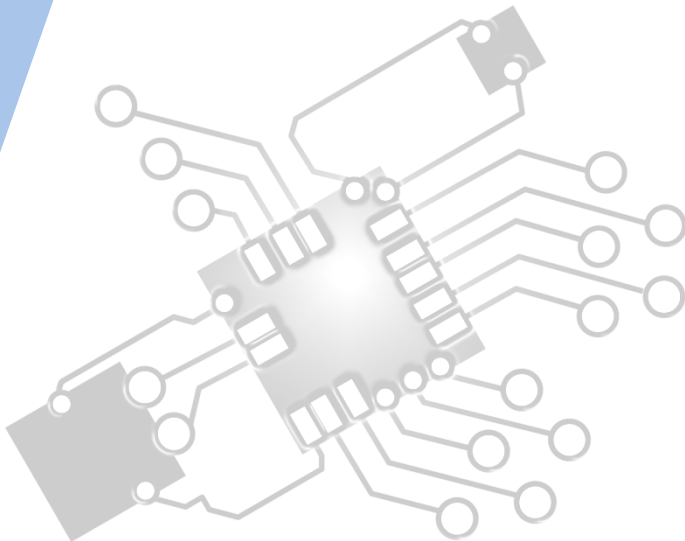




Abstract Data Structures

IB Computer Science



*Content developed by
Dartford Grammar School
Computer Science Department*



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



1: System design

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4: Computational thinking



5: Abstract data structures

6: Resource management



7: Control

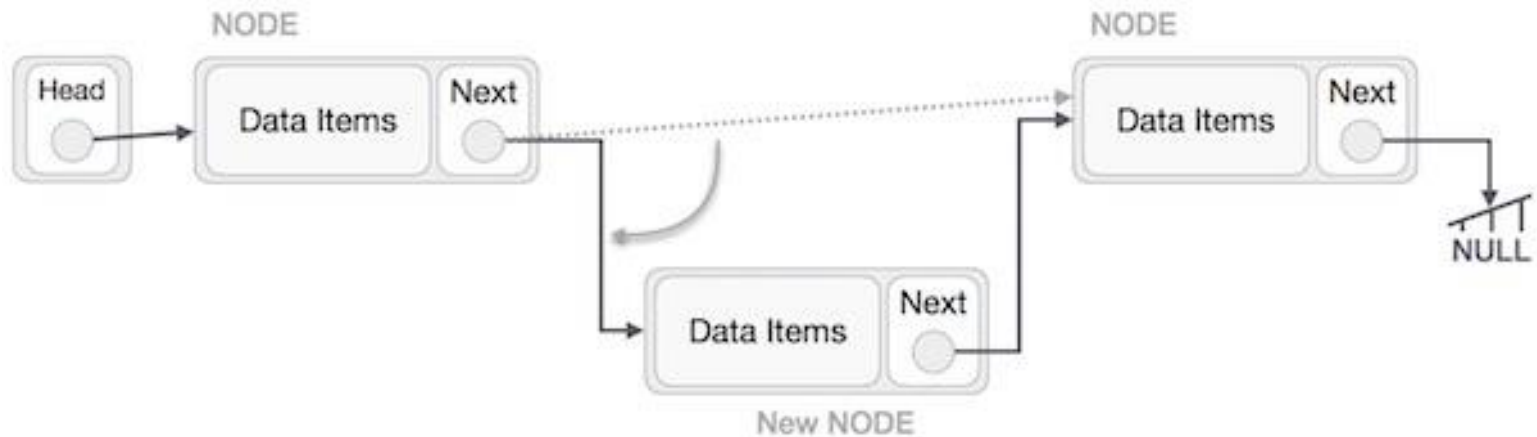
D: OOP





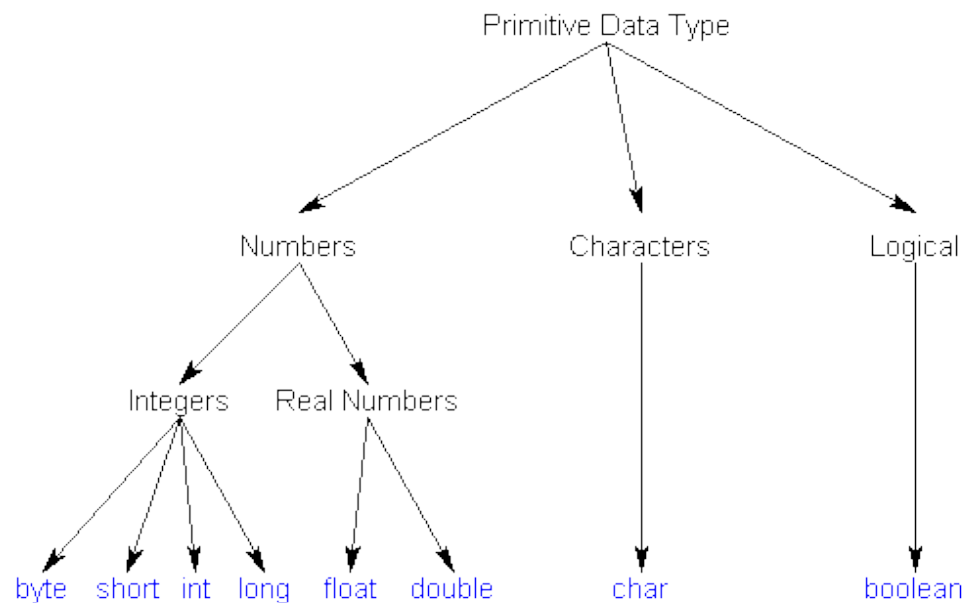
Topic 5.1.13

Sketch linked lists
(single, double and circular)



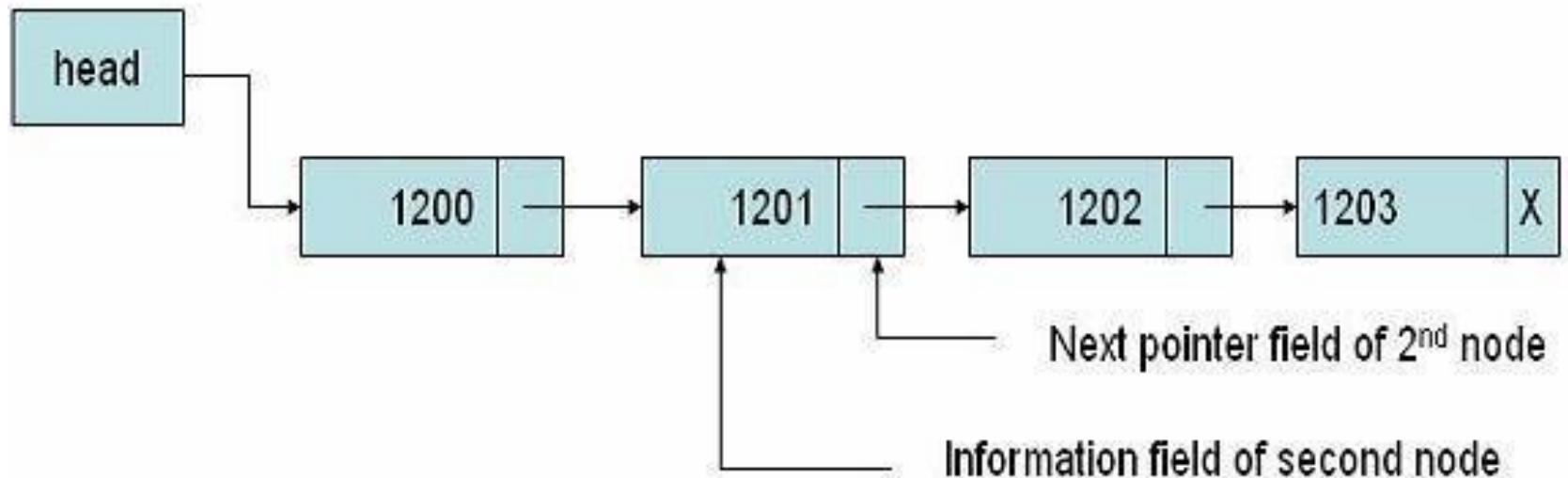
Abstract Data Structures (ADTs)

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



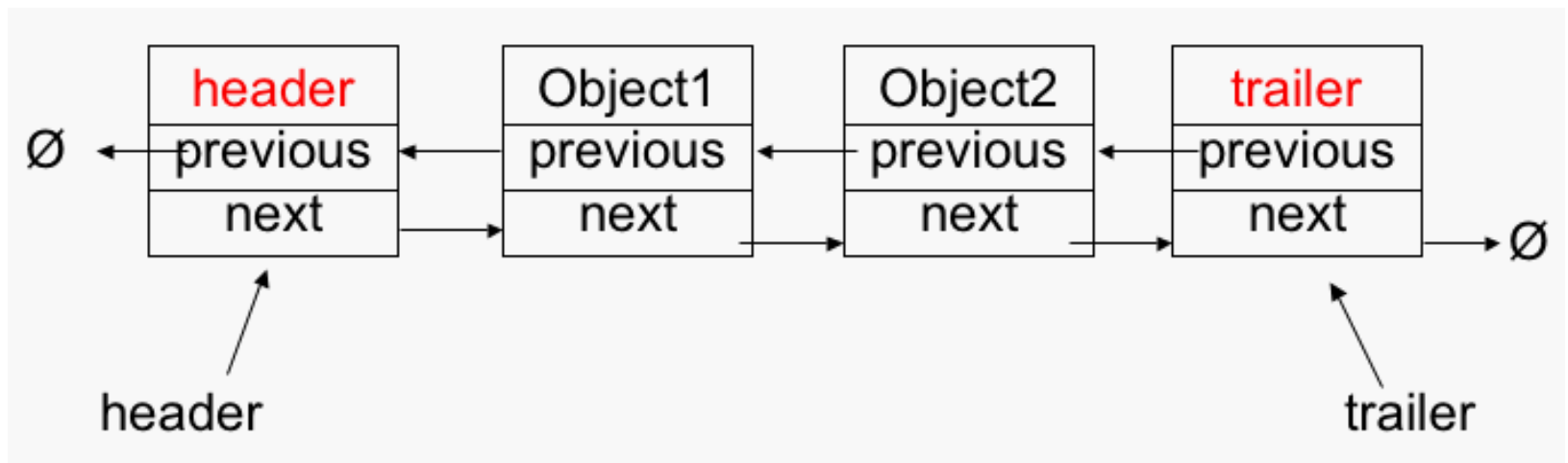
Single linked list (a.k.a. linear lists)

- Single head, single tail (first and last element)
- Each pointer works in one direction only



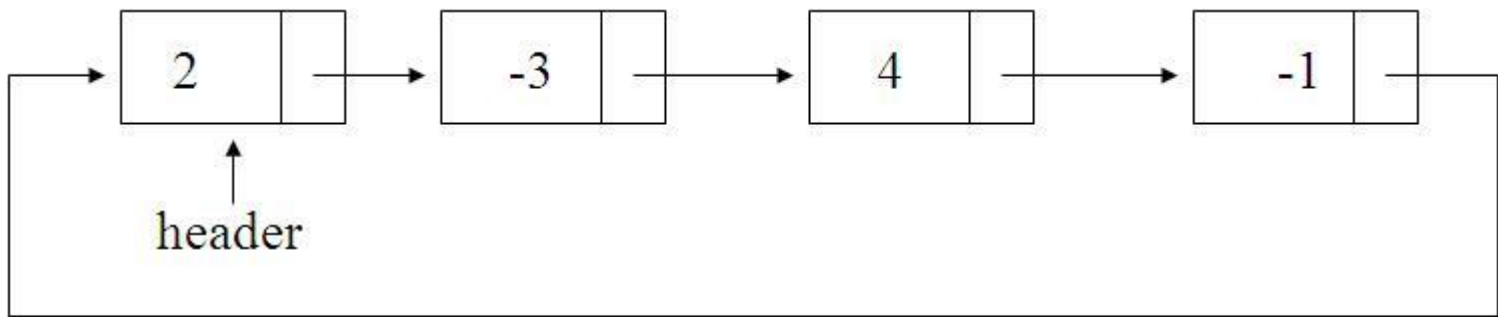
Doubly linked list

- Single head, single tail (first and last element)
- Two pointers for each element (one to next, one to previous)



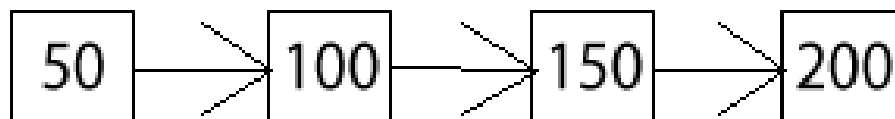
Circular linked list

- Single head
- One pointer for each element (one to next element)
- Last element's pointer points to head (creating a circle)

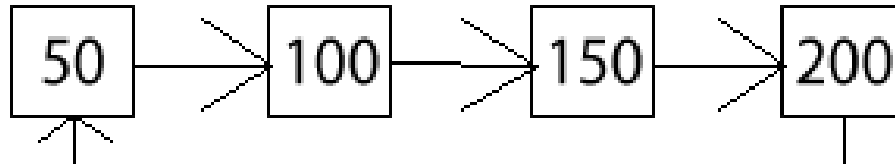


The last node link back to the first (or the header).

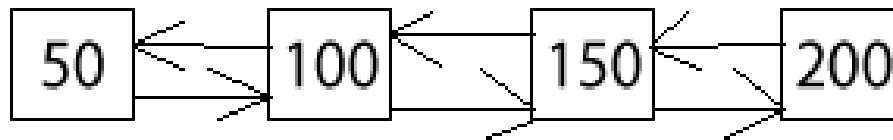
In summary: 3 types of linked lists



Singly Linked List



Singly Circular Linked List



Doubly Linked List