# **Highest Common Factor**

#### **Highest Common Factor (HCF)**

The Highest Common Factor (HCF) of two or more numbers is the largest number that divides each of them exactly.

HCF is also called Greatest Common Divisor (GCD).

### **1. Methods to Find HCF**

#### **A. Prime Factorization Method**

- Find the prime factors of each number.
- Identify the common factors and multiply them.

Example: Find HCF of 36 and 48

- Prime factors of 36:  $2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$
- Prime factors of 48:  $2 \times 2 \times 2 \times 2 \times 3 = 2^4 \times 3$
- Common factors:  $2^2 \times 3 = 12$

HCF of 36 and 48 = 12

#### **B. Division Method**

- i. Divide the larger number by the smaller number.
- ii. Use the remainder as the new divisor and divide again.
- iii. Repeat until the remainder is 0.
- iv. The last divisor is the HCF.

Example: Find HCF of 48 and 60

- 60 ÷ 48 = 1 remainder 12
- 48 ÷ 12 = 4 remainder 0

HCF of 48 and 60 = 12

#### **C. Listing Common Factors Method**

List the factors of each number and find the largest common factor.

Example: Find HCF of 24 and 36

- Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24
- Factors of 36: 1, 2, 3, 4, 6, 9, 12, 18, 36

HCF of 24 and 36 = 12

### 2. Properties of HCF

- i. HCF is always a factor of the given numbers.
- ii. HCF of two prime numbers is always 1 (e.g., HCF of 7 and 13 is 1).
- iii. HCF of a number with itself is the number itself (e.g., HCF of 15 and 15 is 15).
- iv. HCF of co-prime numbers is always 1 (e.g., HCF of 9 and 16 is 1).
- v. HCF helps in simplifying fractions (e.g., 12/18 simplifies to 2/3 using HCF).

#### LCM (Least or lowest Common Multiple)

LCM stands for Least Common Multiple.

It is the smallest number that is a multiple of two or more numbers.

#### Example:

Find the LCM of 4 and 6:

- Multiples of 4 = 4, 8, 12, 16, 20, ...
- Multiples of 6 = 6, 12, 18, 24, ...
- Common multiples = 12, 24, ...
- Least Common Multiple = 12

So, LCM (4, 6) = 12

#### Methods to Find LCM:

#### **1. Common Division Method?**

In this method, we divide the given numbers together by a common prime number step by step until all the remaining numbers become 1.

We multiply all the divisors to get the LCM.

Example: Find LCM of 12 and 18 using Common Division Method

Step	12	18
2	6	9
3	2	3
2	1	3
3	1	1

Now multiply all the divisors used:

 $2 \times 3 \times 2 \times 3 = 36$ 

So, LCM (12, 18) = 36

### Steps:

- i. Write the numbers in a row.
- ii. Divide all by a common prime number (if possible).
- iii. If any number is not divisible, write it as it is.
- iv. Repeat until all numbers become 1.
- v. Multiply all the prime divisors used to get the LCM.

# 2. Prime Factorization Method

Find prime factors of each number and take the highest powers of all primes.

### Example:

LCM of 12 and 18  $12 = 2^2 \times 3$   $18 = 2 \times 3^2$ LCM =  $2^2 \times 3^2 = 4 \times 9 = 36$ 

## **Properties of LCM:**

- i. LCM of any two numbers is always a multiple of both
- ii. LCM of two prime numbers is their product

**Example:** LCM (2, 5) = 2 × 5 = 10

iii. LCM of a number with itself is the number

**Example:** LCM (7, 7) = 7

iv. LCM is used to add or subtract fractions with different denominators

# Use of LCM in Real Life:

To find common time for repeating events

To solve word problems on smallest quantity

To calculate next common meeting point (like bells ringing together)

# Summary:

LCM = Smallest common multiple

Methods: Listing, Prime Factorization

Used in real-life problems and fractions

**Example:** LCM (4, 6) = 12