Data types & Structures

- **Simple Data types**
  - Integer
  - Real (single)
  - Boolean
  - Character (String)

- **Complex Data Structures**
  - 1 D Arrays
  - 2 D Arrays
  - Records
  - Stacks
  - Queues
  - Linked lists
  - Arrays of records
Data types & Structures

Arrays

1d
- Can only contain items of the same type
- Size fixed at execution
- Overfilling results in 'overflow errors'
- Each element is accessed by an index value

2d
- Can only contain items of the same type
- Size fixed at execution
- Overfilling results in overflow errors
- Can involve complex indexing to access items
Data types & Structures

Strings

Special array

- A string is a special type of array
- It is essentially an array of characters
Records

- Can contain variables of different types
- Structure of record is declared by the user
- Then an instance of the record is created
- This is basically an array of type record
Linked List

- Dynamic data structure that can grow or diminish in size as needed
- Consists of a node (data item) and a pointer to the next node
- When representing a list the last data item points to a NULL (empty node)
- Items can be reordered by moving the pointer between nodes
- Lists can be uni or bi directional
Stacks

- A data structure that can only be accessed at the top
- Items are added by ‘Pushing’ them onto the stack or removed by ‘Popping’ them off the stack
- When an array is used to implement a stack, it has a fixed size. Trying to Push items onto a full stack results in ‘Stack Overflow’
- Stack Underflow happens when trying to push items off an already empty stack
- A Stack is a LIFO (Last in First out) structure
- Stack requires a stack pointer to point to the top of the stack
Queues

- A data structure that is a FIFO (First in First out) structure
- Items are added at the back and removed from the front (head)
- Queues require 2 **pointers**, 1 to the front and 1 to the back