Class 9 – NCERT (Chapter 11)

World of Algorithms

Algorithm : Divisors, GCD & Data Structures



1 Key Concepts

- ★ **Algorithm:** A step-by-step method to solve a problem.
- ★ **Divisors:** Numbers that divide a given number exactly.
- ★ **GCD:** Greatest Common Divisor – the largest number dividing two or more numbers.
- ★ **Data Structures:** Organised ways to store data (e.g., lists, tuples).

2 Divisors

- ★ **Example:** Divisors of 24 are: 1, 2, 3, 4, 6, 8, 12, 24
- ★ **Steps to find divisors:**
  1. Start from 1 up to the number.
  2. Check which numbers divide it without remainder.
- ★ **Note:** 1 and the number itself are always divisors.

3 Greatest Common Divisor (GCD)

- ★ **GCD** of two numbers is the largest number that divides both.
- ★ **Example:** GCD of 18 and 24 is 6.
- ★ **Methods:**
  1. Listing common divisors:
     18 → 1, 2, 3, 6, 9, 18
     24 → 1, 2, 3, 4, 6, 8, 12, 24 → GCD = 6
  2. Euclid's Algorithm (efficient method).

4 Euclid's Algorithm

- ★ **Idea:** Use GCD(a, b) = GCD(b, a mod b).
- ★ **Steps:**
  1. If b = 0, then GCD = a.
  2. Otherwise, compute GCD(b, a mod b).
- ★ **Example:** Find GCD of 48 and 18.
  $48 = 18 \times 2 + 12$,
  $18 = 12 \times 1 + 6$,
  $12 = 6 \times 2 + 0 \Rightarrow$ GCD = 6.

5 Data Structures

- ★ **List:** An ordered collection of elements.
  Example: A = [3, 7, 9, 12]
  Operations: add, remove, search.
- ★ **Tuple:** An ordered collection, immutable.
  Example: T = (5, 8, 12)
- ★ **Uses:** storing a group of data like marks, coordinates, etc.

6 Algorithms

- ★ **Algorithm** for finding divisors:

```
1. Input: n
2. For i = 1 to n
       if n mod i = 0, print i
```

- ★ **Algorithm for GCD (Euclid's):**

```
1. Input: a, b
2. While b ≠ 0
       a, b = b, a mod b
3. Print a
```

7 Important Points

- ★ 1 is a divisor of every number.
- ★ A number is always a divisor of itself.
- ★ GCD is used in simplifying fractions, solving problems and finding LCM.
- ★ Lists and tuples help organise data and make it easy to process.
- ★ Euclid's algorithm is efficient even for large numbers.

8 Quick Revision

- ✅ Divisors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36
- ✅ GCD(20, 30) = 10
- ✅ GCD(48, 18) = 6
- ✅ List: [1, 2, 3]
- ✅ Tuple: (7, 8, 9)
- ✅ Euclid's algorithm: GCD(a, b) = GCD(b, a mod b)

9 Key Takeaway

Divisors help us find **factors, GCD** helps us find the largest common divisor, and **data structures** like lists and tuples help us store and manage data efficiently!

Think • Apply • Explore