

Methods to find LCM and GCD

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ABSTRACT: In this article we discuss about factors and multiples of numbers. Here we also discussed about relation between completeness property of real numbers and GCD, LCM of numbers.

Key Words: GCD, LCM, set, factors, multiples.

Introduction:

The theory of LCM and HCF plays an important role in algebra. Finding LCM and GCD is like the game hide and seek. We have factors and multiples of numbers in it but we have to seek them. Theory of LCM and GCD is very interesting, in this article we have discuss about certain methods to find LCM and GCD.

Definatio:

Set: A well defined collection of elements is called set. here well defined means whether a given element is a member of given set or not.

For example: N – set of natural numbers

Q – set of rational numbers

R – set of real numbers

Factors and Multiples of a numbers : If a number x divided other number y completely, then x is called factor of y and y is called multiple of x . Factor is also called divisor.

For example: 2 divide 12 then 2 is a factor of 12 and 12 is multiple of 2.

Upper bound and Lower bound :

Let S be a subset of set of real numbers R .

A real number u is said to be an upper bound of S if $x \in S$ then $x \leq u$.

A real number l is said to be a lower bound of S if $x \in S$ then $x \geq l$.

Let S be a subset of set of real numbers R . S is said to be bounded above if S has an upper bound. S is said to be bounded below

if S has lower bound.

S is said to be a bounded set if S be bounded above as well as bounded below.

Least upper bound (infimum): The upper bound which is smallest among all upper bounds of the set.

Greatest lower bound (supremum): The lower bound which is largest among all lower bounds of the set.

Greatest Common Divisor or Highest Common Factor:

GCD of numbers is the greatest number which is a factor of given numbers. To find GCD we have to find factors of every number.

Methods to find GCD:

1. Listing Method:

In this method we have to make list of possible factors of the given numbers and then collect the common factors of the numbers and then find the largest factor among the common factor which is called GCD.

Example: find GCD of 42 and 72

Factors of 42 = {1, 2, 3, 6, 14, 21, 42}

Factors of 72 = {1, 2, 3, 4, 6, 8, 9, 12, 18, 36, 72}

Common factor of 42 and 72 = {1, 2, 3, 6}

6 is the largest common factor of 42 and 72.

So 6 is GCD of 42 and 72.

Similarly we can find GCD of more than two numbers.

Result: If GCD of two numbers is 1 then the numbers are called co-prime to each other or simply co prime

2. Divison Method :

Let we have to find the GCD of two numbers then divide the larger number by the smaller. Now divide the divisor by thr remainder. Repeat the process until remainder becomes zero. In this process last divisor is called GCD.

GCD of more than two numbers: first find GCD of two numbers let it be X then find GCD of third number and X.

Least Common Multiple:

LCM of given numbers is the smallest number which is multiple of each of the numbers.

Methods to find LCM**1. Factorisation Method:**

First find the prime factor of each number

Then write down the maximum number of times each prime factor appear

The product of prime factors occur in maximum nuber is the LCM.

Example :

Find LCM of 24 ,27 and 42

Prime factors of 24 = {2,2,2,3}

Prime factors of 27={3,3,3}

Prime factors of 42={2,3,7}

Here 2 appears three times, 3 appears three times, 7 appears one time

So LCM=2.2.2.3.3.3.7=1512.

2. Division Method:

Write down the given numbers in a row then divide the row by a number which divide atleast two numbers of the row completely take forward the numbers which are not divisible. Continuing in this manner until the number are divisible by the same number except 1. In the end the product of divisors and undivided number is LCM.

Relationship among two positive numbers:

Product of two numbers = Product of their GCD and LCM

GCD and LCM of Fractions:

$$1. \text{GCD} = \frac{\text{GCD of numerators}}{\text{LCM of denominators}}$$

$$2. \text{LCM} = \frac{\text{LCM of numerators}}{\text{GCD of denominators}}$$

Completeness property of Real Numbers:

Every non empty set of real numbers which is bounded above has its supremum in it.

Every non empty set of real numbers which is bounded below has its infimum in it.

Completeness property and LCM ,GCD:

Find GCD of 24 and 42

Factors of 24 = {2,3,4,6,8,12,24}=S₁

Factors of 42={2,3,7}=S₂

Common factors={2,3}=S₃

Here S₁, S₂, S₃ are the set of real numbers . by completeness property S₃ has supremum 3. So 3 is GCD

Find LCM of 12 and 18

Multiples of 12 = {12,24,36,48,60,72,84,96,108,120,132,144.....}=S₁

Multiples of 18={18,36,54,72,90,108,126,144,162.....}=S₂

Common multiples={36,72,108,144.....}=S₃

S₃ is set of real numbers and bounded below so it has infimum 36. Hence 36 is LCM of 12 and 18.

CONCLUSION:

As we know supremum of a set is unique if exist this implies GCD of two or more numbers is unique if exist

Also we know infimum of a set is unique if exist this implies LCM of two or more numbers is unique if exist

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