A **linear list** is a sequence of $n \geq 0$ nodes `X[1],X[2],...,X[n]` whose essential structural properties involve only the relative positions between items as they appear in a line. The only thing we care about in such structures are the facts that, if $n > 0$, `X[1]` is the first node and `X[n]` is the last node; and if $1 < k < n$, the kth node `X[k]` is preceded by `X[k-1]` and followed by `X[k+1]`.

The operations we might want to perform on linear lists include:

i) Gain access to the kth node of the list to examine and/or to change the contents of its fields.

ii) Delete the kth node.

iii) Delete the kth node.

iv) Combine two or more linear lists into a single list.

v) Split a linear list into two or more lists.

vi Make a copy of a linear list.

vii Determine the number of nodes in a list.

viii Sort the nodes of the list into ascending order based on certain fields of the nodes.

ix Search the list for the occurrence of a node with a particular value in some field.

In operations (i), (ii), (iii) the special cases $k = 1$ and $k = n$ are of principal importance, since the first and last iteams of a linear list may be easier to get at than a general element is.

Linear list in which insertions, deletions, and accesses to values occur almost always at the first or last node are frequently encountered, and we give them special names:

A **stack** is a linear list for which all insertions and deletions (and usually all accesses) are made at one end of the list.

A **queue** is a linear list for which all insertions are made at one end of the list; all deletions (and usually all accesses) are made at the other end.

A **deque** ("double-ended queue") is a linear list for which all insertions and deletions (and usually all accesses) are made at the ends of the list.

We write,

$$A \Leftarrow x$$

(when A is a stack) to mean that the value x is *inserted* on top of a stack A, or (when A is a queue) to mean that x is *inserted* at the rear of the queue.

We write,

$$x \Leftarrow A$$

to mean that the variable x is set equal to the value at the top of stack A or at the front of queue A, and this value is *deleted* from A. This notation is meaningless when A is empty—that is, when A contains no values.

If A is a nonempty stack, we may write

$$top(A)$$

to denote its top elementi.