



Basic Operations on Data Structures

Subtitle: DS - UGCSE201

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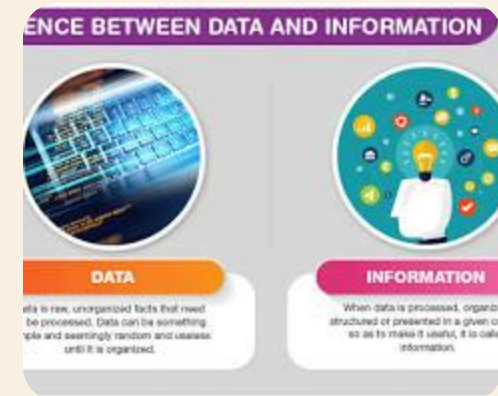
1. WHAT IS DATA?

Data is a collection of raw, unorganized facts, figures, and symbols, such as numbers, words, images, and observations, that can be processed to provide meaningful information.



Content:

- Data = raw facts
- Information = processed meaningful data
- Example:
 - Data → 28, Rahul
 - Info → Rahul's age is 28



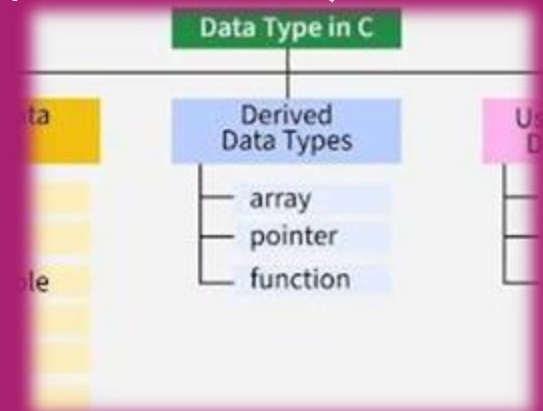


2. WHAT IS A DATA TYPE?

A data type is a classification that specifies what kind of data a variable can hold, how the computer will interpret it, and the operations that can be performed on it.

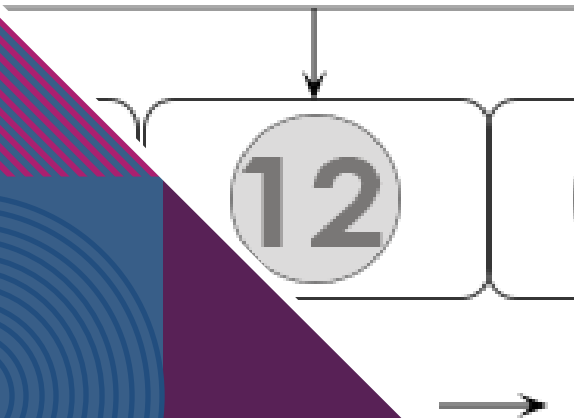
Content:

- Integer, Float, Character, Boolean
- Built-in types
- User-defined (structures, classes)





Elements of an



3. WHAT IS A DATA STRUCTURE?

A data structure is a way to organize, store, and manage data in a computer so it can be accessed and manipulated efficiently

Examples:

Arrays, Linked Lists, Stack, Queue, Trees, Graphs

Diagram:

Linear vs Non-linear structure

4. CLASSIFICATION OF DATA STRUCTURES

Two main categories:

- **Primitive**
- **Non-Primitive**
 - Linear (Array, Stack, Queue, Linked List)
 - Non-Linear (Tree, Graph)

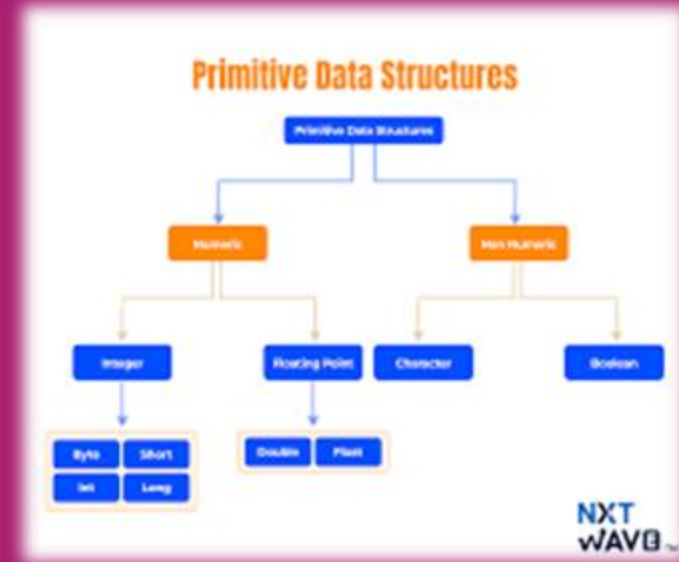


5. PRIMITIVE DATA STRUCTURES

Examples: int, float, char, bool

Small definitions + examples

Diagram: simple memory cells

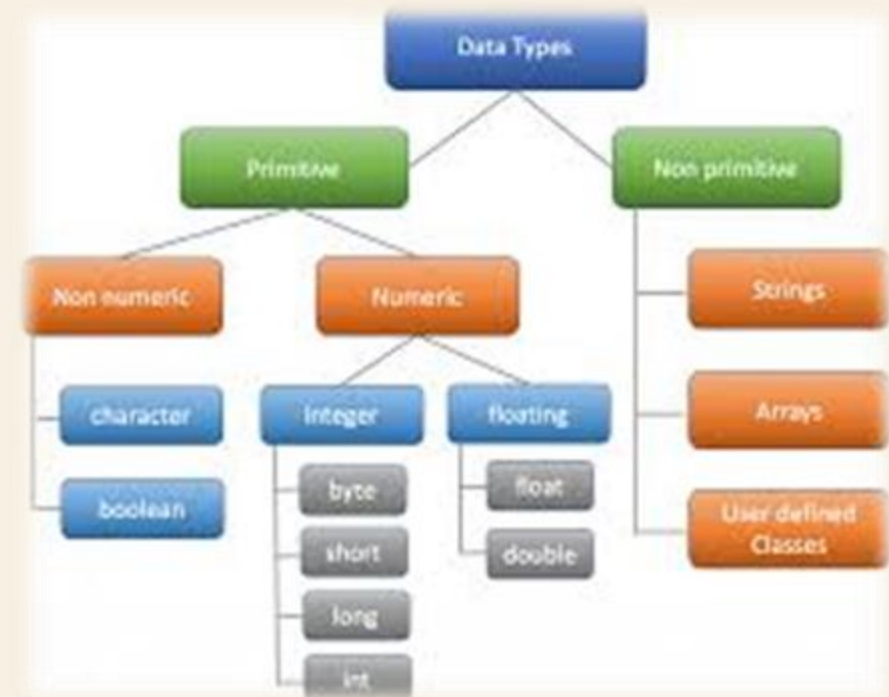


6. NON-PRIMITIVE DATA STRUCTURES

Linear: Array, Stack, Queue, LL

Non-Linear: Trees, Graphs

Real-life examples





7. OPERATIONS ON DATA STRUCTURES

- **Traversing:** Visiting each element of a data structure one by one.
- **Searching:** Finding the location of a specific element in a data structure.
- **Insertion:** Adding a new element to a data structure.
- **Deletion:** Removing an existing element from a data structure.
- **Sorting:** Arranging elements in a specific order (ascending or descending).
- **Merging:** Combining two sorted structures into one sorted structure.
- **Updating:** Changing the value of an existing element in a data structure.

8. PSEUDOCODE - TRAVERSING ARRAY

vbnet

```
FOR i = 1 to N  
    PRINT A[i]  
END FOR
```

9. LINEAR SEARCH - ALGORITHM & EXAMPLE

Algorithm

vbnet

```
LINEAR_SEARCH(A, N, ITEM)
    FOR i = 1 to N
        IF A[i] == ITEM THEN
            RETURN i
        END IF
    END FOR
    RETURN -1
END
```



10. BINARY SEARCH - ALGORITHM + EXAMPLE

vbnet

```
BINARY_SEARCH(A, LB, UB, ITEM)
    WHILE LB <= UB
        MID = (LB + UB) / 2
        IF A[MID] == ITEM
            RETURN MID
        ELSE IF ITEM < A[MID]
            UB = MID - 1
        ELSE
            LB = MID + 1
        END IF
    END WHILE
    RETURN -1
END
```



11. INSERTION IN ARRAY

mathematica

```
INSERT(A, N, K, ITEM)
  FOR i = N down to K
    A[i+1] = A[i]
  NEXT i
  A[K] = ITEM
  N = N + 1
END
```

12. DELETION IN ARRAY

mathematica

```
DELETE(A, N, K)
  ITEM = A[K]
  FOR i = K to N-1
    A[i] = A[i+1]
  NEXT i
  N = N - 1
END
```

THANK YOU

Vivekananda Global University, Jaipur

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