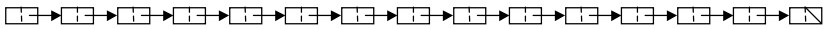
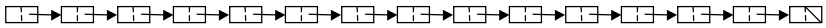


CSE 373: Queues

Chapter 3

Queue:



Queue Operations

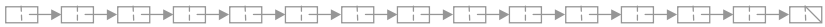
Main Operations:

```
void Enqueue(Queue,QType);
QType Dequeue(Queue);
QType Front(Queue);
int IsEmpty(Queue);
```

Other Operations:

- normal creation/deletion operations
- again, generally no iteration operations

Queue Example



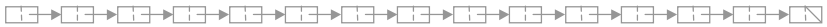
```
Queue Q;
int frontval, newval;

Q = NewQueue();
Enqueue(Q,1);
Enqueue(Q,1);
for (i=2;i<n;i++) {
  frontval = Dequeue(Q);
  newval = frontval + Front(Q);
  Enqueue(Q,newval);
}
```


List-based Queue Implementation

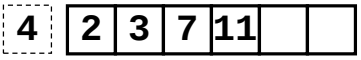
- As with Stacks, Queues are a specialized List
  - **`Push()`** = **`Insert()`** at a specific end of the list
  - **`Pop()`** = **`Delete()`** from the *opposite* end
- Thus, Lists could be used to implement the Queue ADT
  - Similar advantages and disadvantages as the Stack case

Array-Based Queue Implementation



Naive approach:

- `Enqueue()` = insert at end of array
- `Dequeue()` = delete from front of array



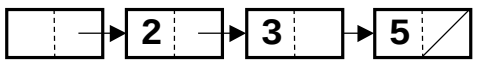
Running Time:

- `Enqueue()`:
- `Dequeue()`:

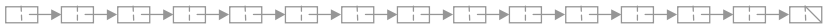
How could we improve this?

Link-Based Queue Implementation

What are the challenges to making a link-based `Enqueue()` and `Dequeue()` efficient?



Evaluating Queue Implementations



List-based *Array-based* *Link-Based*

Operations:

```
Enqueue()
Dequeue()
Front()
IsEmpty()
```

Space:

Other:

Applications of Queues

Anything where "fairness" (FIFO) is required

- **operating systems:** printer queues, storing user input, servers, scheduling processes
- **compilers (and in general):** worklists
- **graphics:** queue of things to render
- **applications:** list of recently used files
- **real-life:** lines at fast-food restaurants, "waiting for next available operator" lists
- **searching:** "breadth-first" searches