

Abstract Types

A *queue* Q is a list of elements from a universe. The *front* position is the first position, and the *back* position is the end position.

Abstract Operations

Let Q be a queue, and e be an element.

- $\text{EMPTY}(Q)$ returns true if and only if Q is an empty queue.
- $\text{FRONT}(Q)$ returns the element which resides at the front position. An `UNDERFLOW_ERROR` occurs if Q is empty.
- $\text{DEQUEUE}(Q)$ deletes the element which resides at the front position in Q . An `UNDERFLOW_ERROR` occurs if Q is empty.
- $\text{ENQUEUE}(Q, e)$ inserts the element e into the queue Q at the back position. An `OVERFLOW_ERROR` occurs if Q cannot physically “expand” to include e .