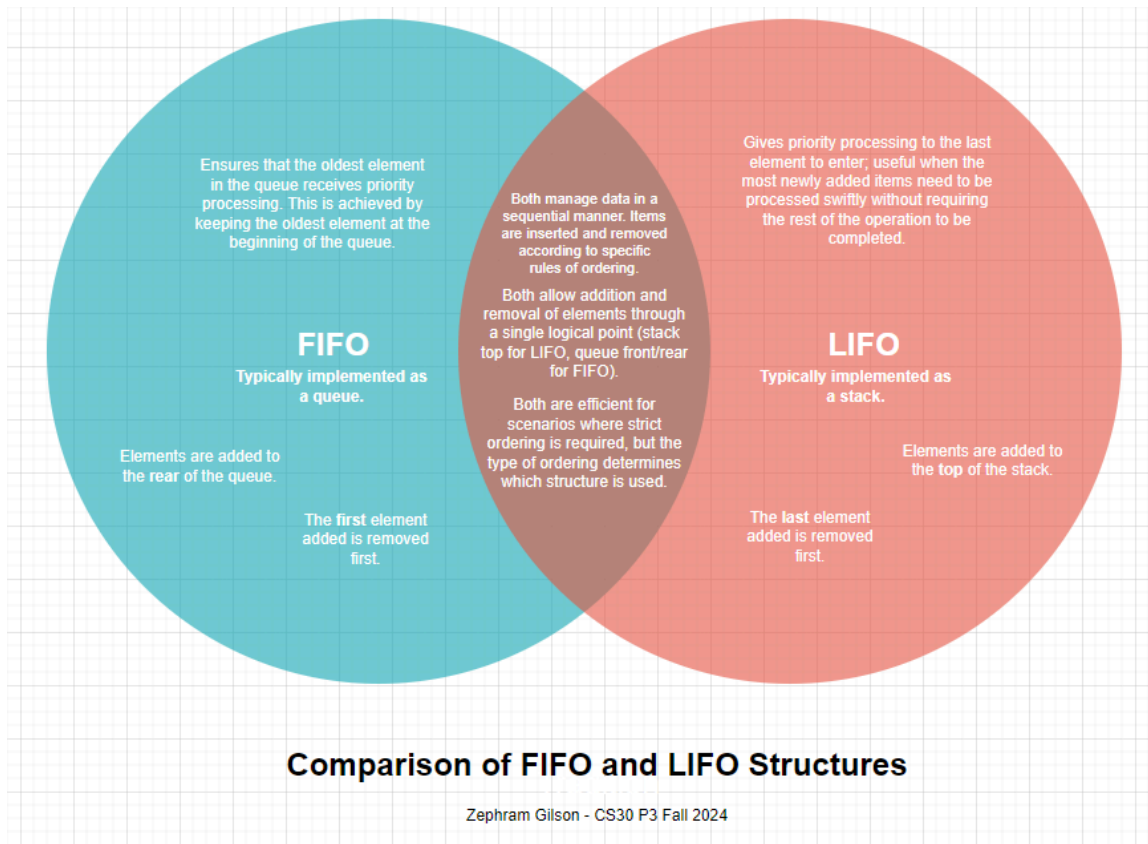
12 8

6. **FIFO, or First-In, First-Out** is defined as a data structure principle where the first element added to the structure is processed first. Similarly, **LIFO, or Last-In, First-Out** is defined as a data structure principle where the most recently added element to the structure is processed first:



The **LIFO Structure**, as described before, can be analogous to a stack of hot plates, in that you can only grab the top plate in the stack, it is much harder to grab the bottom plate of the stack.

The **FIFO Structure** can be analogous to a gumball machine, in that the gumball that was added first into the machine is going to come out before the most recently added ones, as they would be at the top. Another common example is a line of people, the first person in line is typically served first.



7. Additional examples of real-world situations representing queue (FIFO) structures:

- a. **Multiple print jobs sent to a printer;** The first print job sent to the printer is processed first, and subsequent jobs wait in line until their turn.
- b. **Calls or chat requests in a customer service center;** The first customer to contact support is attended to first, and new customers are added to the end of the queue.