Fakultas Informatika
School of Computing
Telkom University

CDK2AAB4
STRUKTUR DATA

Linked List Implementation

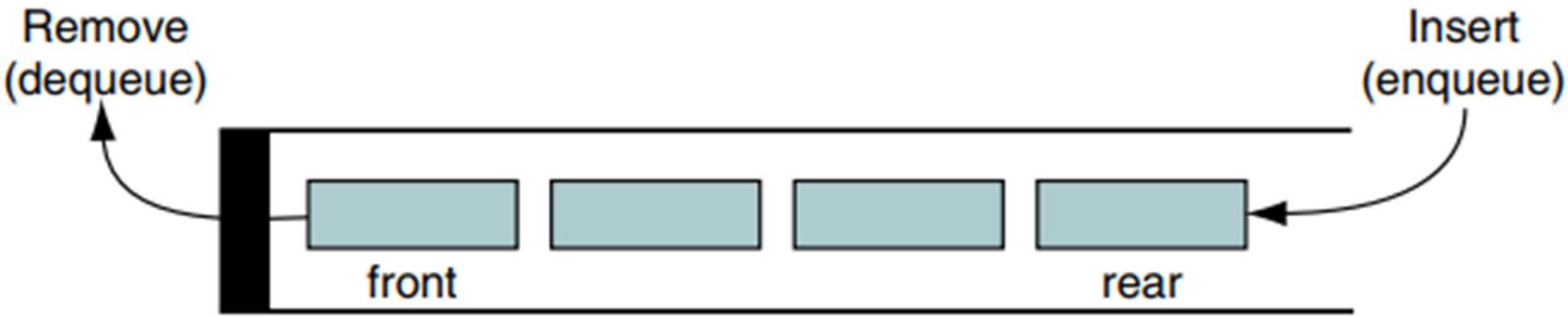
Queue

Queue

- A queue is a linear list in which data can only be inserted at **one end**, called the **rear**, and deleted from the other end, called the **front**.

- In a queue the first item inserted is the first to be removed (**First-In-First-Out, FIFO**)

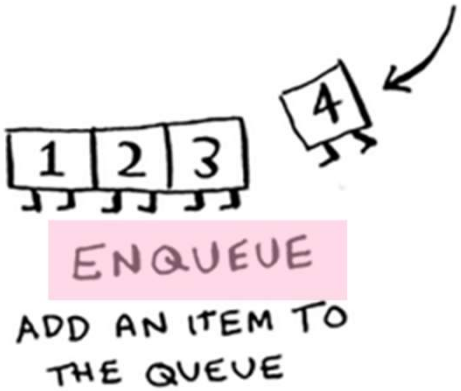
Queue

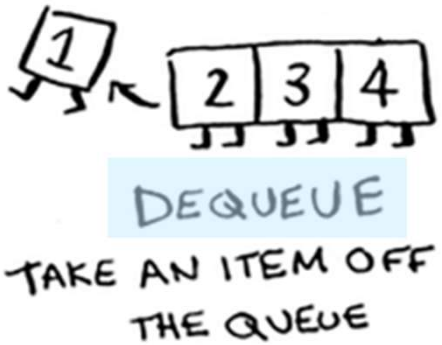


Ref. Gilberg & Forouzan, 2005: Data Structures-
A Pseudocode Approach with C

Primary Queue Operations

- `enqueue(el)`—Put the element el at the end of the queue.
- `dequeue()`—Take the first element from the queue.



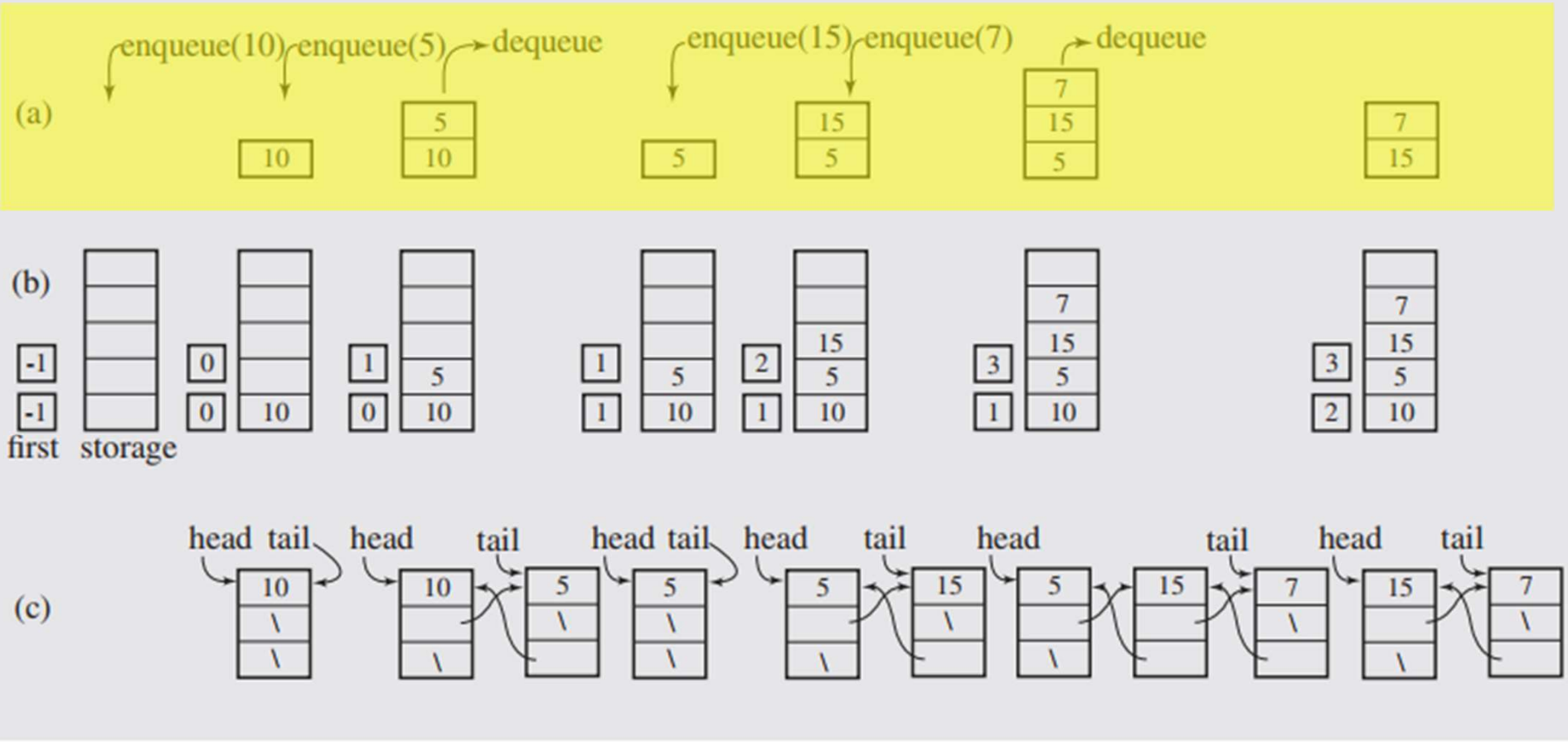


Ref. Drozdek, 2013: Data Structures and Algorithms in C++
Bhargava, 2016: Grokking Algorithms

Auxiliary Queue Operations

- **`isEmpty()`**—Check to see if the queue is empty.
- **`firstEl()`**—Return the first element in the queue without removing it.
- **`size()`**—Return the number of element in the queue.

FIGURE 4.11 A series of operations executed on (a) an abstract queue and the queue implemented (b) with an array and (c) with a linked list.



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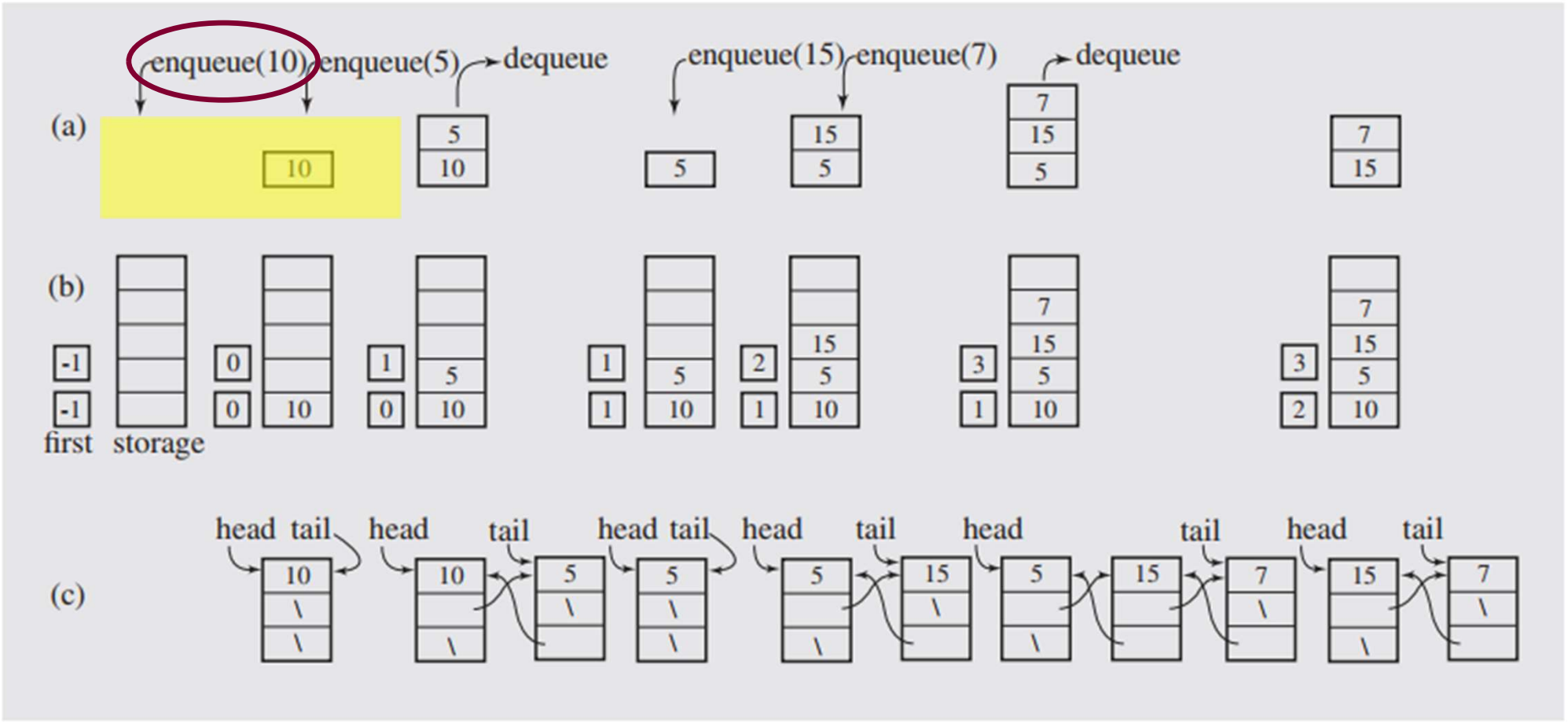

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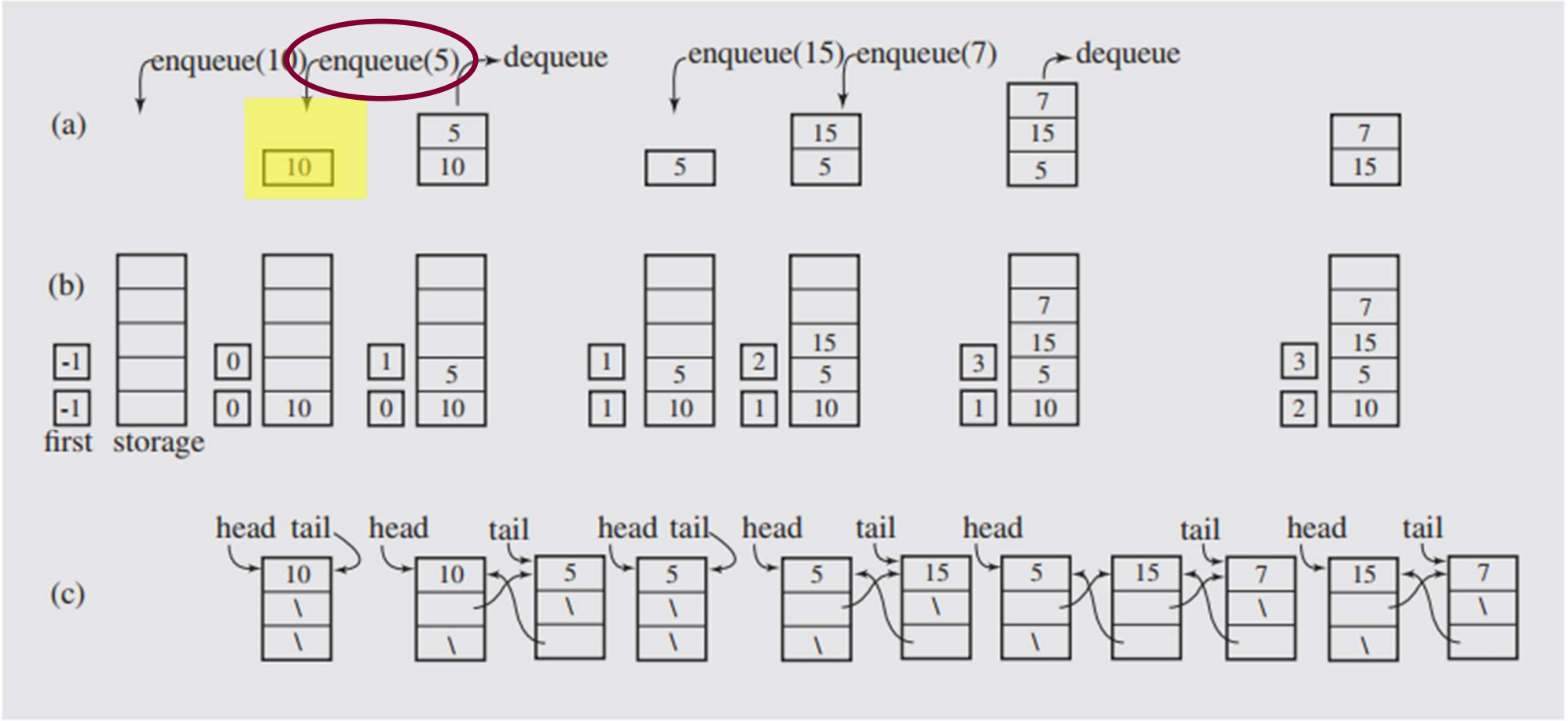

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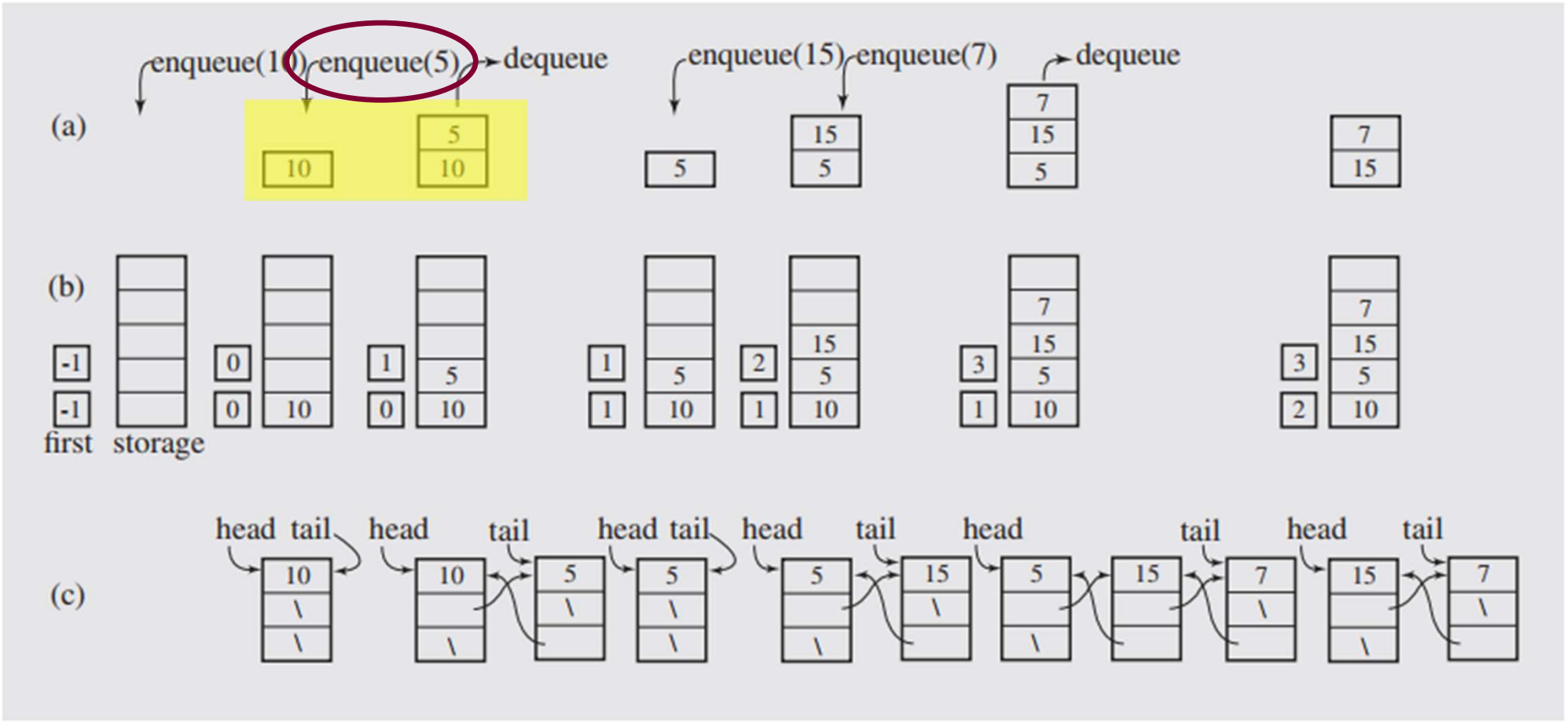

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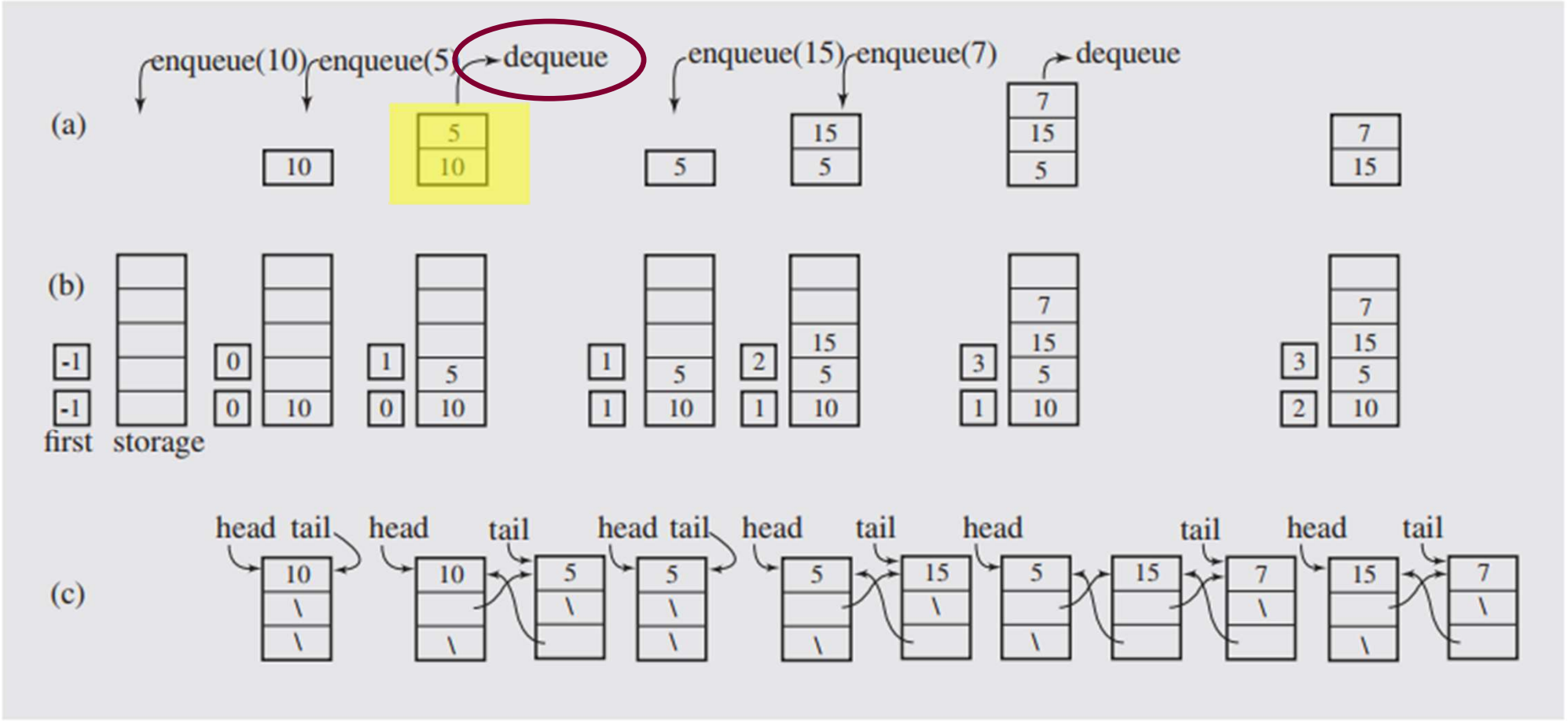

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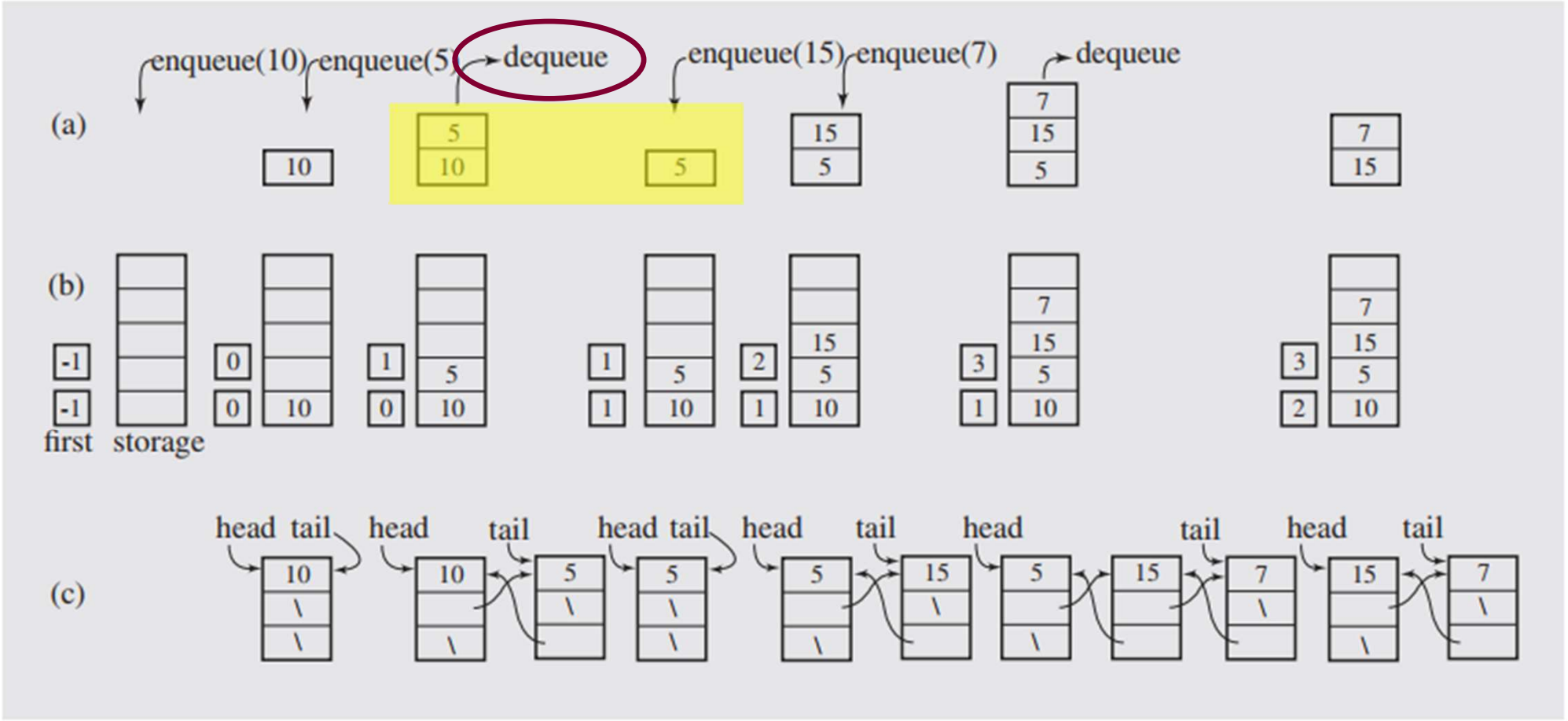

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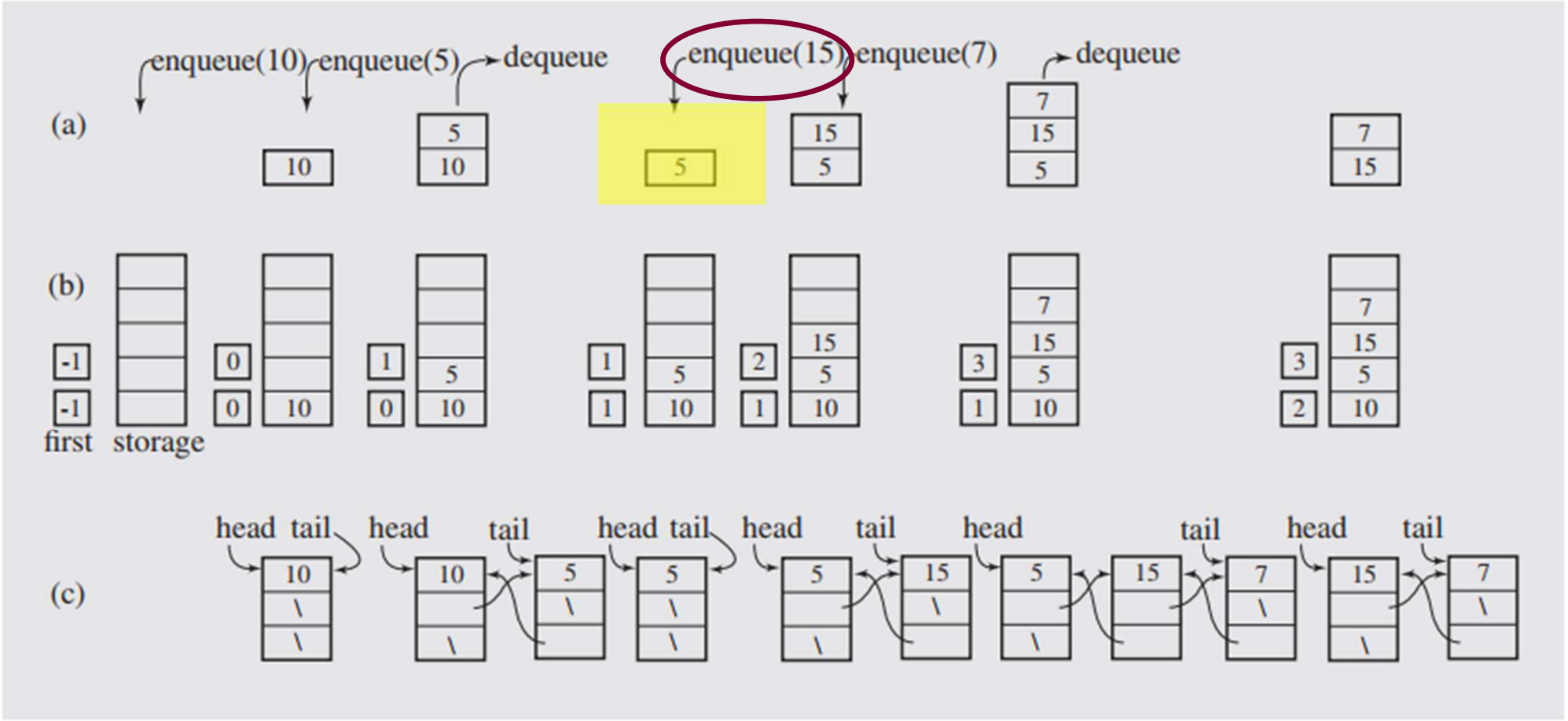

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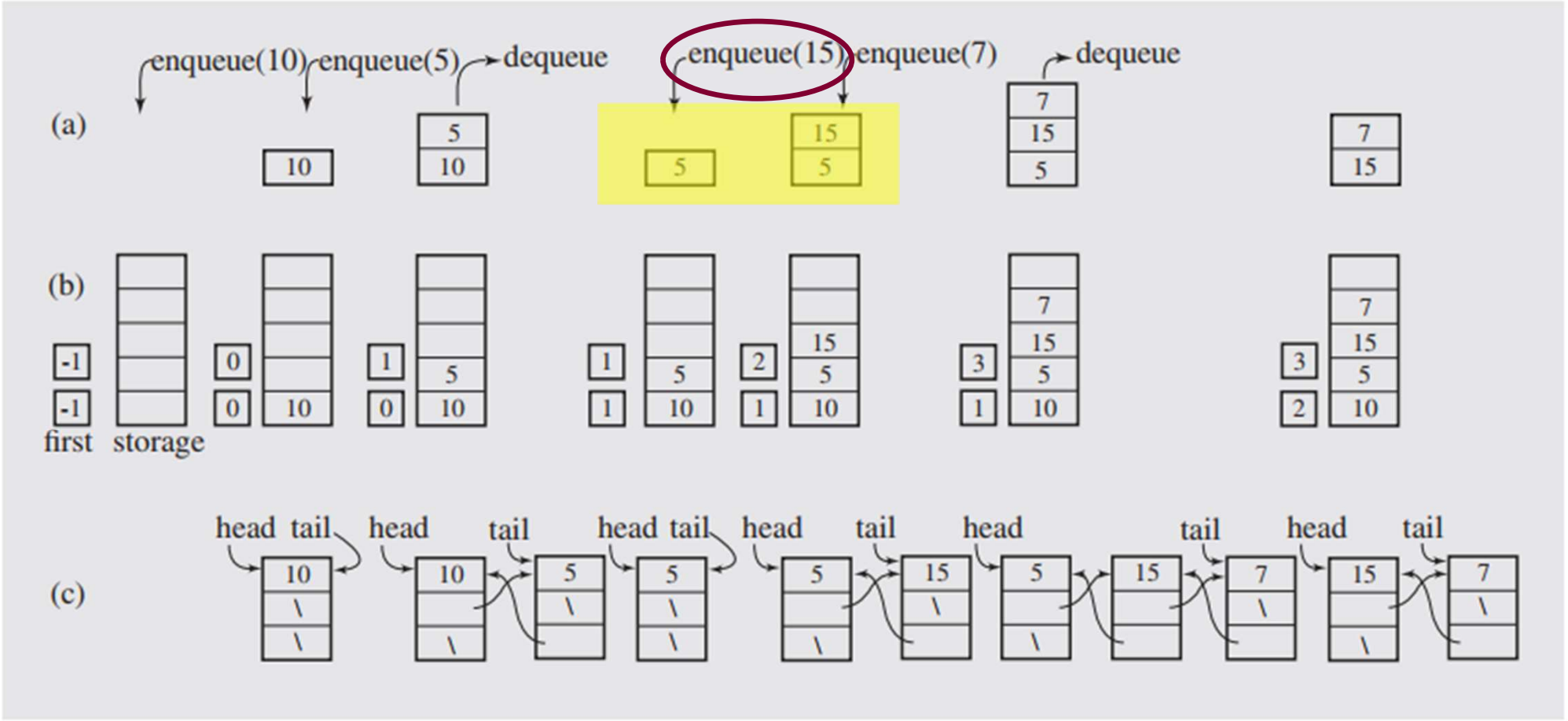

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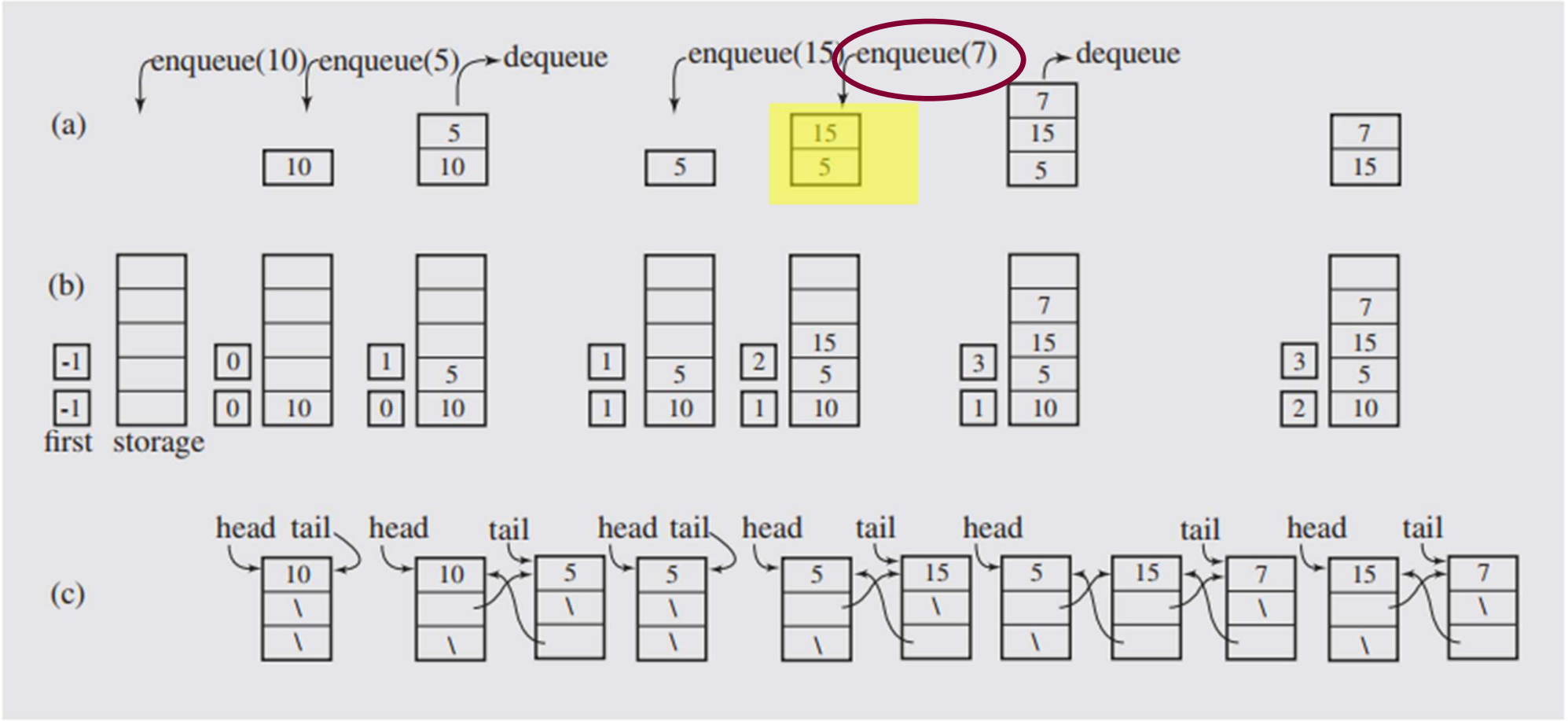

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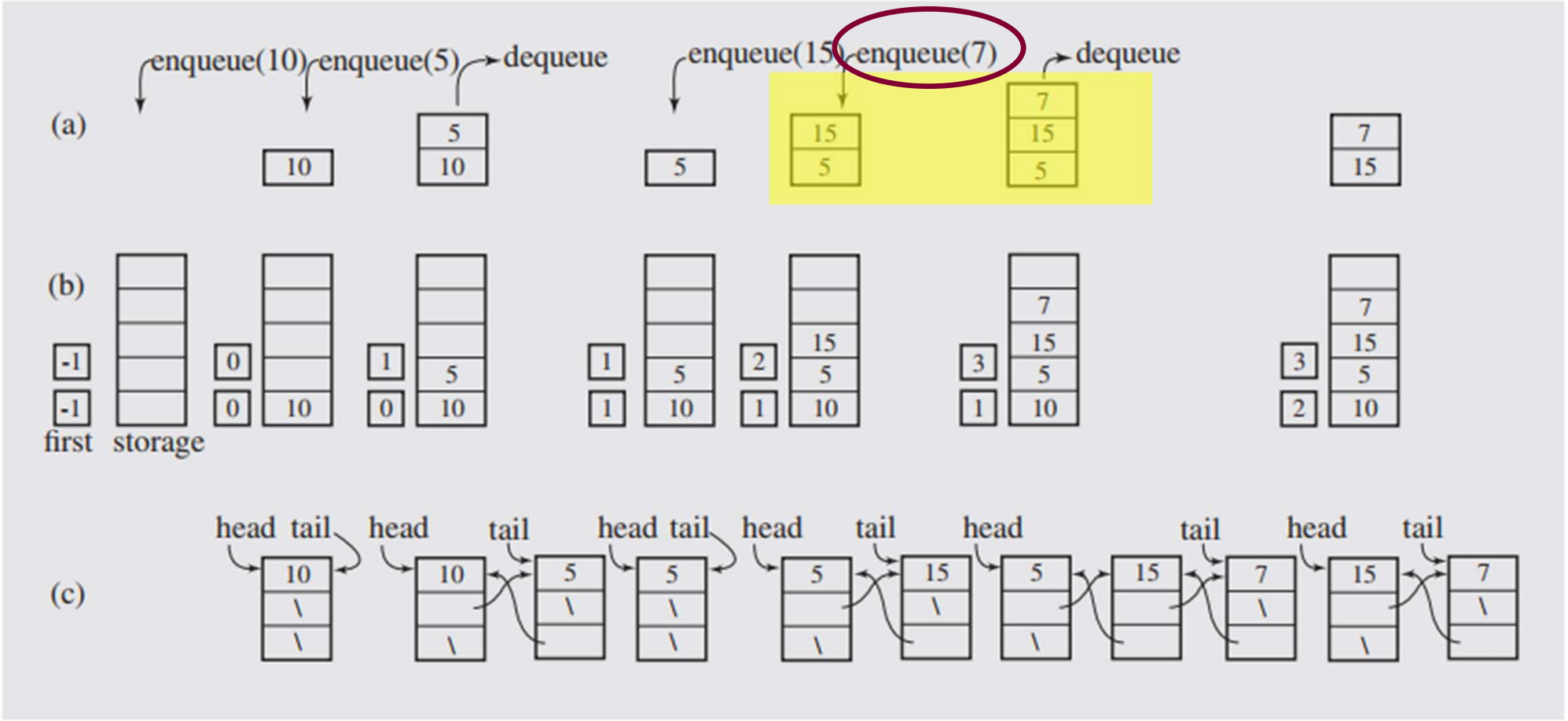

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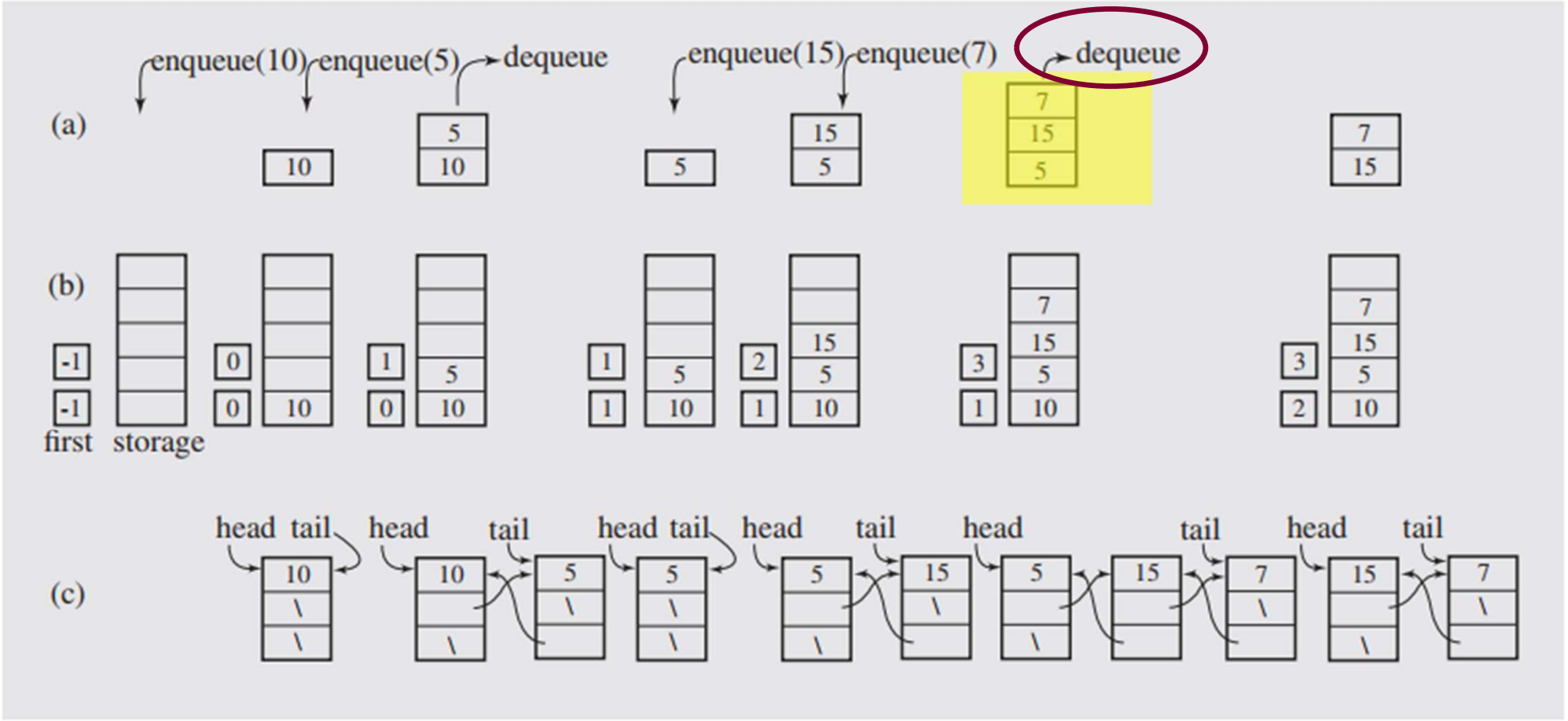

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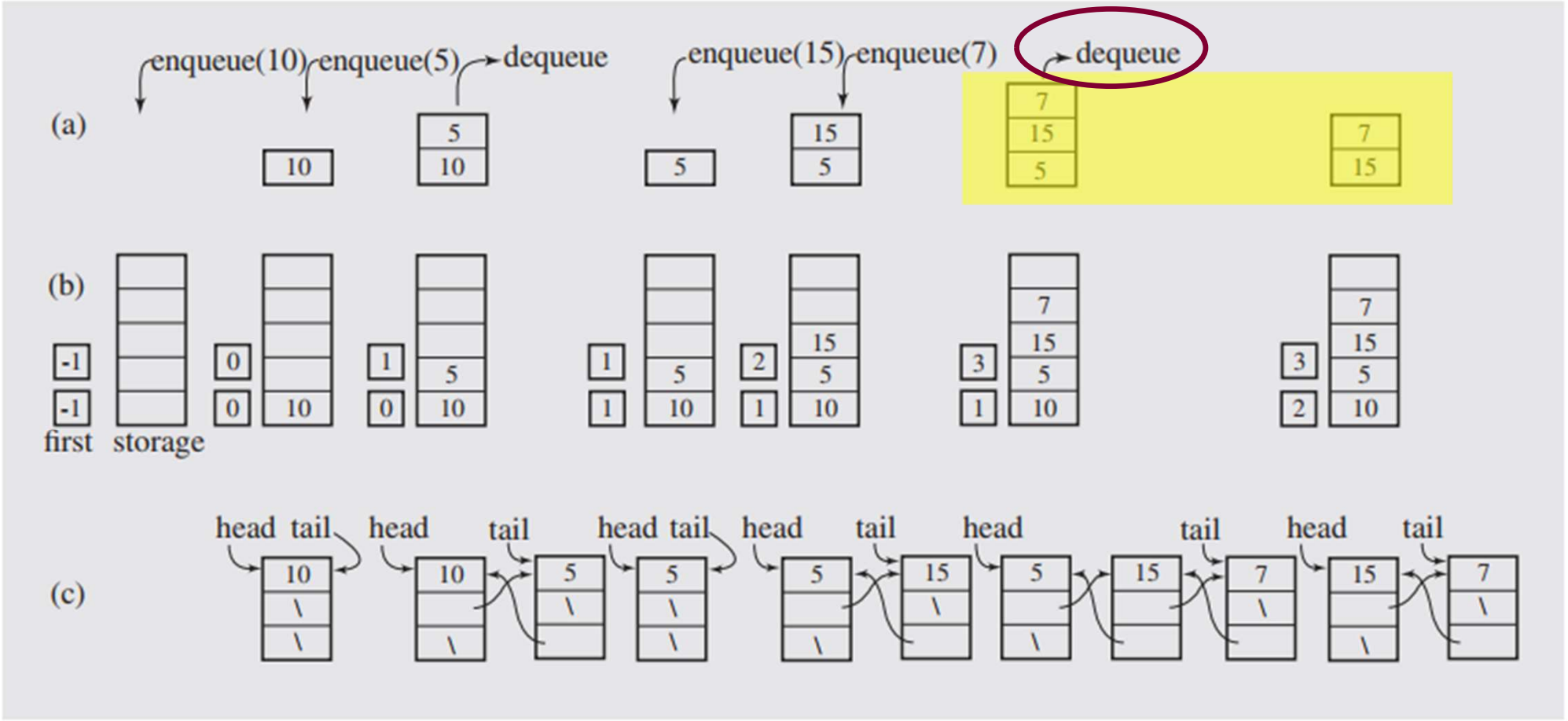

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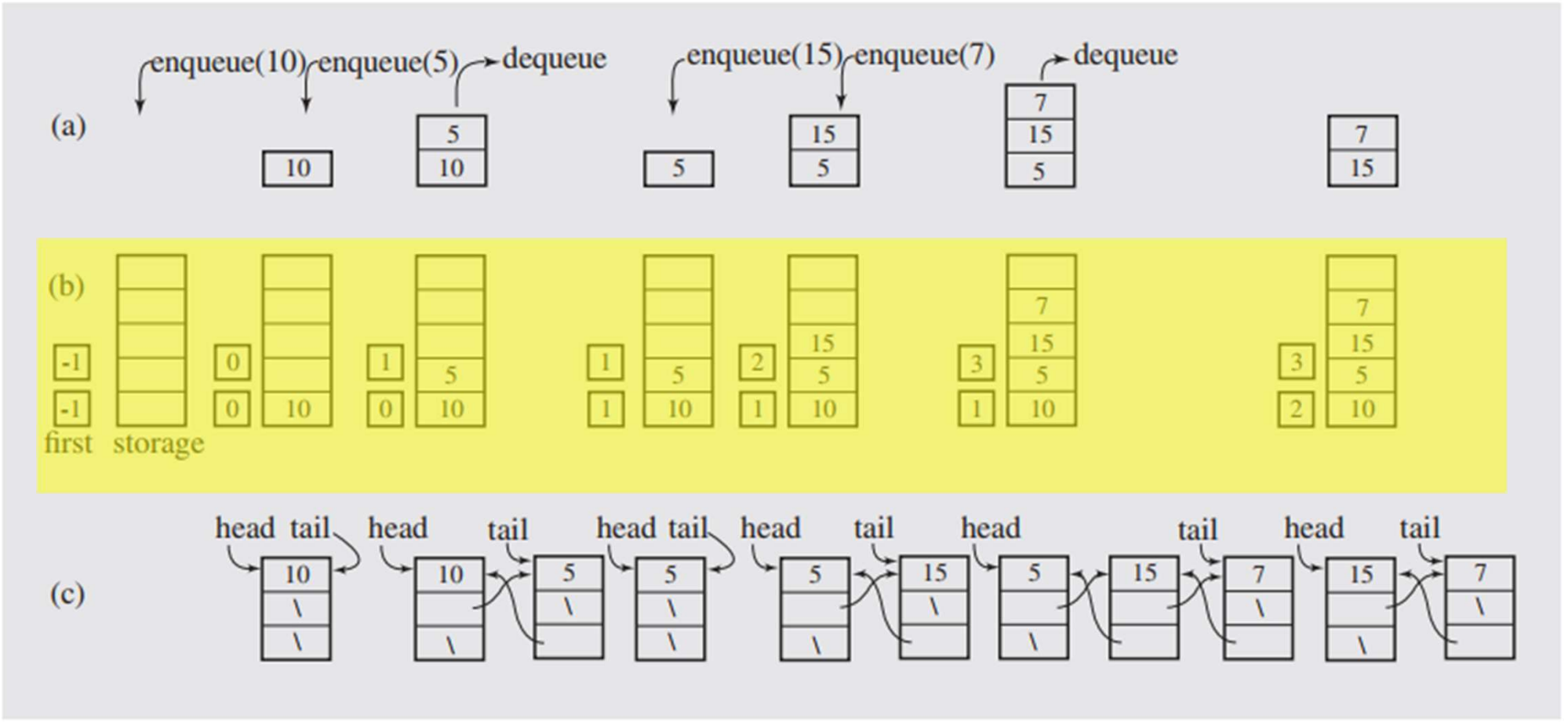

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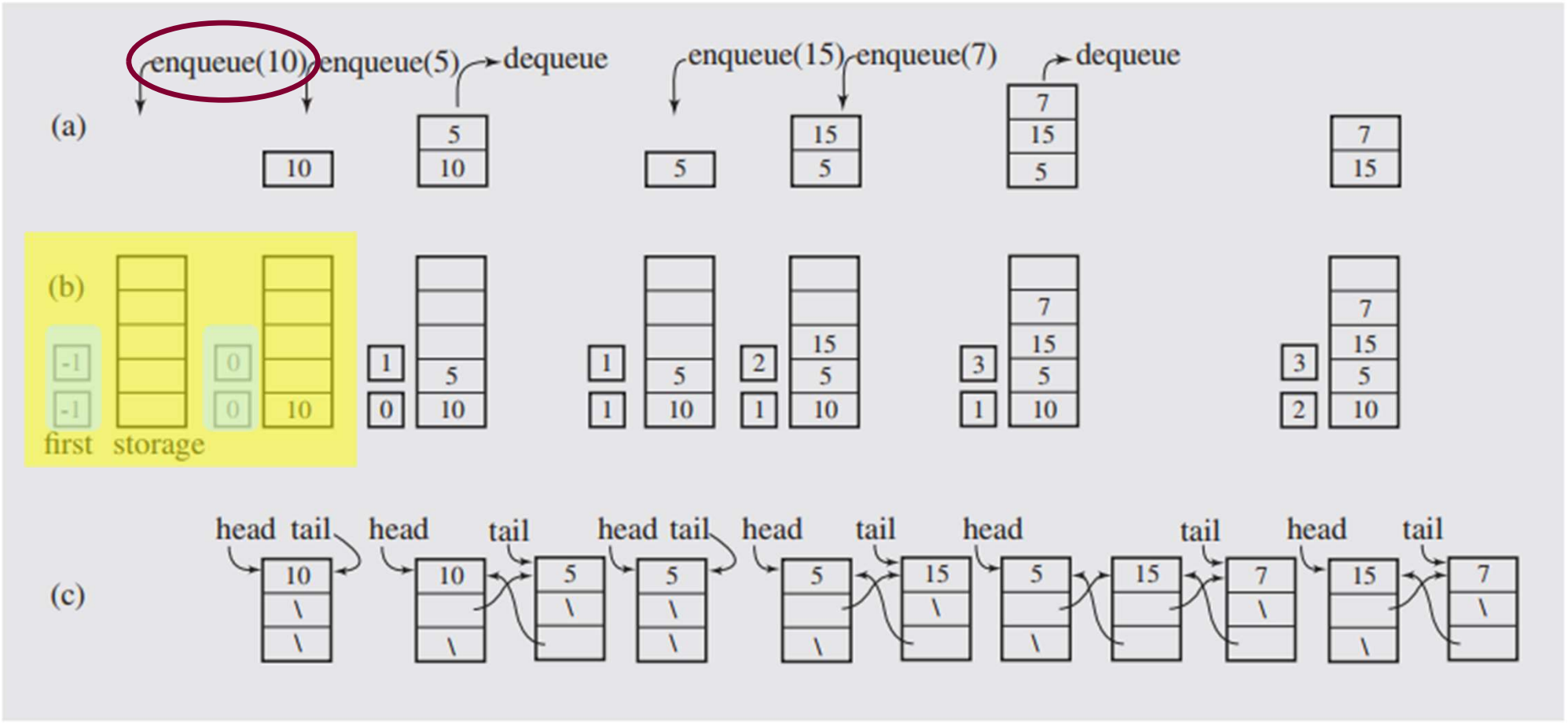

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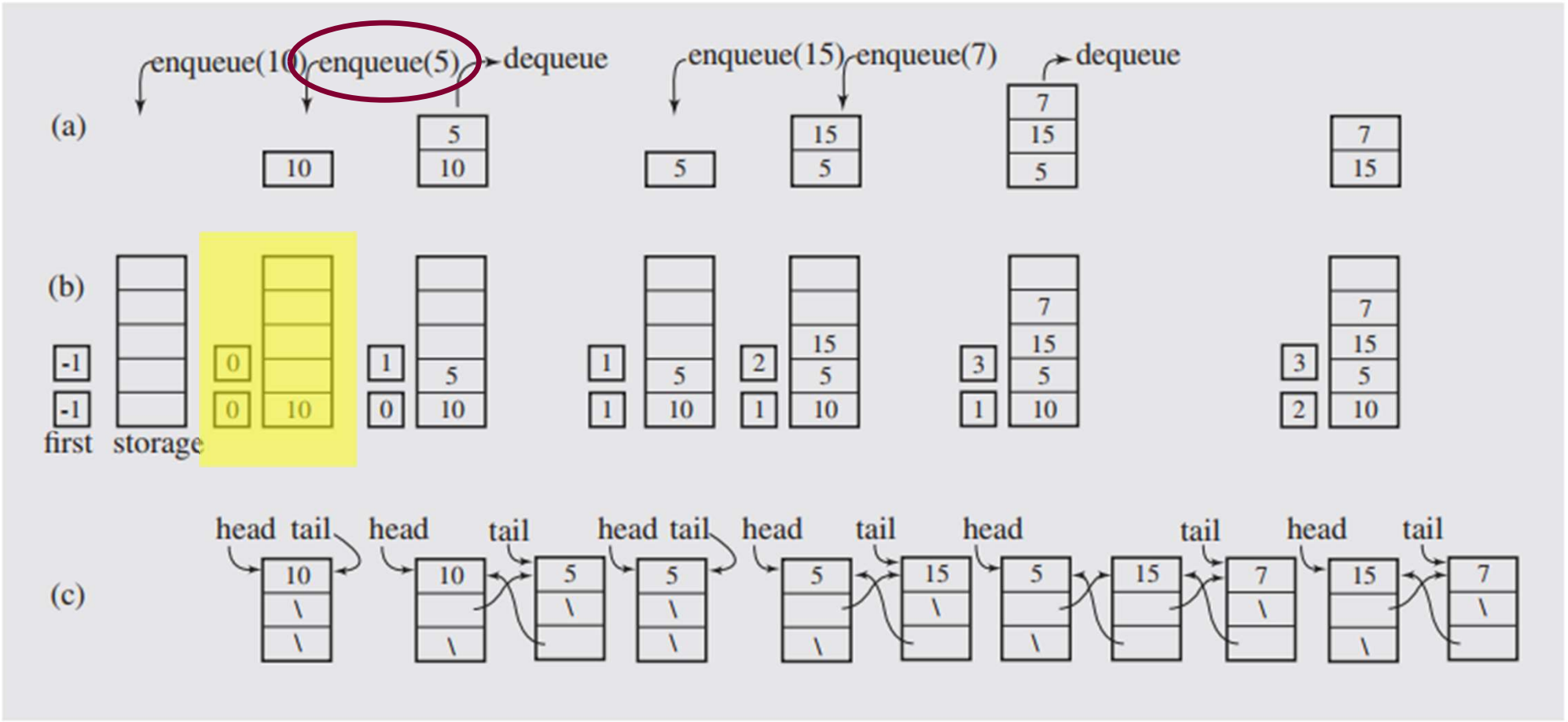

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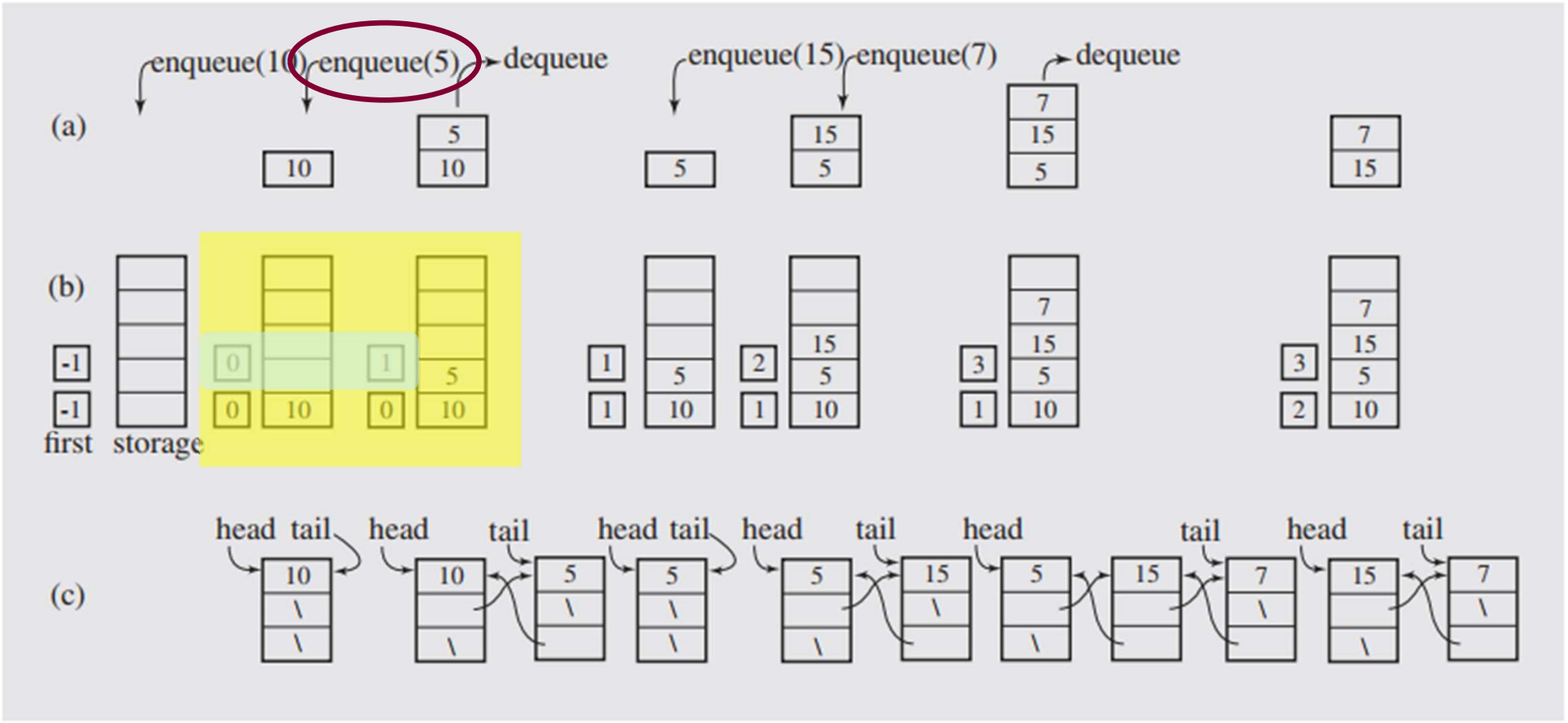

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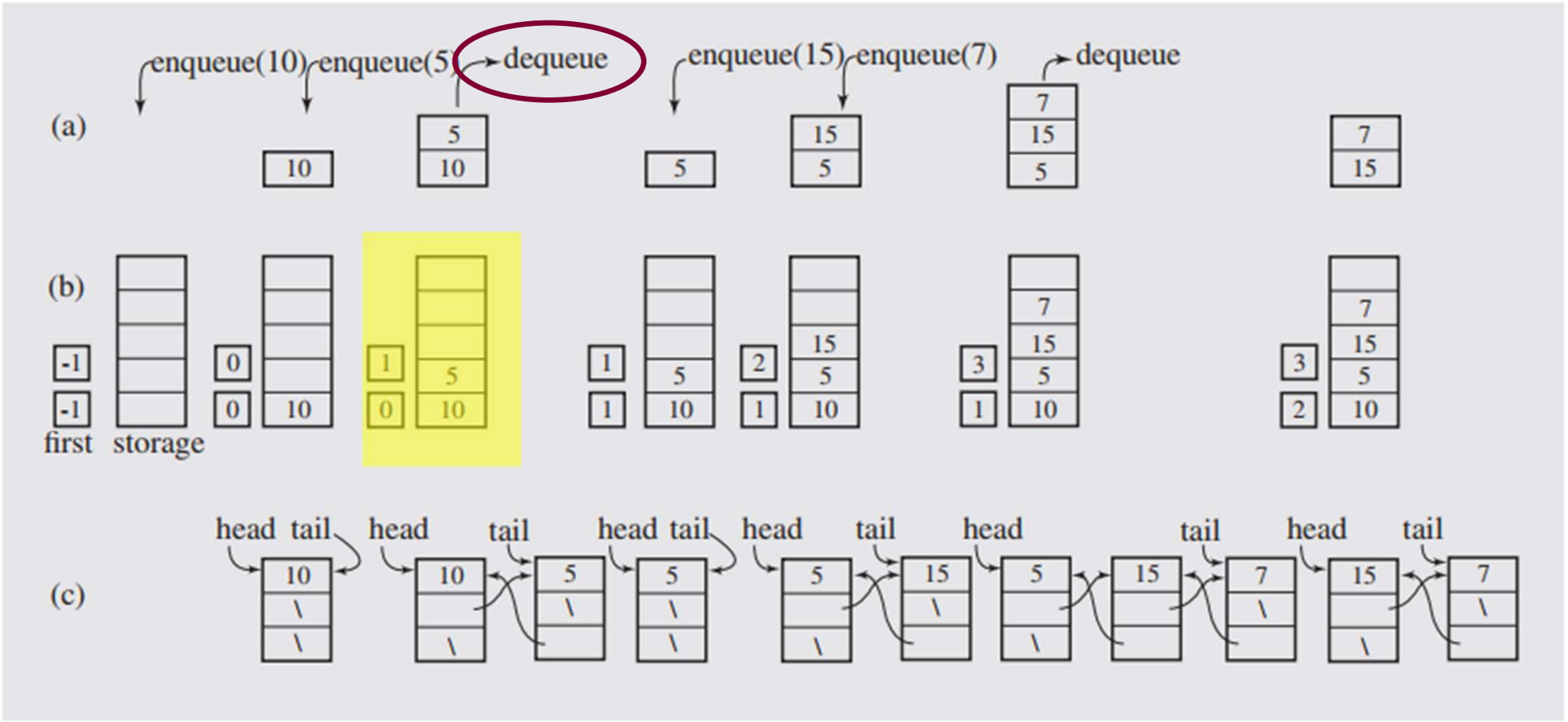

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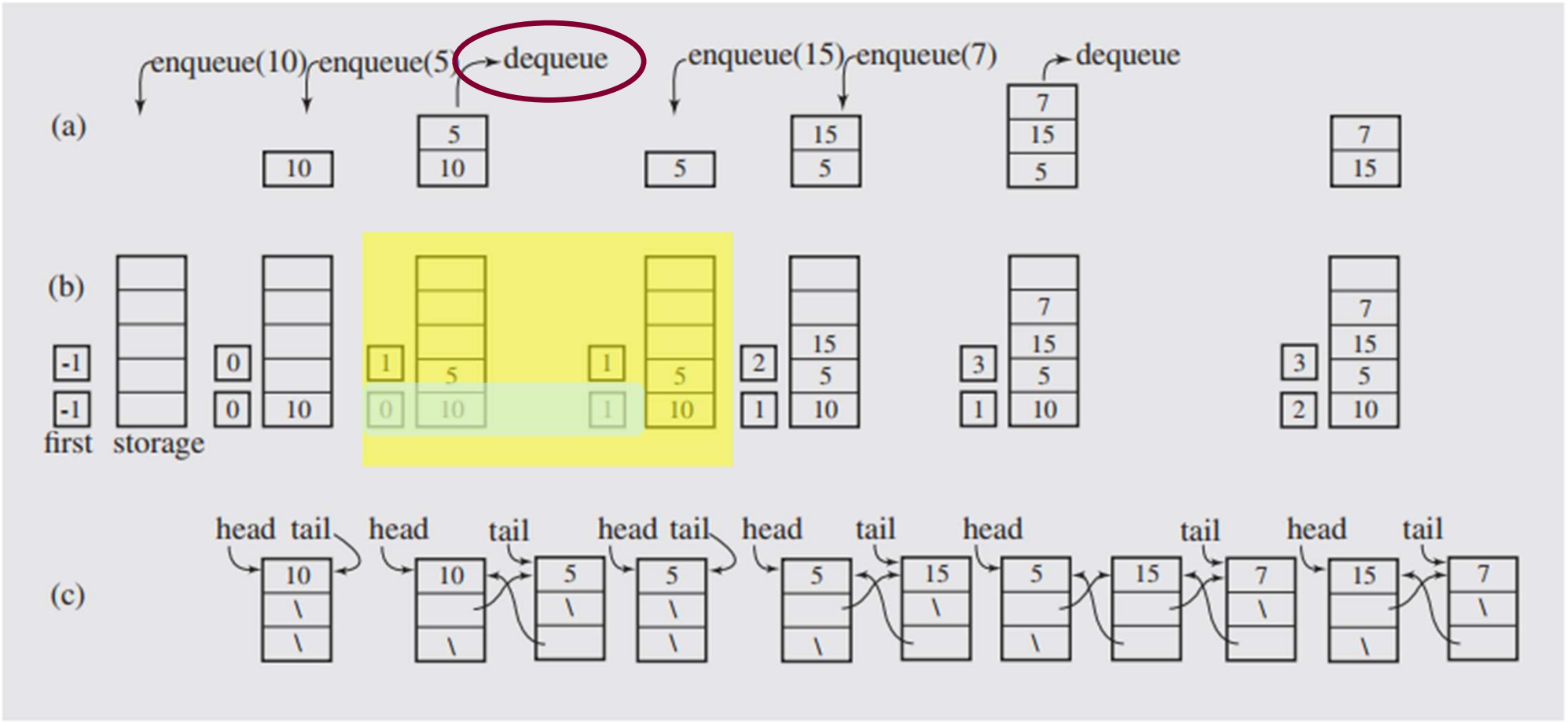

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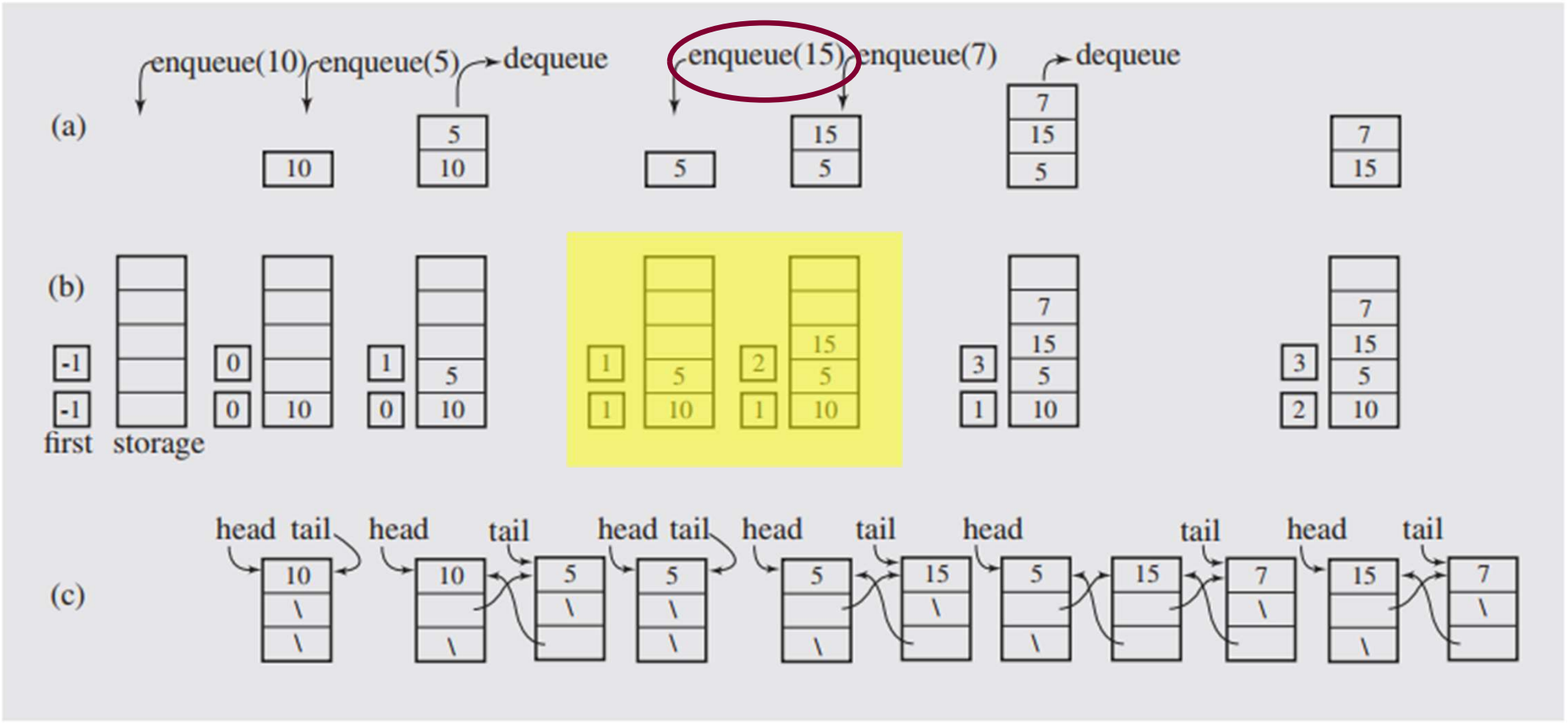

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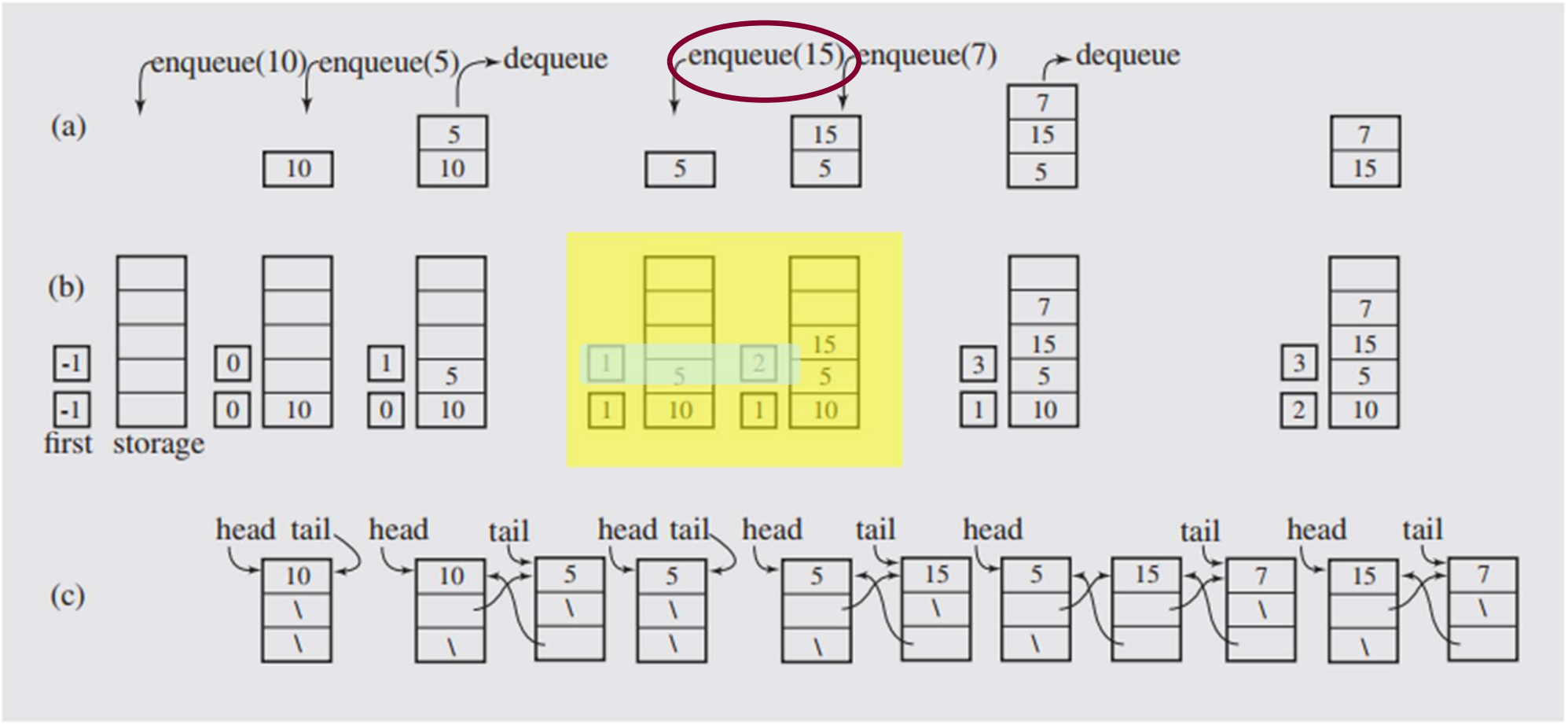

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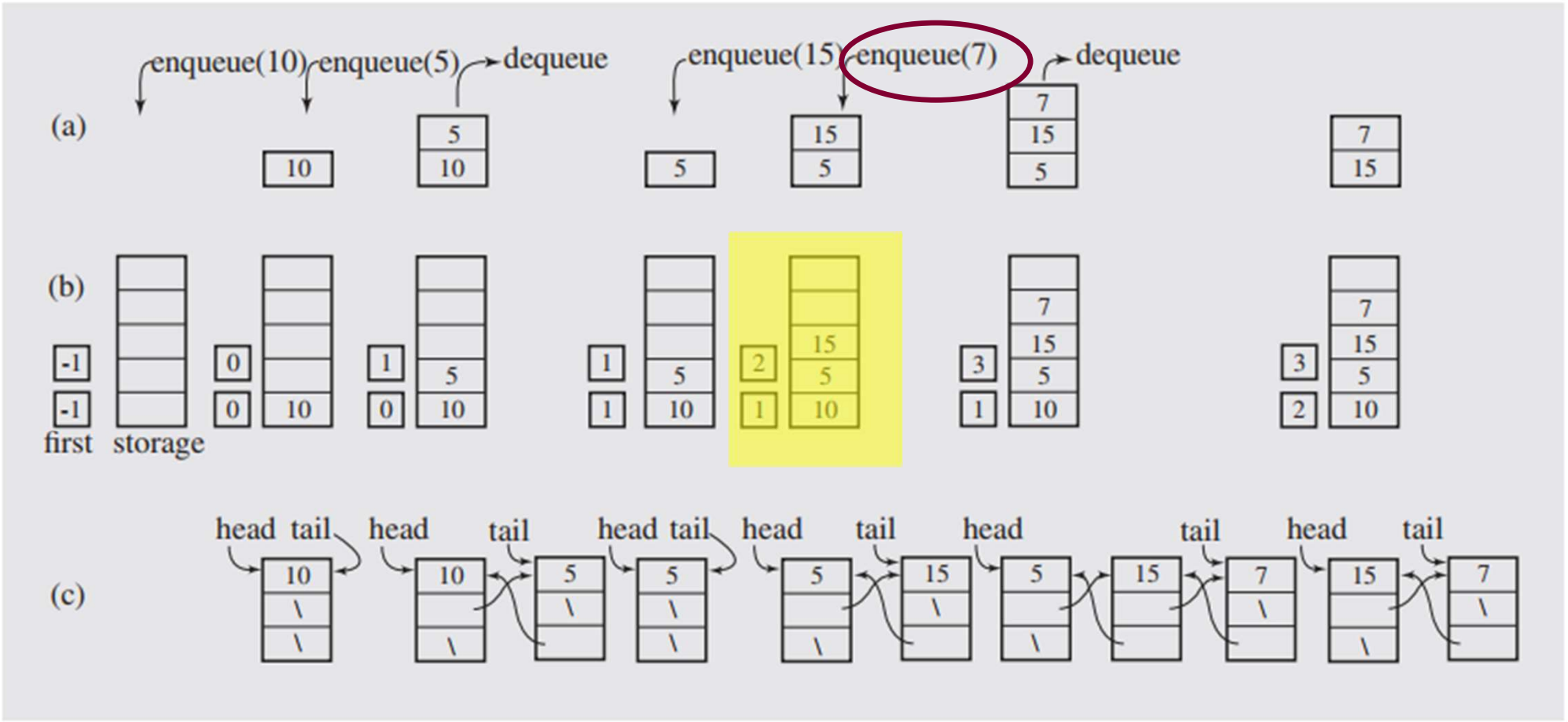

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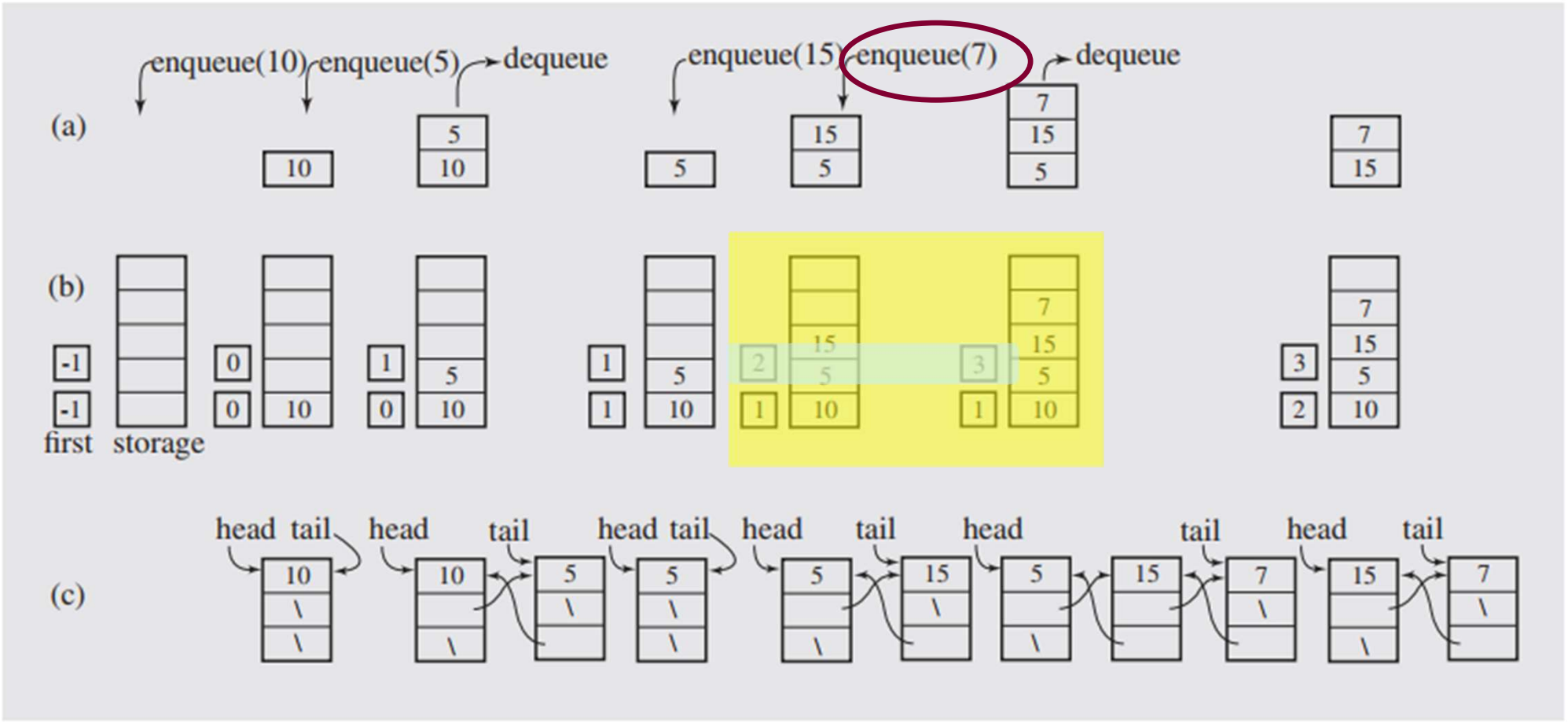

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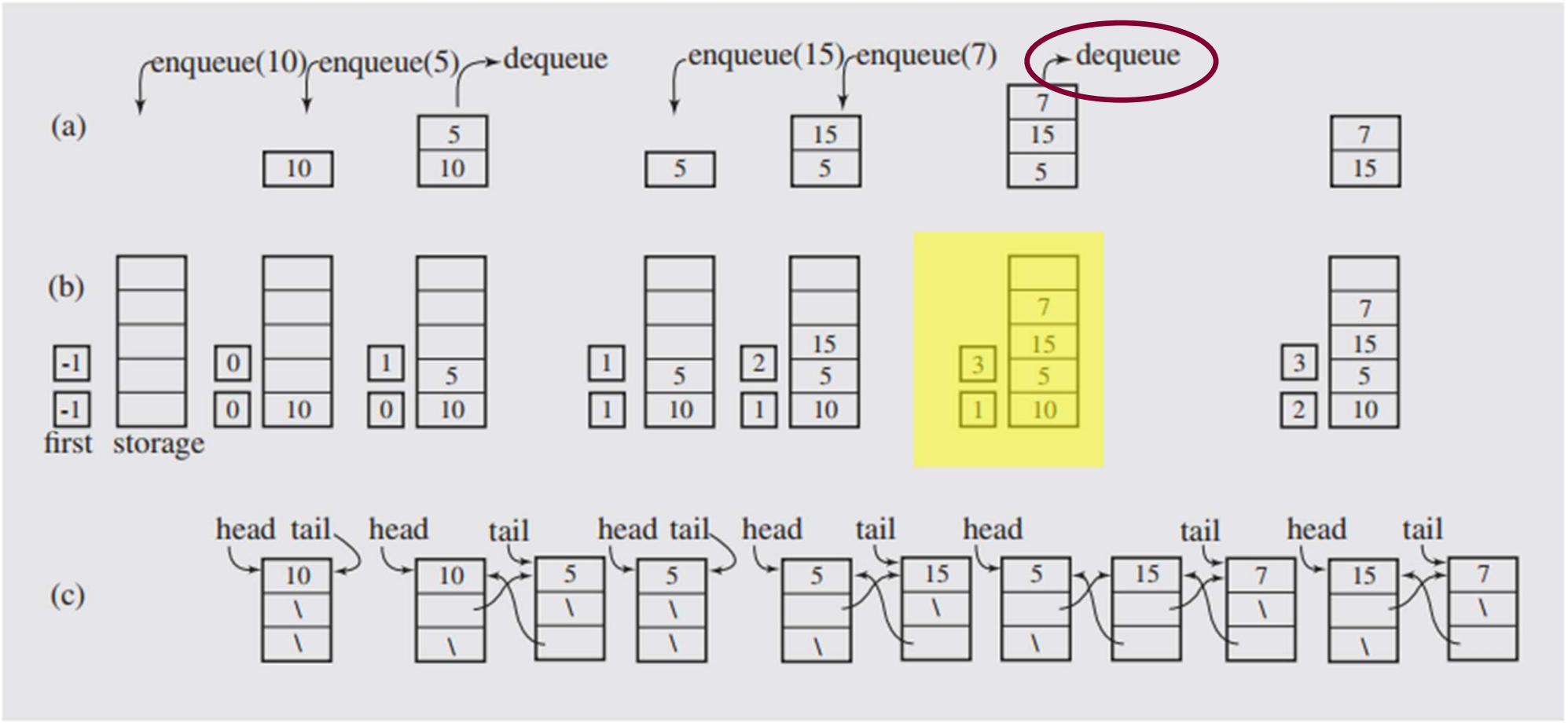

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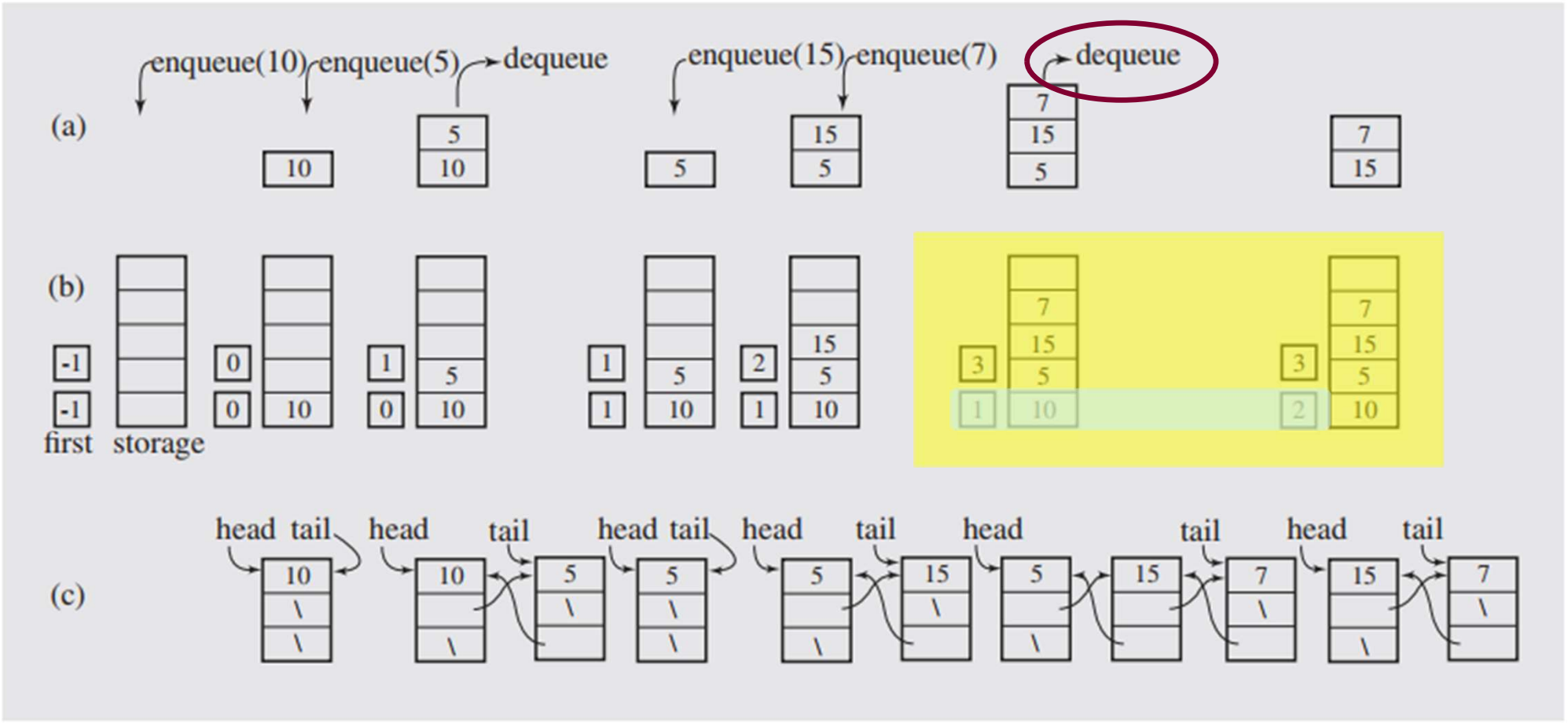
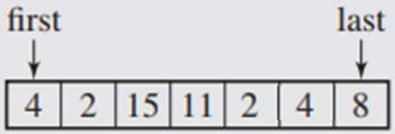
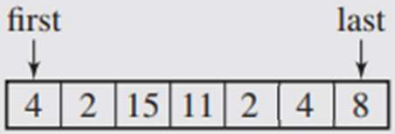


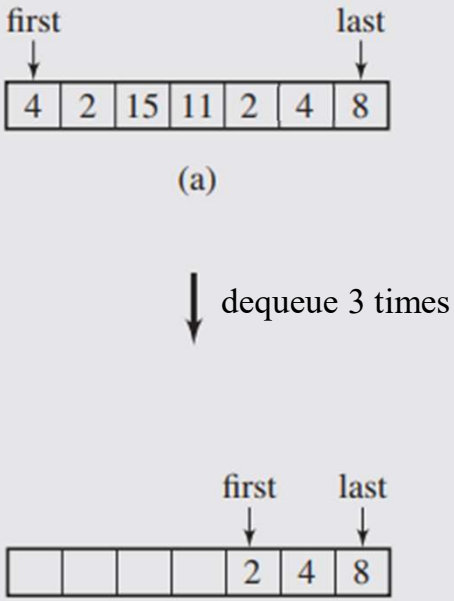


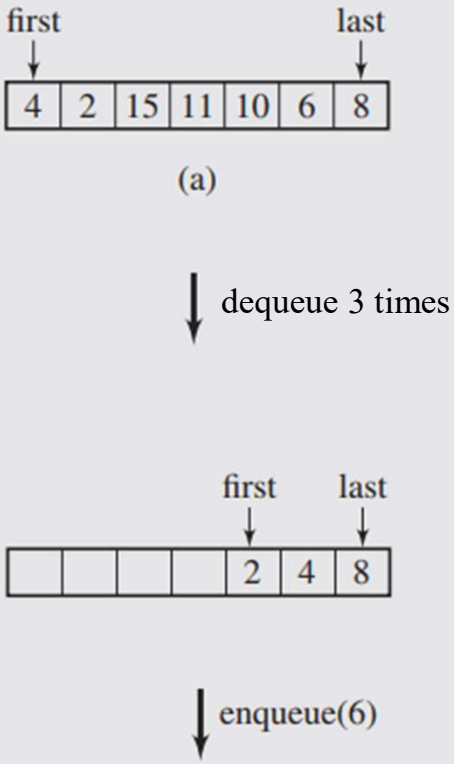
(a)

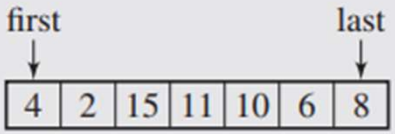


(a)

dequeue 3 times


first
last
4 2 15 11 2 4 8
(a)
dequeue 3 times
first
last
2 4 8


first
last
4 2 15 11 10 6 8
(a)
dequeue 3 times
first
last
2 4 8
enqueue(6)



(a)

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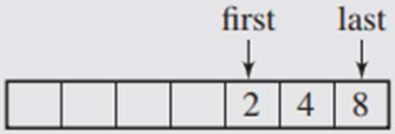
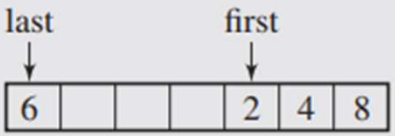
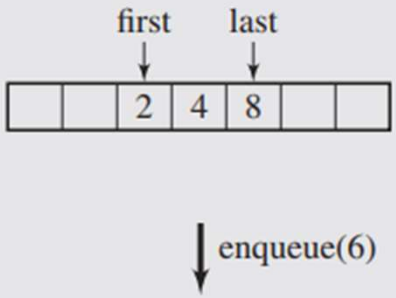


enqueue(6)



(d)



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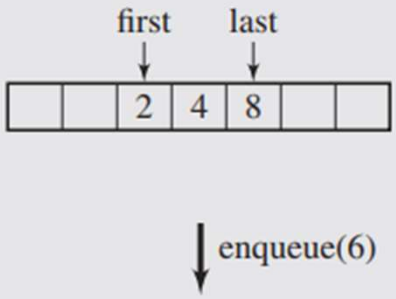
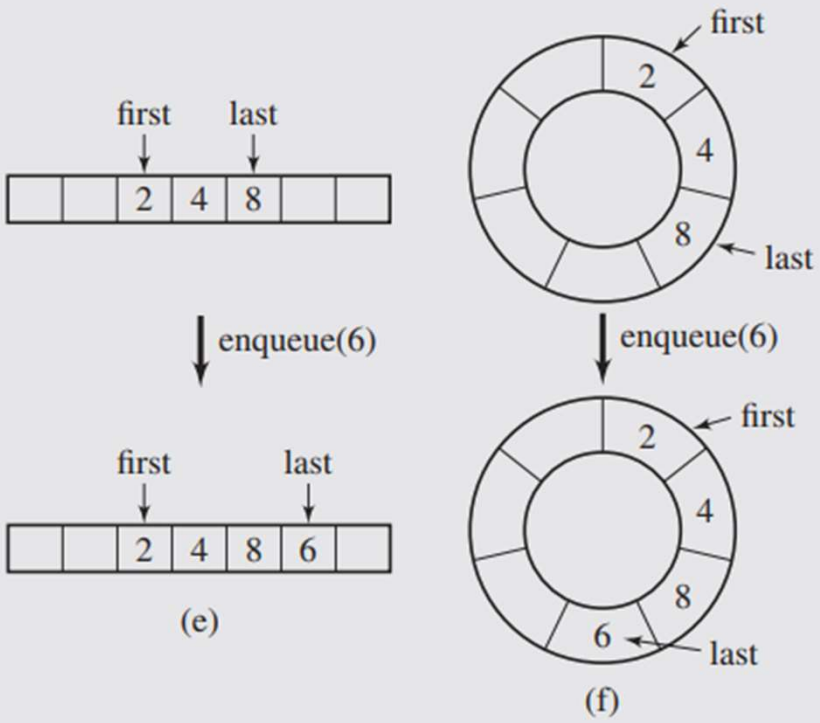


(e)



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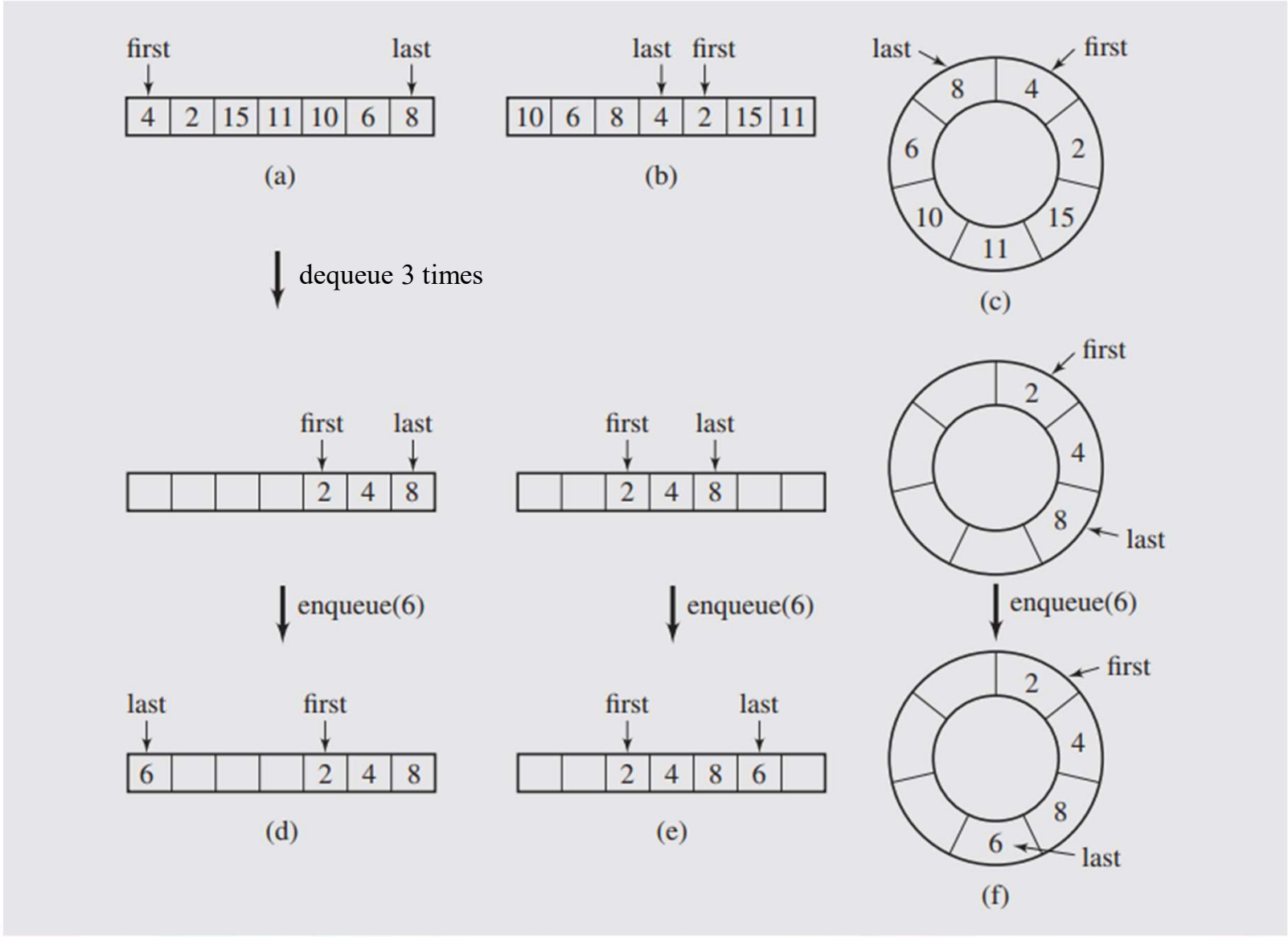

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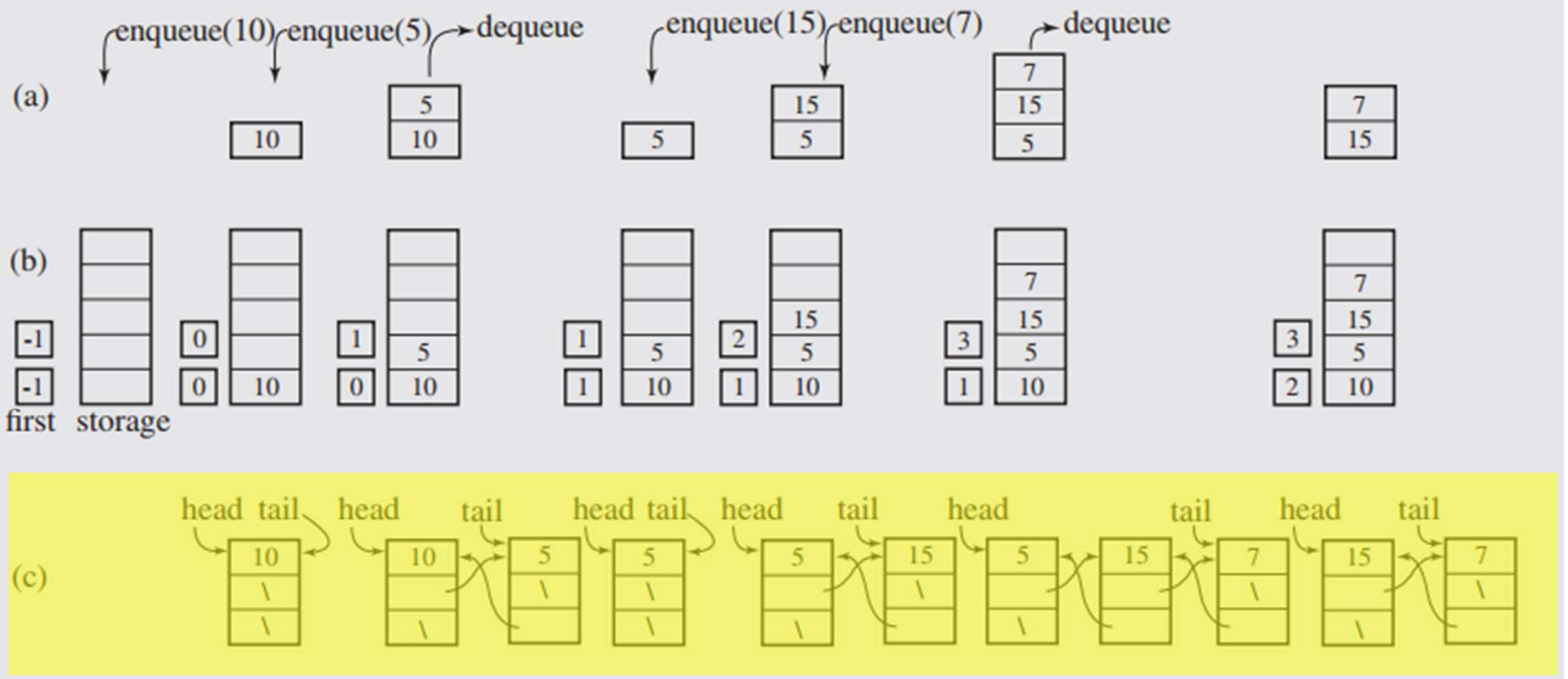

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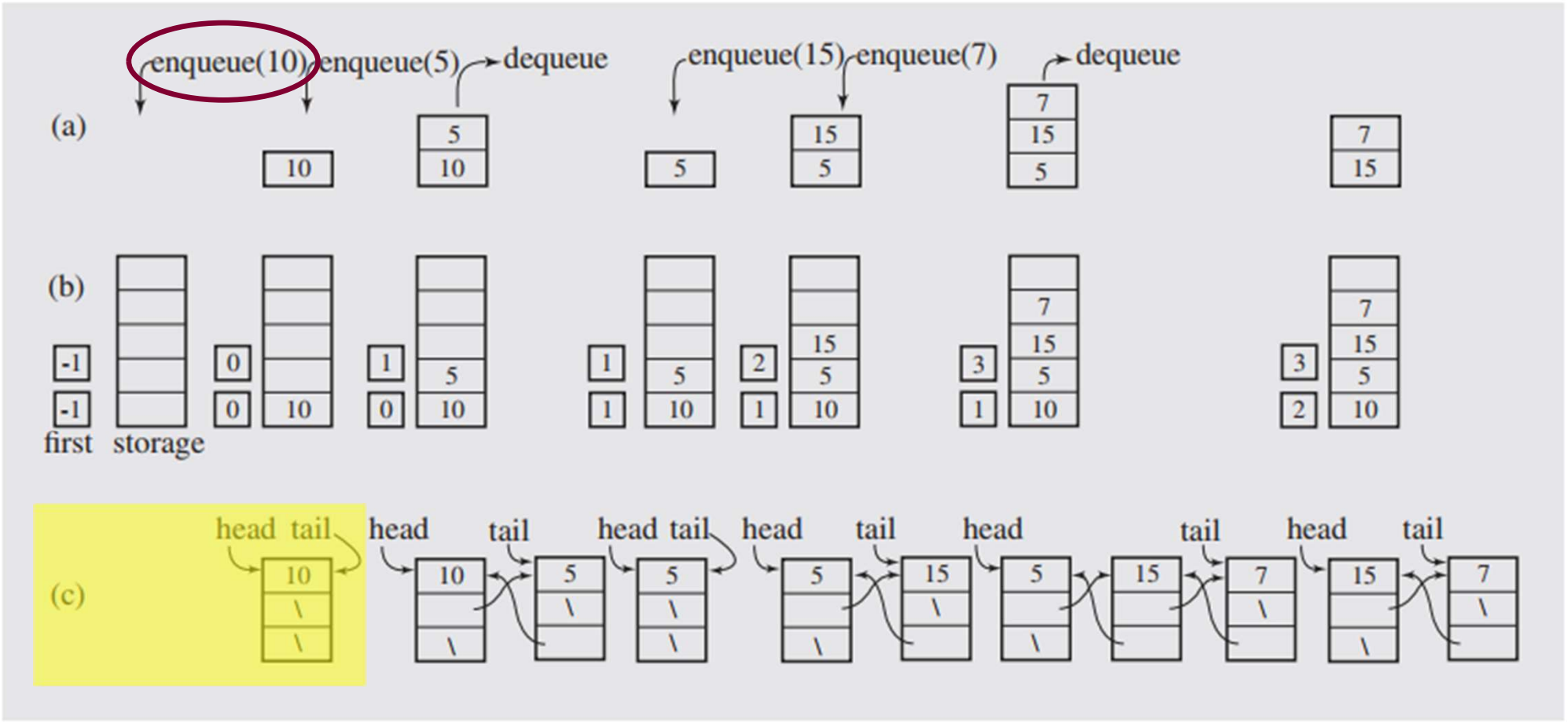

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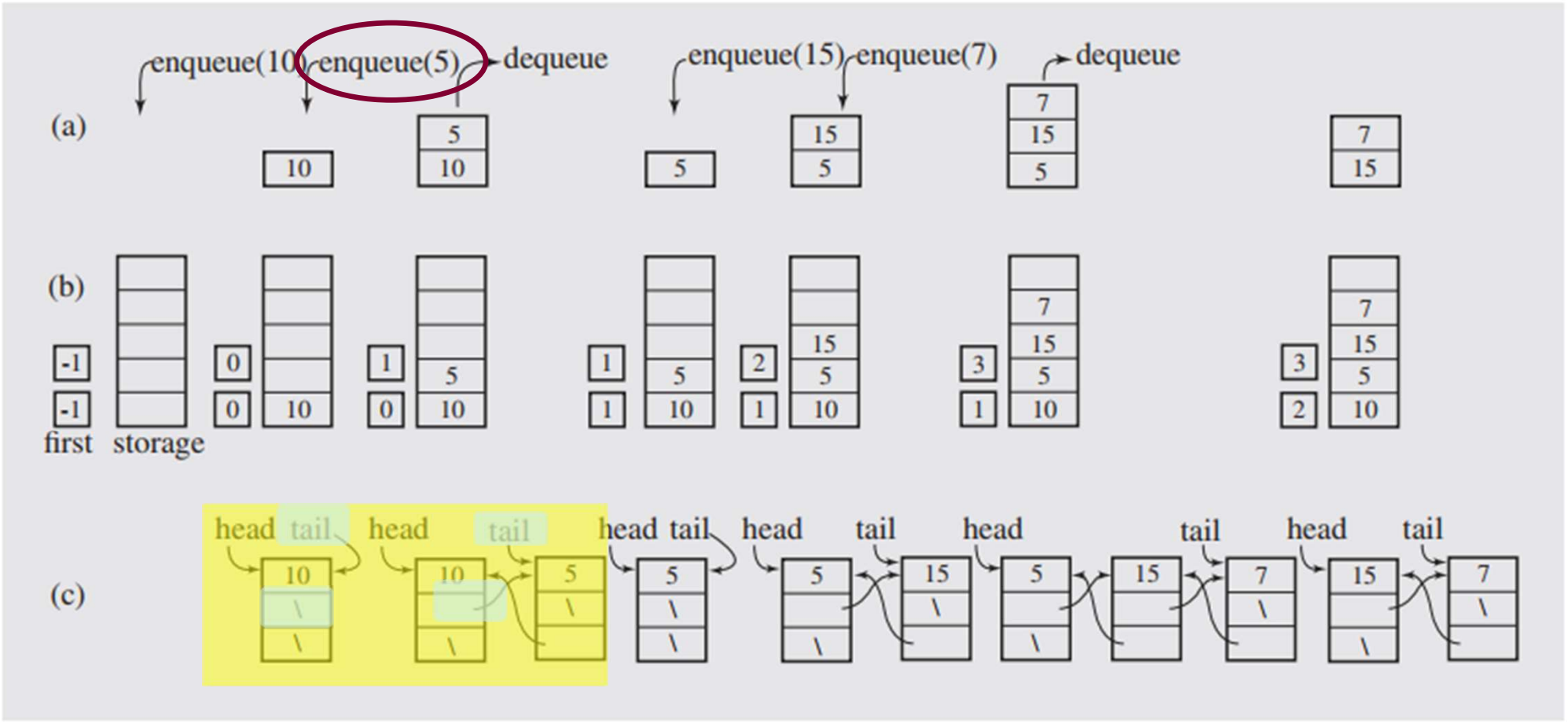

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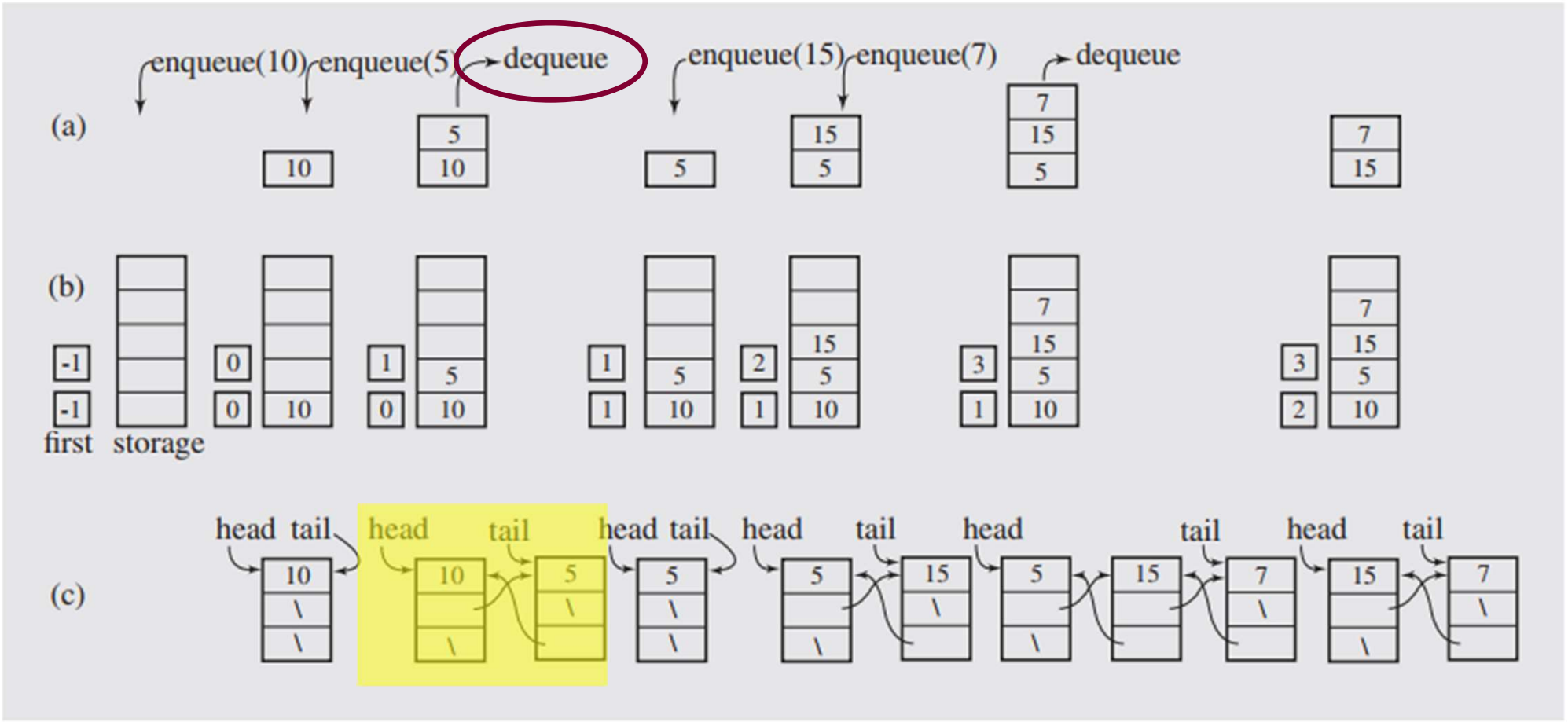

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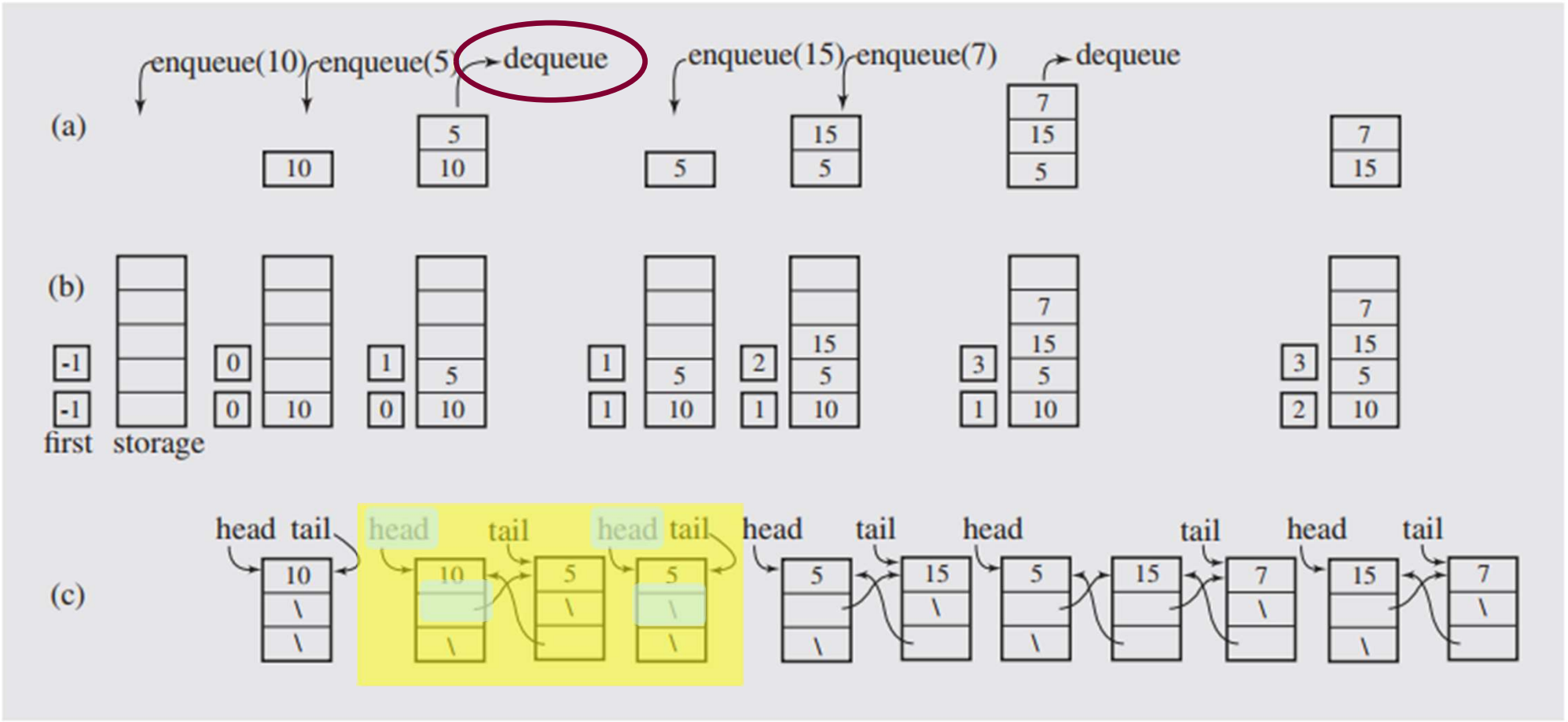

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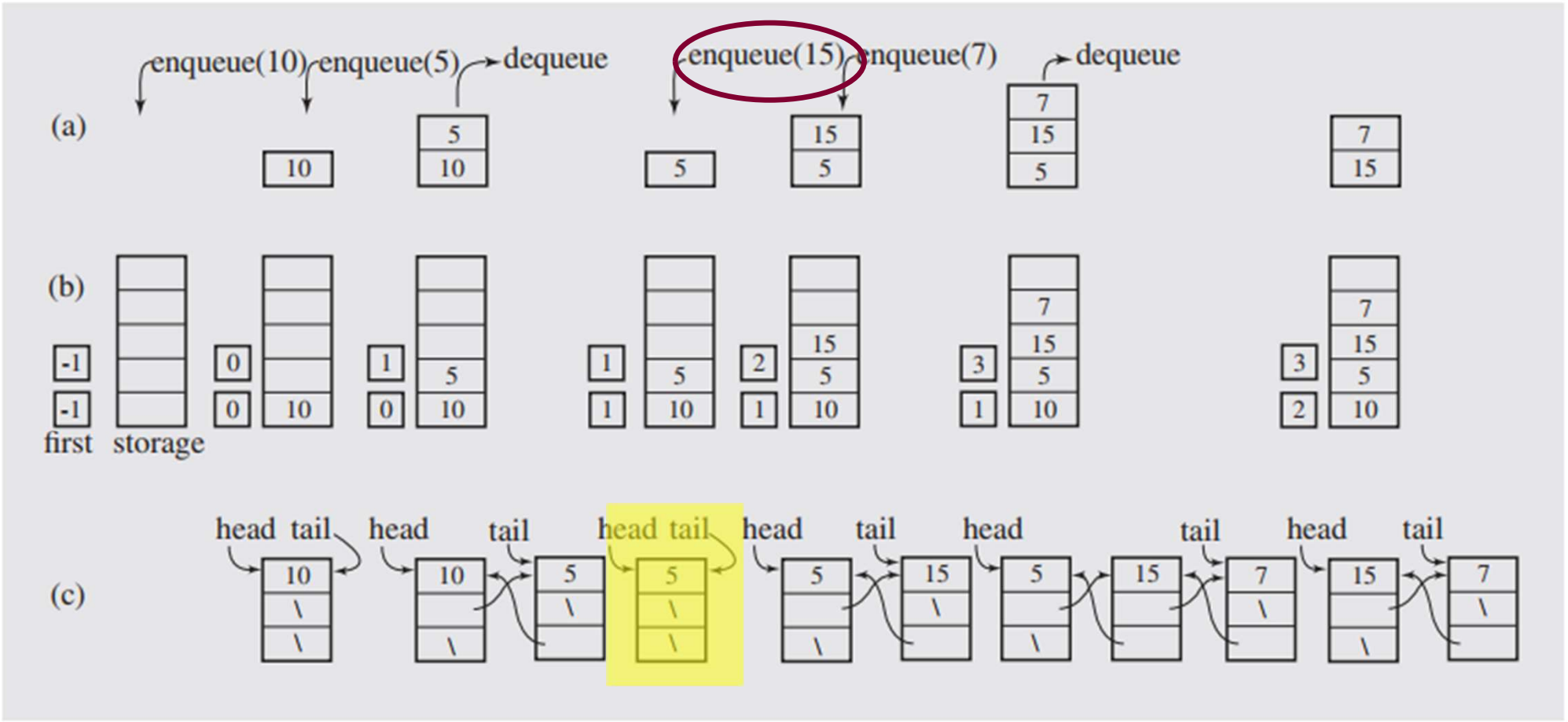

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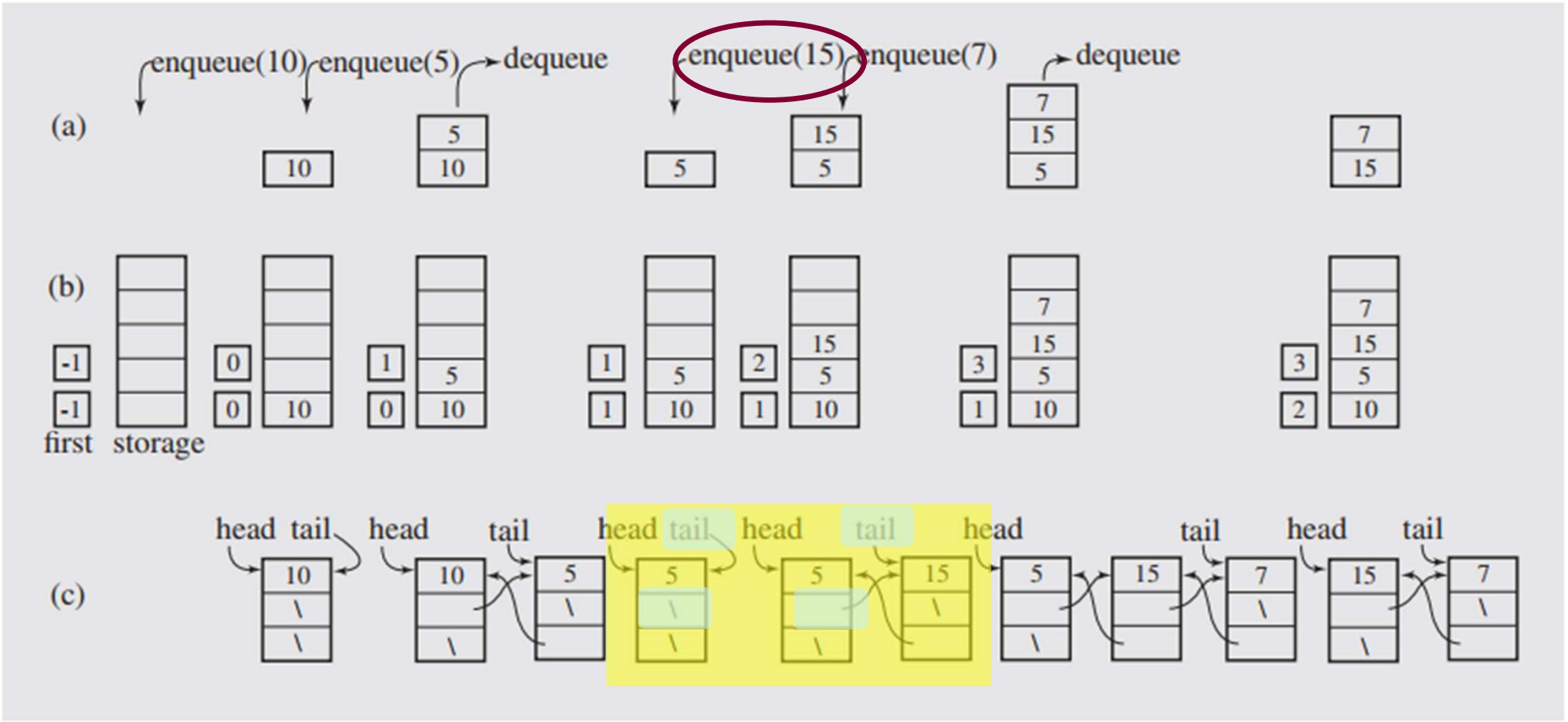
FIGURE 4.11 A series of operations executed on (a) an abstract queue and the queue implemented (b) with an array and (c) with a linked list.



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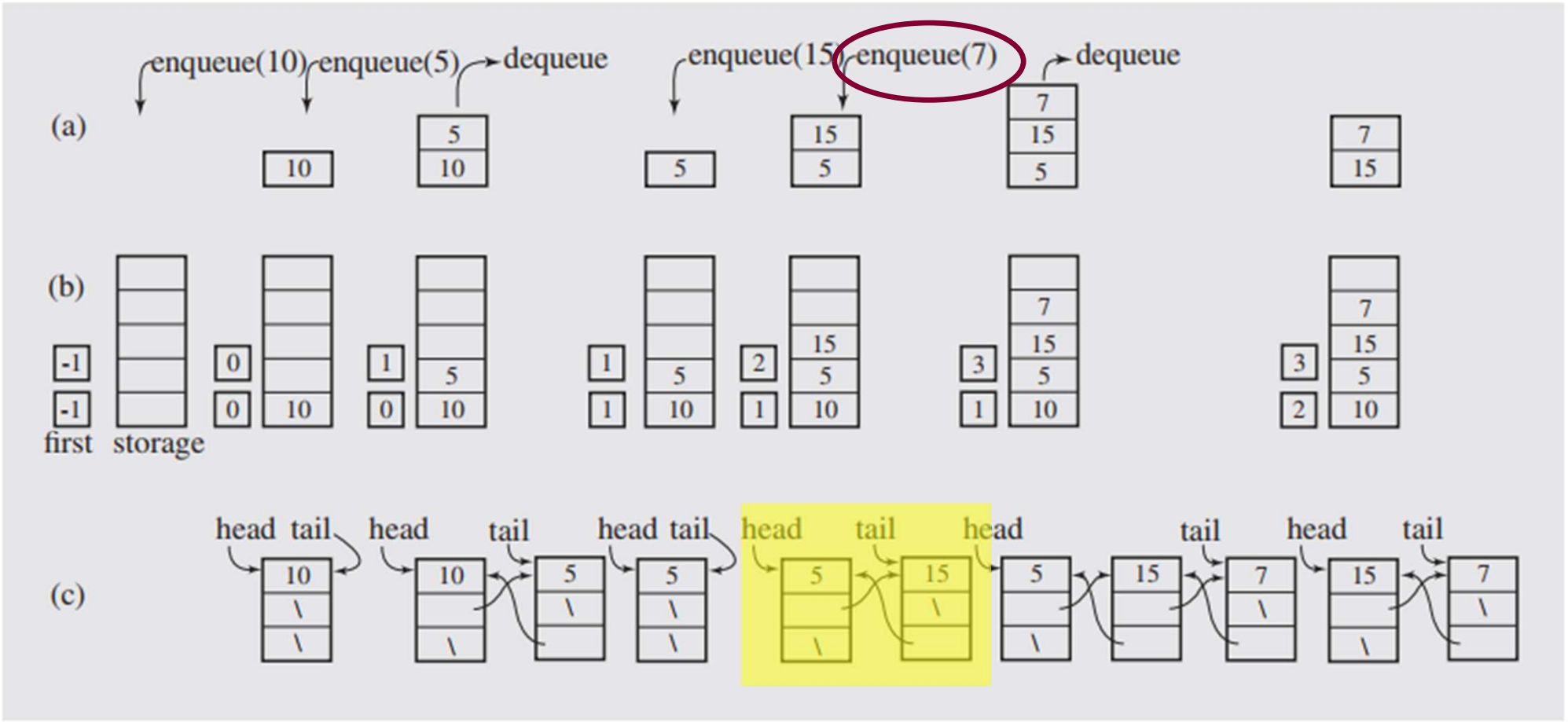

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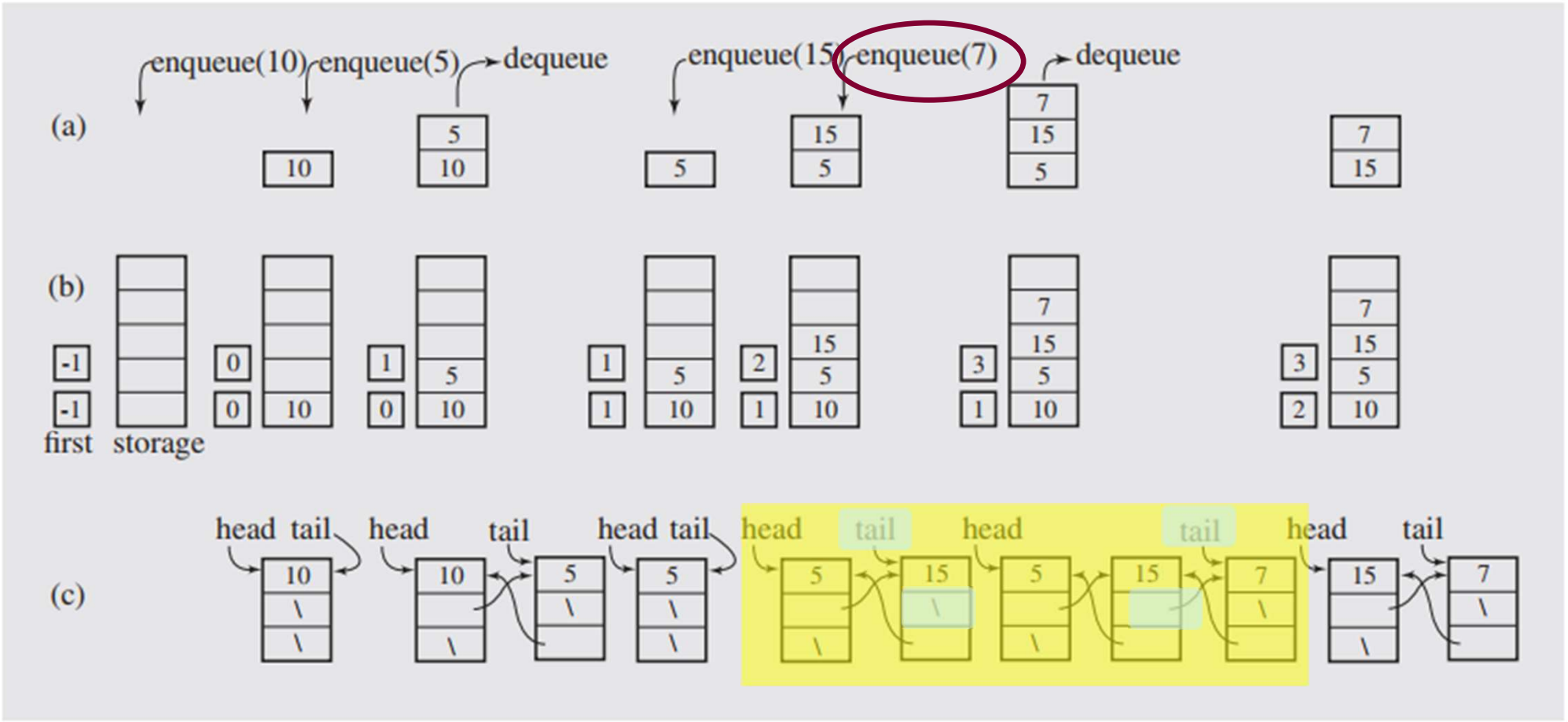

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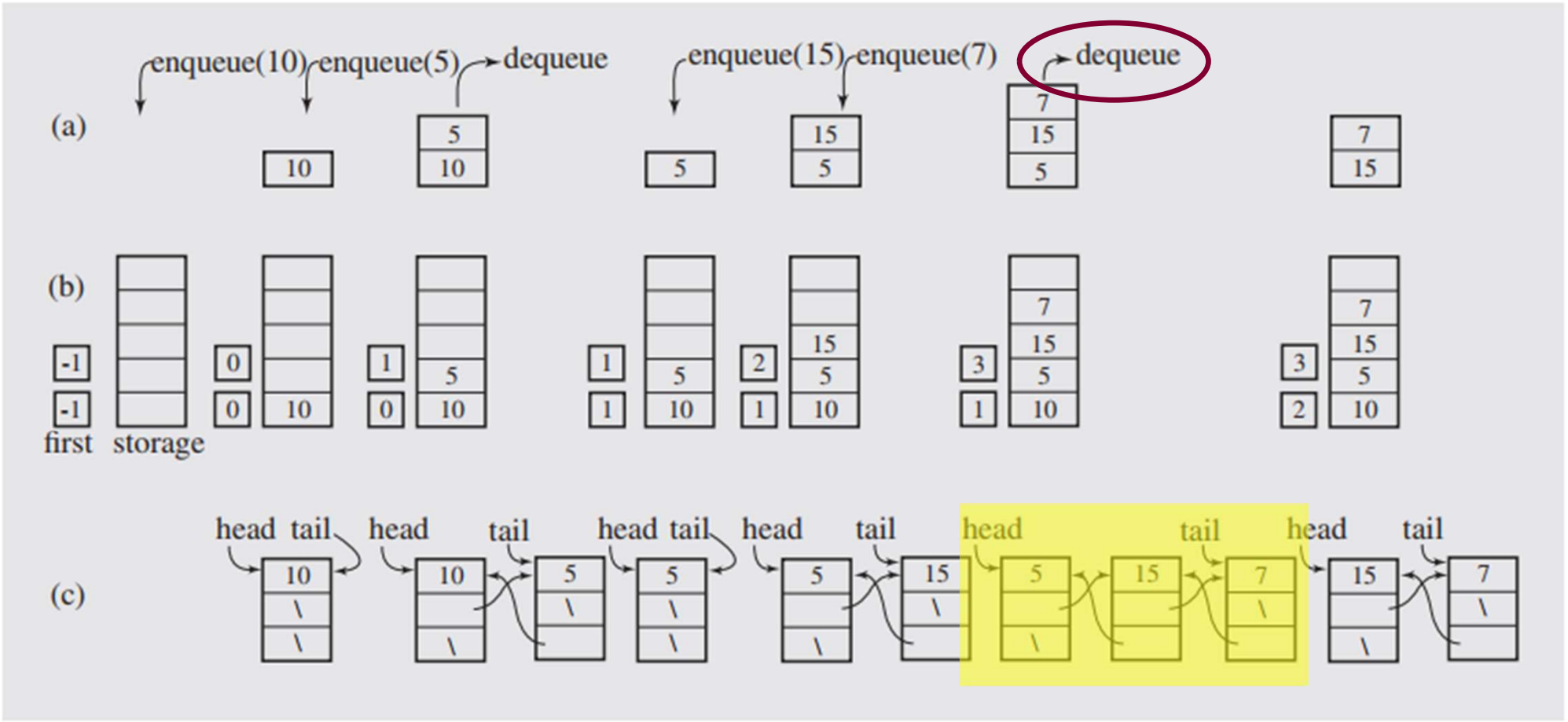

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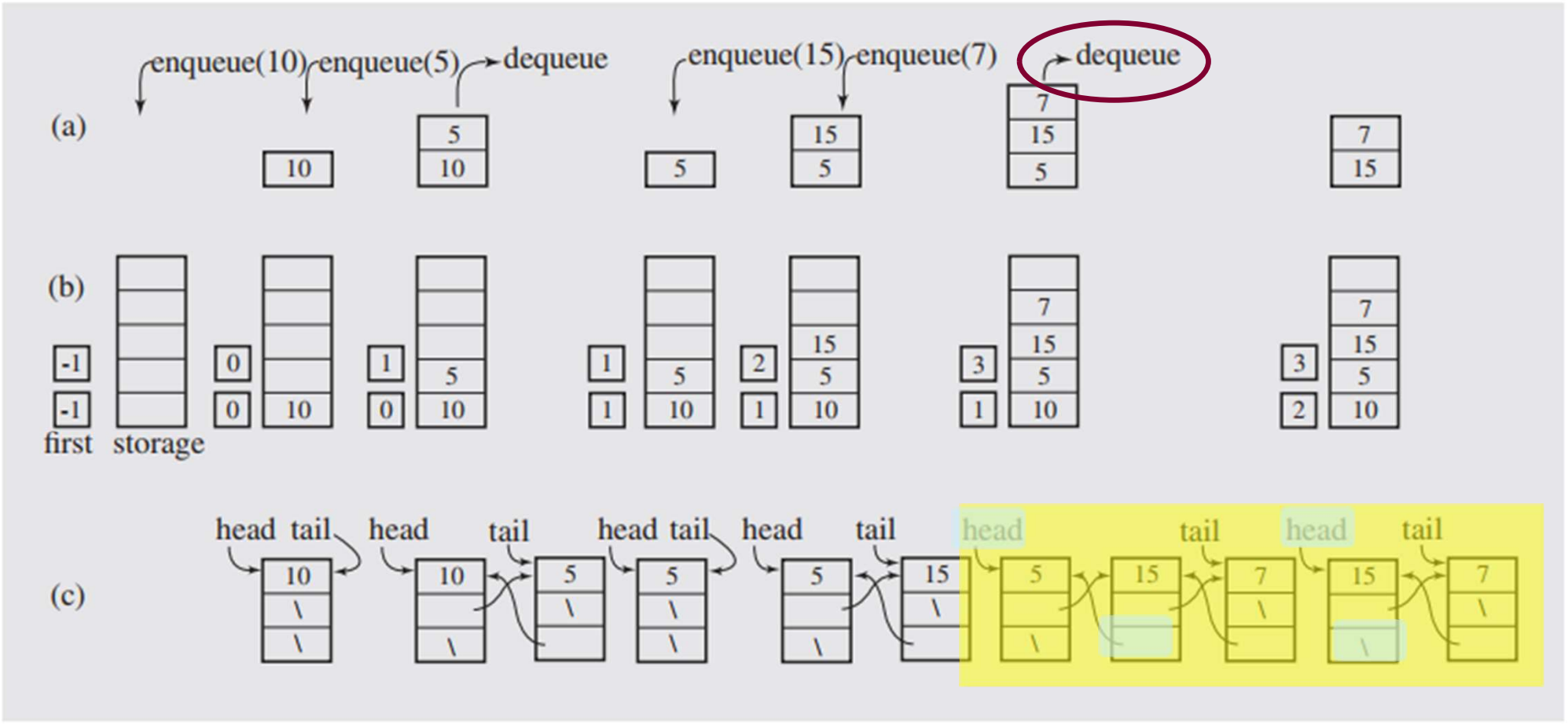

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Queue Applications

- Printer's jobs
  - When jobs are submitted to a printer, they are arranged in order of arrival. Thus, essentially, jobs sent to a printer are placed on a queue.
- Real-life line
  - For instance, lines at ticket counters are queues, because service is first-come first-served.
- File server
  - Users on other machines are given access to files on a first-come first-served basis.

Queue Implementations

- Simple circular array-based implementation
- Linked list implementation

Ref. Karumanchi, 2017: Data Structures And Algorithms Made Easy

Queue – Linked List Implementation

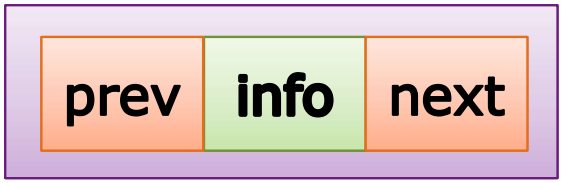
- Doubly Linked List with only
  - Insert Last → add, enqueue
  - Delete first → del, dequeue
- L.first replaced by Q.head
- L.last replaced by Q.tail

ADT Queue Element

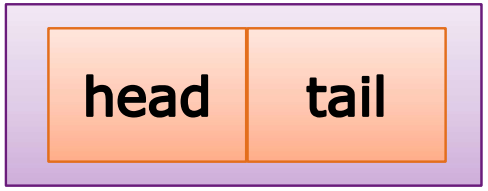
```
type Infotype : integer
type Address : pointer to ElmQueue

type ElmQueue <
   info : Infotype
   next : Address
   prev : Address
>

type Queue: <
    head: address
    tail : address
 >
```



ElmQueue



Queue

Queue Operations (Primitives)

- Put the element el at the end of the queue.
- Take the first element from the queue.
- Check to see if the queue is empty.
- Return the first element in the queue without removing it.
- Return the number of element in the quee.

Question?

Referensi

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THANK YOU