DAY 3
PRIME & COMPOSITE NUMBERS

Before discussing next topic you should know about prime numbers, composite numbers & co-prime numbers.

***Prime numbers*:- those numbers which are divisible by 1 and itself.**
or which numbers have exactly two factors that are called prime numbers.
e.g. 2,3,5,7,11,… etc.

***Composite numbers*:- those numbers which are not prime numbers.**
Or which numbers have more than two factors are called composite numbers.
e.g. 4,6,9,14,15,…etc.

REMEMBER:-

i) 1 is neither prime nor composite.
ii) 2 is only even number which is prime.

***Co-prime numbers*:-** The pair of numbers whose HCF is unity or 1 called co-prime numbers. e.g. $HCF\ (12,25) = 1$ (12,25 are co-prime)
$HCF\ (5,18) = 1$ (5,18 are called co-prime)

1.4 THE FUNDAMENTAL THEORM OF ARTHIMETIC

Statement :-

Every composite number can be expressed as the product of primes and their decomposition is unique apart from the order in which the prime factors occurs.

Means given any composite number there is only one way to write or decompose it as product of primes.

e.g. $36 = 2 \times 2 \times 3 \times 3 = 2^2 \times 3^2$
$400 = 2 \times 2 \times 2 \times 2 \times 5 \times 5 = 2^4 \times 5^2$

Where prime numbers are written in ascending order.

Lets discuss some examples:

1. **Factorise the following:**
   $(i)\mathbf{135}$ $(ii)\mathbf{144}$ $(iii)\mathbf{1080}$ $(iv)\mathbf{5005}$

Sol:- (i) $135 = 3 \times 3 \times 3 \times 5 = 3^3 \times 5$
(ii) $144 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 2^4 \times 3^2$
(iii) $1080 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 5 = 2^3 \times 3^3 \times 5^1$
(iv) $5005 = 5 \times 7 \times 11 \times 13$

HCF(Highest Common Factor): The highest number which divides the given numbers. For calculation of this take **small powers of common factors.**

LEAST COMMON MULTIPLE (LCM):- The lowest number which is divisible by given numbers. To find LCM, take **highest power of all factors.**

NOTE:- ***For any two positive integers a and b***
$$\boldsymbol{HCF(a,b) \times LCM(a,b) = a \times b}$$

2. Find HCF and LCM of 6 and 20 by prime factorization. (NCERT, Example 6)

Sol:- $6 = 2 \times 3$ and $20 = 2^2 \times 5$

HCF= small power of common factor 2 = 2

LCM= large powers of all factors of 2, 3 and $5 = 2^2 \times 3 \times 5 = 60$

3. Find HCF and LCM of 96 and 404 by prime factorization. (NCERT, Example 7)

Sol:- $96 = 2^5 \times 3$ and $404 = 2^2 \times 101$

HCF= small power of common factor $2 = 2^2$

LCM= large powers of all factors of 2, 3, $101 = 2^5 \times 3 \times 101 = 9696$

4. Find HCF and LCM of 24 and 36 by prime factorization. Also verify $HCF(24, 36) \times LCM(24, 36) = 24 \times 36$

Sol:- $24 = 2^3 \times 3$ and $36 = 2^2 \times 3^2$

HCF= small power of common factor 2 and $3 = 2^2 \times 3^1 = 12$

LCM= large powers of all factors of 2 and $3 = 2^3 \times 3^2 = 72$

Verification:-

Now $HCF(24,36) \times LCM(24,36) = 12 \times 72 = 864$

and $24 \times 36 = 864$ Hence relation is verified.

5. Find HCF and LCM of 6,72 and 120 by prime factorization. (NCERT, Example 8)

Sol:- $6 = 2 \times 3$, $72 = 2^3 \times 3^2$ and $120 = 2^3 \times 3 \times 5$

HCF= small power of common factor 2 and $3 = 2^1 \times 3^1 = 6$

LCM= large powers of all factors of 2, 3 and $5 = 2^5 \times 3^2 \times 5 = 360$

6. Find HCF & LCM of 12, 18, 24 by prime factorization method.

Sol:- $12 = 2^2 \times 3$; $18 = 2 \times 3^2$; $24 = 2^3 \times 3$

HCF $(12,18,24)$ = small power of common factor 2 and $3 = 2^1 \times 3^1 = 6$

LCM $(12,18,24)$ = large powers of all factors of 2 and $3 = 2^3 \times 3^2 = 72$

EXERCISE

1. Prime factorise the following:

(i) 140 (ii) 156 (iii) 3825 (iv) 196 (v) 225

2. Find HCF & LCM by fundamental of Arithmetic:-

i) 510 and 92 **ii)**336 and 54 **iii)** 17and 25

3. Find LCM & HCM of following integers by prime factorisation method.

i) 18,24,36 **ii)** 21, 35, 49 **iii)** 17, 23, 29

4. Exercise 1.2, Q 1,2,3,7