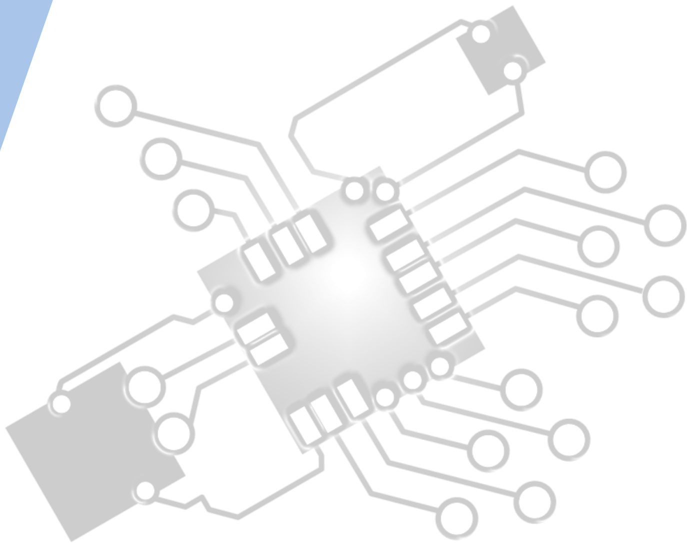
Abstract Data Structures

IB Computer Science



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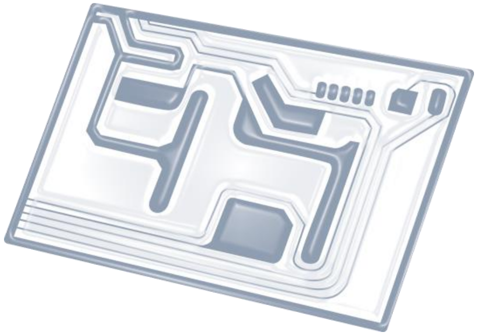
HL Topics 1-7, D1-4



1: System design

2: Computer Organisation

3: Networks

4: Computational thinking

5: Abstract data structures

6: Resource management

7: Control

D: OOP

HL only 5 Overview

Thinking recursively

5.1.1 Identify a situation that requires the use of recursive thinking

5.1.2 Identify recursive thinking in a specified problem solution

5.1.3 Trace a recursive algorithm to express a solution to a problem

Abstract data structures

5.1.4 Describe the characteristics of a two-dimensional array

5.1.5 Construct algorithms using two-dimensional arrays

5.1.6 Describe the characteristics and applications of a stack

5.1.7 Construct algorithms using the access methods of a stack

5.1.8 Describe the characteristics and applications of a queue

5.1.9 Construct algorithms using the access methods of a queue

5.1.10 Explain the use of arrays as static stacks and queues

Linked lists

5.1.11 Describe the features and characteristics of a dynamic data structure

5.1.12 Describe how linked lists operate logically

5.1.13 Sketch linked lists (single, double and circular)

Trees

5.1.14 Describe how trees operate logically (both binary and non-binary)

5.1.15 Define the terms: parent, left-child, right-child, subtree, root and leaf

5.1.16 State the result of inorder, postorder and preorder tree traversal

5.1.17 Sketch binary trees

Applications

5.1.18 Define the term dynamic data structure

5.1.19 Compare the use of static and dynamic data structures

5.1.20 Suggest a suitable structure for a given situation

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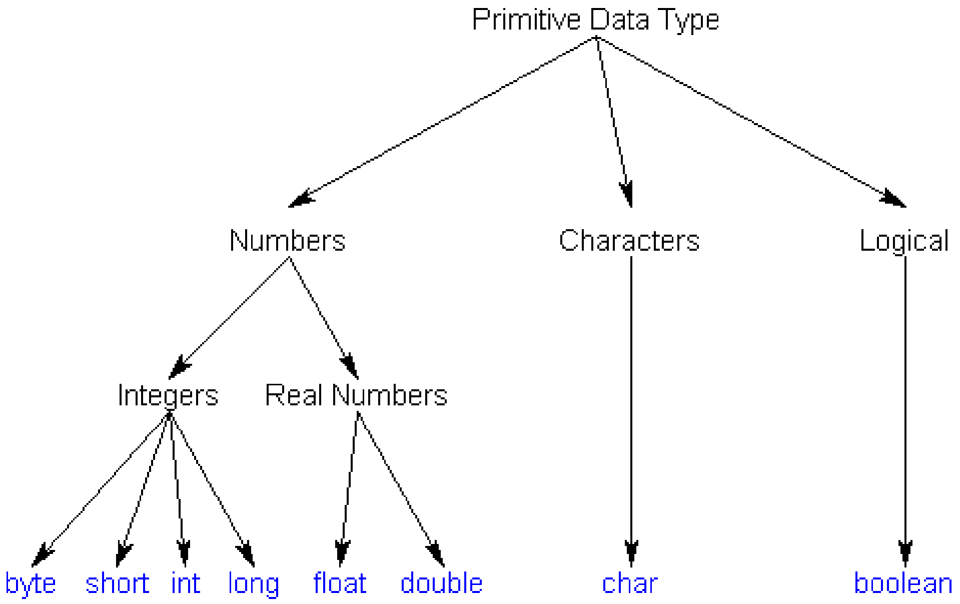
Topic 5.1.11

Describe the **features** and **characteristics** of a **dynamic data structure**

Abstract Data Structures (ADTs)

- 2D array
- **Stack**
- **Queue**
- **Linked List**
- **(Binary) Tree**
- Recursion



Types of data structures

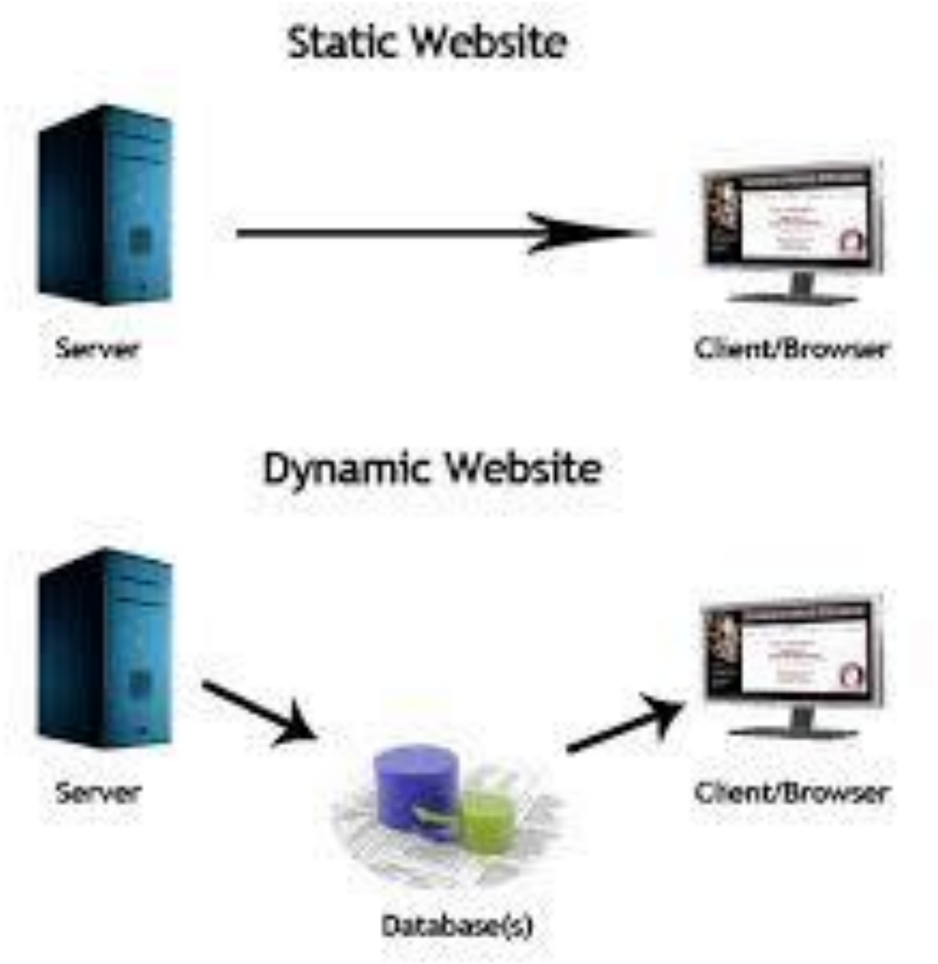
Static

- Size/length is determined at creation
- Might be/might not be good use of memory space
- Associated with FOR loops

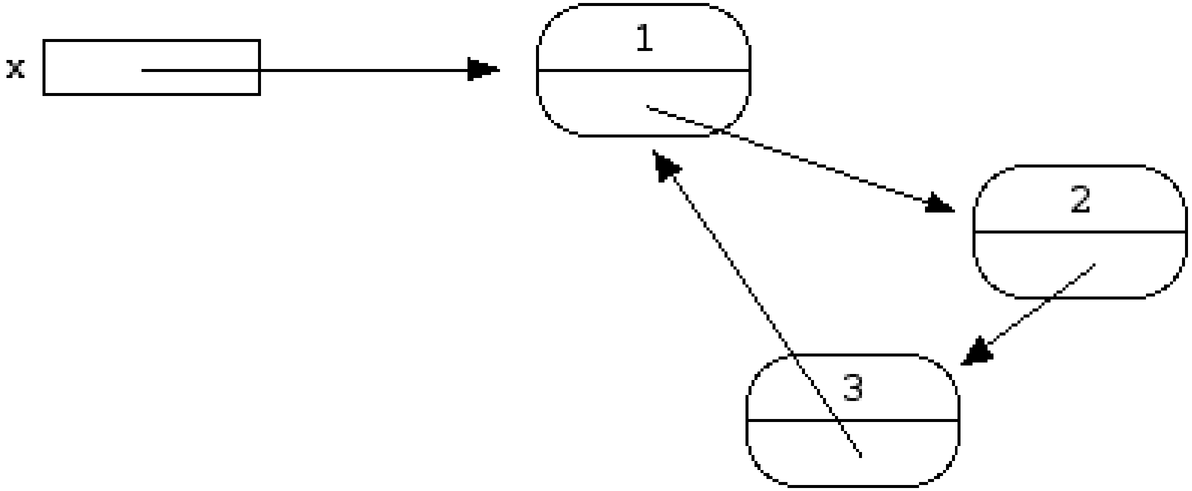
Dynamic

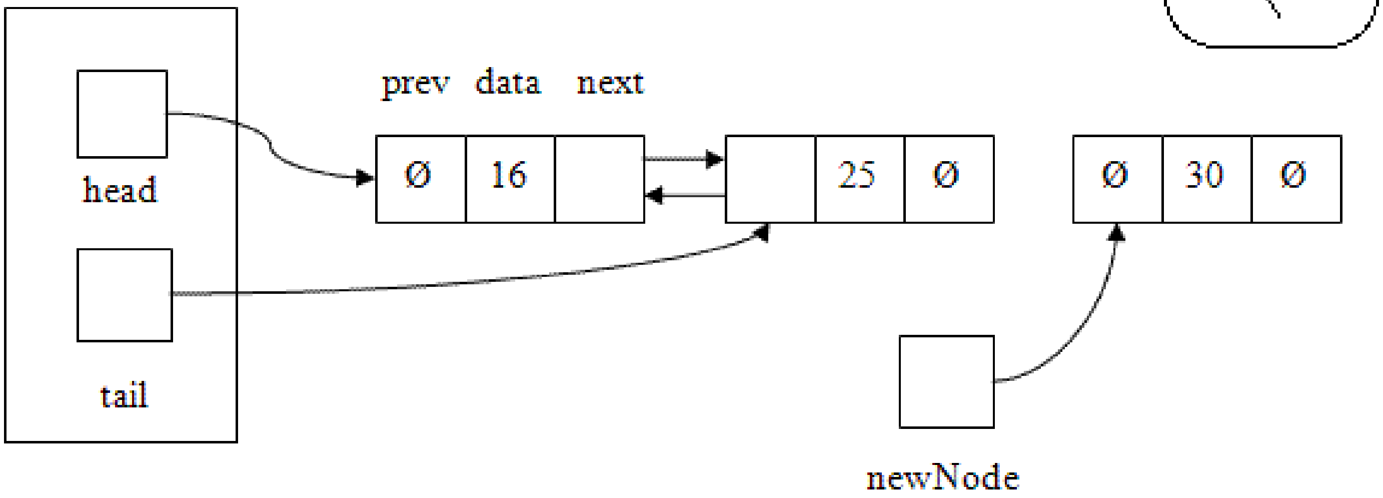
- Size/length is determined by contents
- Uses nodes/pointers
- Usually a good use of memory space
- Associated with WHILE loops

Tangent example (not 5.1.11!)



Nodes and pointers

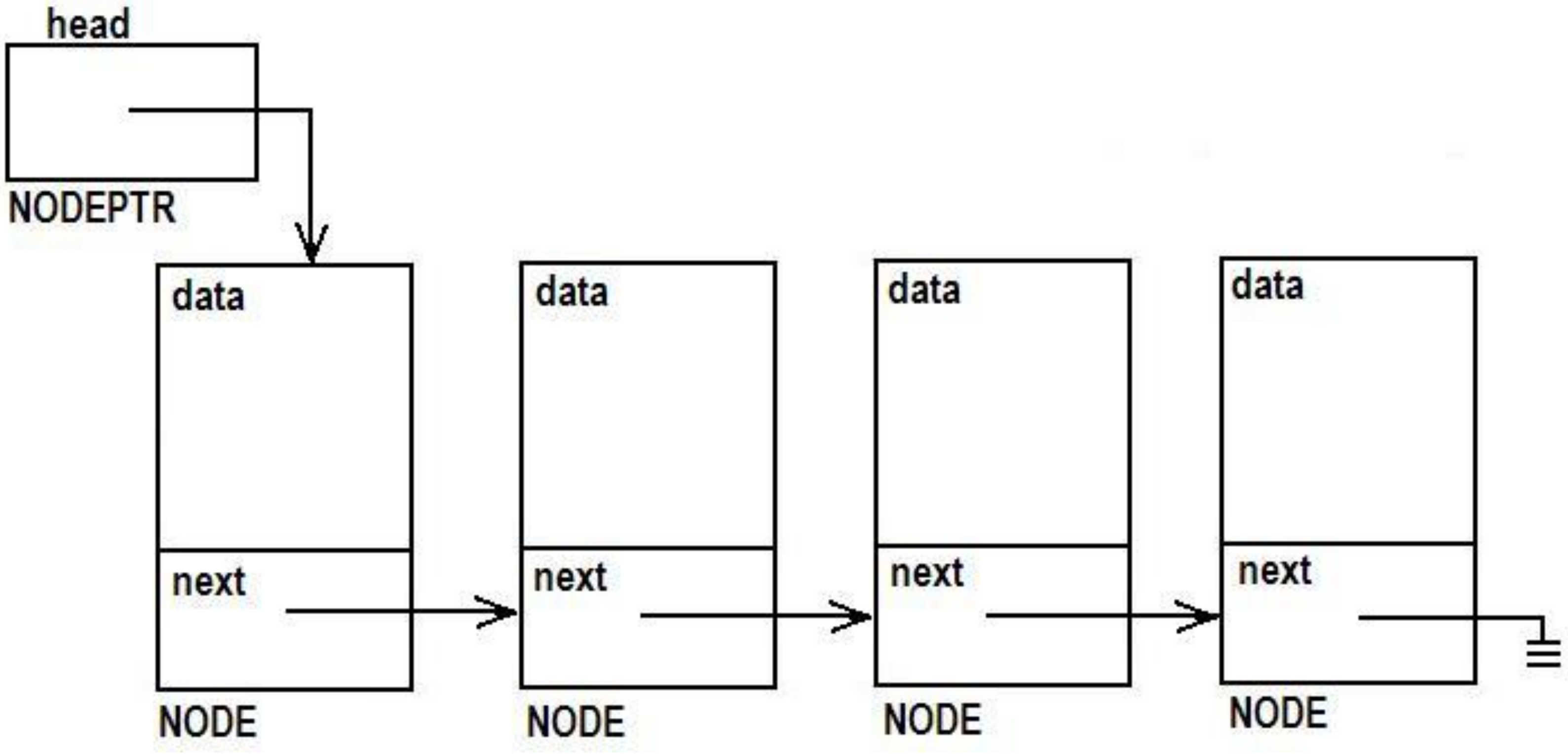




Head = contains pointer to data

Data = contains the data

Tail = contains pointer to next head


head
NODEPTR
data
next
NODE
data
next
NODE
data
next
NODE
data
next
NODE