HCF (Highest Common Factor) and LCM (Least Common Multiple)

HCF (Highest Common Factor) and LCM (Least Common Multiple) concepts are the foundation of many mathematical operations and are essential in solving complex problems.

What is HCF (Highest Common Factor)?

The Highest Common Factor (HCF) of two numbers is the highest possible number that divides both numbers completely. The Highest Common Factor (HCF) is also known as the Greatest Common Divisor (GCD).

H.C.F. is also called the greatest common factor (GCF).

How to Find HCF?

There are 3 methods to calculate the HCF of two numbers:

1.HCF by listing factors method

2.HCF by prime factorization

3.HCF by division method

1. HCF by Listing Factors Method

Here, we list the factors of each number and find the common factors of those numbers. Then, among the common factors, we determine the highest common factor.

Example:

Find the HCF of 32 and 14.

Solution: First, list down the factors of 32 and 14.

The factors of 32 are: 1, 2, 4, 8, 16, 32

The factors of 14 are: 1, 2, 7, 14

We can see that 1, 2 are the only common factors of 32 and 14. Whereas 2 is the greatest among all the common factors.

Hence, HCF of 32 and 14 is 2.

2. HCF by Prime Factorization

We can find HCF using Prime factorization method of the given numbers.

Follow the steps below to calculate the HCF of given numbers using the prime factorization

method:

First, Find the common prime factors of the given numbers.

Multiply these common prime factors to obtain the HCF of those numbers.

Example:

Find the HCF of 80 and 90.

Solution:

The prime factors of 80: 2 * 2 * 2 * 2 * 5;

The prime factors of 90: 2 * 3 * 3 * 5.

We can see that 2, 5 are the only common factors of 80 and 90, Now, the HCF of 80 and 90 will be the product of the common prime factors, which are 2 and 5.

Hence, HCF of 80 and 90 is 10.

3. HCF by Division Method

The HCF of two numbers can be calculated using the division method.

Follow the steps below to calculate the HCF of given numbers using the Division Method

First, we divide the larger number by the smaller number and check the remainder.

Then, make the remainder of the previous step as the new divisor and the divisor of the previous step becomes the new dividend. After this we perform the long division again.

Continue the long division process till we get the remainder as 0. It should be noted that the last divisor will be the HCF of those two numbers.

What is LCM (Least Common Multiple)?

In arithmetic, the LCM or least common multiple of two numbers a and b, is denoted as LCM (a,b) is the smallest or least positive integer that is divisible by both a and b.

LCM is also called the Least Common Divisor

Example:

Let’s take two positive integers 3 and 4, the task is to find the LCM(3, 4).

Solution:

Multiples of 3: 3,6,9,12,15,18,21,24…

Multiples of 4: 4,8,12,16,20,24, 28…

The common multipliers of 3 and 4 are 12, 24…, So, the least common multiple is 12.

Hence, LCM(3, 4) = 12

How to Find LCM?

There are 3 methods to find the least common multiple of two numbers.

LCM by Listing Method

LCM by Prime Factorization Method

LCM using Division Method

1. LCM by Listing Method :

We can find out the common multiples of two or more numbers by listing their multiples. And out of these common multiples and the least common multiple is considered to be the LCM of two given numbers .

Follow the steps below to calculate the LCM of the two numbers A and B by the listing method:

First, list down first few multiples of A and B.

Mark the common multiples from the multiples of both numbers.

Select the smallest marked common multiple. Hence, this results in the LCM(A, B).

Example:

Find LCM of two positive integers 2 and 6.

Solution:

Multiples of 2: 2,4,6,8,10,12,14…

Multiples of 6: 6,12,18,24, 30…

The common multipliers of 2 and 6 are 6, 12…, So, the least common multiple is 6.

Hence, LCM(2, 6) = 6

2. LCM by Division Method:

We can find LCM using Division method of the given numbers. This can be done by dividing the numbers by a common prime number, and these prime factors are used to calculate the LCM of those numbers.

Follow the steps below to calculate the LCM of the two numbers A and B by Division Method:

First, find a prime number which is a factor of at least one of the given numbers. Write this prime number on the left of the given numbers.

If the prime number in step 1 is a factor of the number, then divide the number by the prime and write the quotient below it. If the prime number in step 1 is not a factor of the number, then write the number in the row below as it is. Continue the steps until 1 is left in the last row.

3. LCM by Prime Factorization Method:

We can find LCM using Prime factorization method of the given numbers.

Follow the steps below to calculate the LCM of two numbers using the prime factorization method:

First, find the prime factors of the given numbers using repeated division method.

Write these numbers in the form of exponent and find the product of only those prime factors that have the highest power.

The product of these factors with the highest powers is the LCM of the given numbers

How to Find HCF and LCM of a Fraction?

HCF of a fraction: HCF of Numerators /LCM of Denominators.

LCM of a fraction: LCM of Numerators /HCF of Denominators.

Example

Q. Find the HCF and LCM of 1/3 , 8/7, 9/11.

Solution: LCM of given numbers : LCM(1,8,9)/HCF (3,7,11) = 72/1.

HCF of given numbers : HCF(1,8,9)/LCM(3,7,11) = 1/231.