

# CHAPTER 10: DATA TYPES AND STRUCTURES

## 10.1 DATA TYPES

### 10.1.1 Primitive Data Types

Type	Description
<b>INTEGER</b>	Whole numbers
<b>REAL</b>	Decimal numbers
<b>CHAR</b>	Single character
<b>STRING</b>	Sequence of characters
<b>BOOLEAN</b>	True/False
<b>DATE</b>	Date values

### 10.1.2 Records

**Definition:** A structure that holds a set of data of different types under one identifier.

**Purpose:**

- Group related data of different types
- Like a record in a database

**Example:**

<TEXT>

```
RECORD Employee
  DECLARE EmpID : INTEGER
  DECLARE Name : STRING
  DECLARE Salary : REAL
```

## 10.2 ARRAYS

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### 10.2.1 One-Dimensional Arrays

**Definition:** A collection of elements of the same type accessed by index.

**Terms:**

- Index: Position of element
- Lower bound: First index (usually 0 or 1)
- Upper bound: Last index

**Declaration:**

<TEXT>

```
DECLARE arrayname[upperbound] : TYPE
```

**Access:**

<TEXT>

```
arrayname[index]
```

### 10.2.2 Two-Dimensional Arrays

**Definition:** Array of arrays; elements accessed by row and column.

**Declaration:**

<TEXT>

```
DECLARE arrayname[row, column] : TYPE
```

### 10.2.3 Array Operations

### **Linear Search:**

- Check each element sequentially
- Works on unsorted data
- $O(n)$  time complexity

### **Bubble Sort:**

- Compare adjacent elements
- Swap if in wrong order
- Repeat until sorted
- $O(n^2)$  time complexity

## **10.3 FILES**

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### **10.3.1 File Need**

- Store data permanently
- Large amounts of data
- Data persistence between program runs

### **10.3.2 File Operations**

#### **Opening:**

```
<TEXT>
```

```
OPENFILE filename FOR READ/WRITE/APPEND
```

#### **Reading:**

```
<TEXT>
```

```
READFILE filename, variable
```

#### **Writing:**

```
<TEXT>
```

```
WRITEFILE filename, variable
```

## Closing:

<TEXT>

CLOSEFILE filename

## 10.4 ABSTRACT DATA TYPES (ADT)

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### 10.4.1 Stack

#### Characteristics:

- LIFO (Last In, First Out)
- Add to top (push)
- Remove from top (pop)

#### Operations:

- Push: Add item to top
- Pop: Remove item from top
- Peek: View top item without removing

### 10.4.2 Queue

#### Characteristics:

- FIFO (First In, First Out)
- Add to rear (enqueue)
- Remove from front (dequeue)

### 10.4.3 Linked List

#### Characteristics:

- Dynamic structure
- Nodes contain data and pointer to next node
- Can grow/shrink easily

#### Operations:

- Add node

- Delete node
  - Search
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