# CS 240

## Data Structures and Algorithms I

Alex Vondrak

ajvondrak@csupomona.edu

November 2, 2011

# Course Topics

Topics:

- Arrays (Chapter 3.1)
- Algorithm analysis (Chapter 1.2)
- Searching (Chapter 11.1)
- Generics (Chapter 5)
- Stacks (Chapter 6)
- Queues (Chapter 7)
- Linked lists (Chapter 4)
- Recursion (Chapter 8)
- Hashing (Chapter 11.2–11.5)

Status:

# Course Topics

Topics:

- Arrays (Chapter 3.1)
- Algorithm analysis (Chapter 1.2)
- Searching (Chapter 11.1)
- Generics (Chapter 5)
- Stacks (Chapter 6)
- Queues (Chapter 7)
- Linked lists (Chapter 4)
- Recursion (Chapter 8)
- Hashing (Chapter 11.2–11.5)

Status:

- Done

# Course Topics

Topics:

- Arrays (Chapter 3.1)
- Algorithm analysis (Chapter 1.2)
- Searching (Chapter 11.1)
- Generics (Chapter 5)
- Stacks (Chapter 6)
- Queues (Chapter 7)
- Linked lists (Chapter 4)
- Recursion (Chapter 8)
- Hashing (Chapter 11.2–11.5)

Status:

- Done
- Always doing. . .

# Course Topics

Topics:

- Arrays (Chapter 3.1)
- Algorithm analysis (Chapter 1.2)
- Searching (Chapter 11.1)
- Generics (Chapter 5)
- Stacks (Chapter 6)
- Queues (Chapter 7)
- Linked lists (Chapter 4)
- Recursion (Chapter 8)
- Hashing (Chapter 11.2–11.5)

Status:

- Done
- Always doing. . .
- A little bit. . .

# Course Topics

Topics:

- Arrays (Chapter 3.1)
- Algorithm analysis (Chapter 1.2)
- Searching (Chapter 11.1)
- Generics (Chapter 5)
- Stacks (Chapter 6)
- Queues (Chapter 7)
- Linked lists (Chapter 4)
- Recursion (Chapter 8)
- Hashing (Chapter 11.2–11.5)

Status:

- Done
- Always doing. . .
- A little bit. . .
- Done

# Course Topics

Topics:

- Arrays (Chapter 3.1)
- Algorithm analysis (Chapter 1.2)
- Searching (Chapter 11.1)
- Generics (Chapter 5)
- Stacks (Chapter 6)
- Queues (Chapter 7)
- Linked lists (Chapter 4)
- Recursion (Chapter 8)
- Hashing (Chapter 11.2–11.5)

Status:

- Done
- Always doing. . .
- A little bit. . .
- Done
- Done

# Course Topics

Topics:

- Arrays (Chapter 3.1)
- Algorithm analysis (Chapter 1.2)
- Searching (Chapter 11.1)
- Generics (Chapter 5)
- Stacks (Chapter 6)
- Queues (Chapter 7)
- Linked lists (Chapter 4)
- Recursion (Chapter 8)
- Hashing (Chapter 11.2–11.5)

Status:

- Done
- Always doing. . .
- A little bit. . .
- Done
- Done
- Done (?)

# Course Topics

Topics:

- Arrays (Chapter 3.1)
- Algorithm analysis (Chapter 1.2)
- Searching (Chapter 11.1)
- Generics (Chapter 5)
- Stacks (Chapter 6)
- Queues (Chapter 7)
- Linked lists (Chapter 4)
- Recursion (Chapter 8)
- Hashing (Chapter 11.2–11.5)

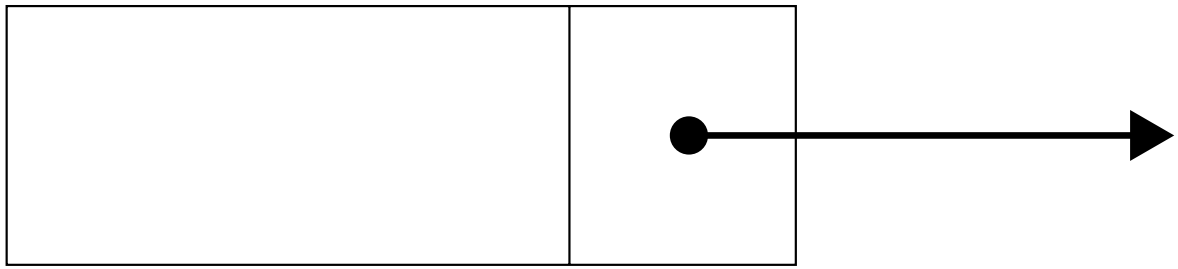
Status:

- Done
- Always doing. . .
- A little bit. . .
- Done
- Done
- Done (?)
- Haven't covered
- Haven't covered
- Haven't covered

# Linked Lists

**Idea:** Represent a sequence of elements by a group of nodes

## Definition



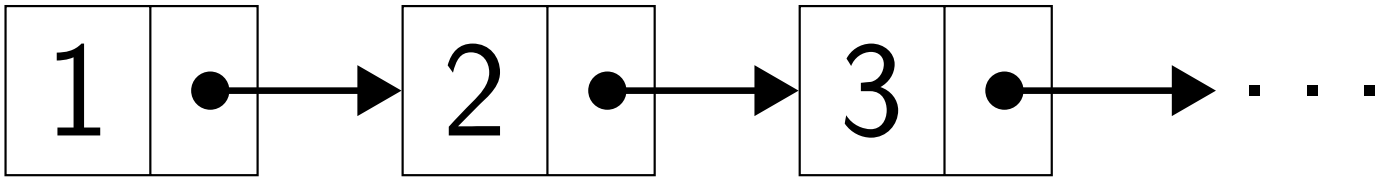
A node (or cons cell) is an object that consists of two parts, which go by several different names:

- `data/link`
- `head/tail`
- `first/rest` (`fst/rst`)
- `car/cdr`

# Linking Nodes

To represent a list of data, we connect together the cons cells via their cdrs.

Example

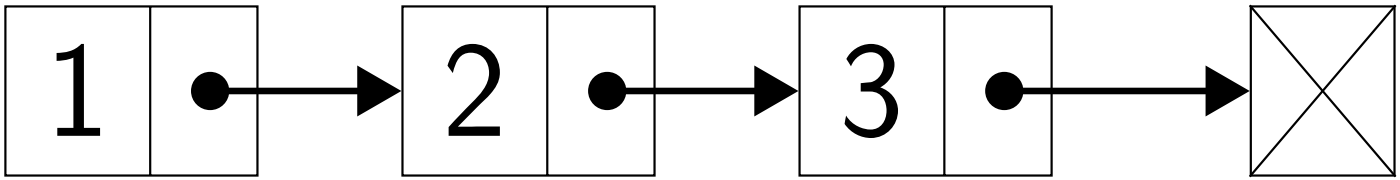



Problem: how do we know when the list ends?

# Null Nodes

To represent the empty list, we use a null cell (a.k.a. nil)

**Example**




This represents the list `(1 2 3)`

# Linked Lists

## Importance

John McCarthy
September 4, 1927–October 24, 2011