Algorithms → Limited access data types → Queue

Theory: Queue

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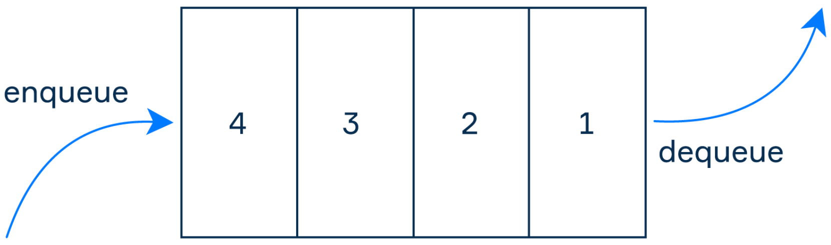
§1. Essentials

A **queue** is a fundamental data structure with two basic operations: **enqueue** which inserts an element and **dequeue** which removes an element. Elements are inserted to the end of a queue and removed from the top of it. This rule is known as **First In First Out**, or **FIFO** (or, alternatively, **Last In Last Out**, **LILO**).

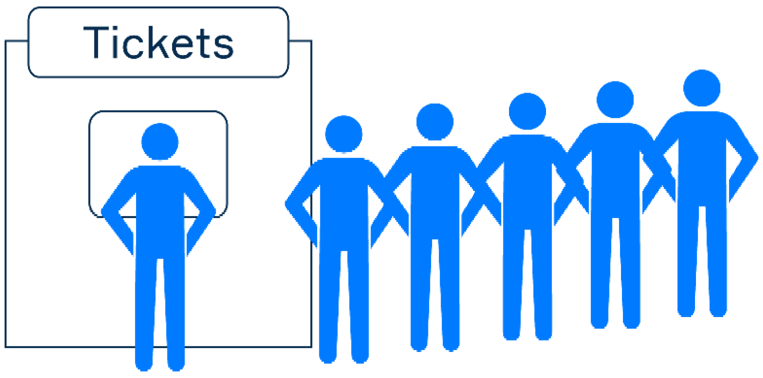
The following image demonstrates how a queue works:



Here, element **1** was added before any other, and hence it will be dequeued first. At the same time, element **4** was added last and it is last to be dequeued.

§2. Real queues, virtual queues

Even if you do opt for an easier word "line", you still probably know what a queue is: according to Cambridge Dictionary, it is "a row of people waiting for something, one behind the other". Let's imagine a queue as a line of people in a movie theatre. The first one in line is the first one to enter the theater: first come first served, as we sometimes say in life. This is exactly how the FIFO principle works when we're speaking about queues in programming.



As you see, by analogy, queues are often used in programming. The operating system on your computer, for instance, uses a queue to store keystroke data as you type on the keyboard. Recall typing something in a text editor while the computer is busy doing another task: the keystrokes still aren't lost. This happens because the system stores them in queue order until they can be processed.

§3. Complexity

In the case of using a linked list or a classic array (non-resizable) as an internal structure, both **enqueue** and **dequeue** operations always take constant **O(1)** time. It does not depend on how many elements are in the queue, therefore the operations are very quick.

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