Learn the concept of LCM and HCF for WBCS Exam

Welcome to a tailored guide designed to elevate your preparation for the WBCS Exam by delving into the essential concepts of Lowest Common Multiple (LCM) and Highest Common Factor (HCF). In the dynamic landscape of competitive exams, a strong command of mathematical principles is paramount, and understanding LCM and HCF is a foundational skill. This resource offers a comprehensive exploration, providing clarity through detailed explanations, practical examples, and strategic problem-solving techniques. Whether you're a WBCS aspirant aiming to enhance your quantitative aptitude or someone seeking a thorough understanding of LCM and HCF, this guide is crafted to meet your needs.

The journey unfolds with a focus on conceptual mastery, empowering you to confidently navigate quantitative challenges in the WBCS Exam. Join us on this educational odyssey, where knowledge meets strategy, ensuring you're well-equipped to tackle mathematical intricacies and emerge successful in the quantitative section of the WBCS Exam.

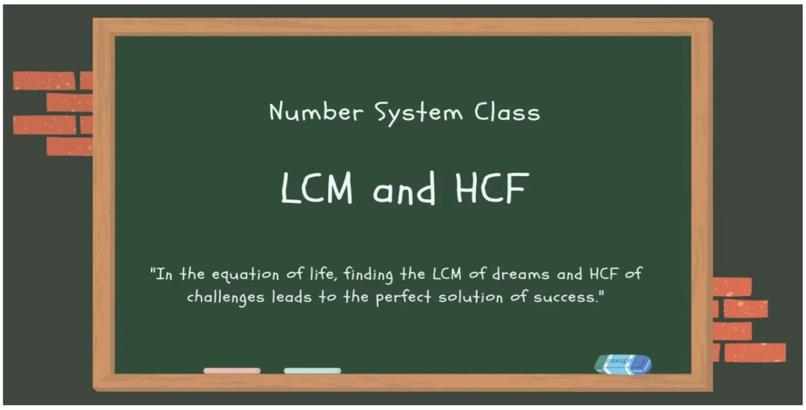
This is the fourth part of the '**Number System**' blog series. So, before understanding concepts of LCM and HCF, first understand the concept of Factors and Multiples by clicking the embedded link. Now, let's start understanding the concepts of **LCM and HCF**.

LCM and HCF

HCF: Highest Common Factor (HCF) is the largest factor of two or more given numbers which can divide all of these numbers. It is also called Greatest Common Divisor (GCD).

LCM: Lowest Common Multiple (LCM) of two or more numbers is the least number which is divisible by each of these numbers (i.e. leaves no remainder).

[**Note:** Product of two numbers = Their LCM × Their HCF]



E.g. Find the HCF and LCM of 288, 432 and 768.

Sol: $288 = 2^5 \times 3^2$

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⇒ $432 = 2^4 \times 3^3$

⇒ $768 = 2^8 \times 3$

So, HCF would be (every prime number with minimum power) = $2^4 \times 3 = 48$

And, LCM would be (every prime number with maximum power) = $2^8 \times 3^3 = 6912$ (**Ans.**)

E.g. If the product of two number is 576 and the LCM of the two numbers is 48. Find the HCF.

Sol: We know that,

Product of two numbers = their LCM × their HCF

⇒ 576 = 48 × HCF

⇒ HCF = 576/48 = 12 (**Ans.**)

Now, here are some interesting ways to find HCF of two or more numbers.

Ways to find HCF of two or more Numbers

We will discuss 3 ways to find HCF. These 3 methods are different from the factorization method. Factorization method (as mentioned in first example) is the best method to find LCM and HCF. But look at these three methods to save your time in exam.

1) Long Division method (Best applicable for two numbers)

Take two numbers. Divide the greater number by the smaller number, then divide the divisor by the remainder, divide the divisor of this division by the next remainder and so on until the remainder is 0. The last divisor is the HCF of the two numbers taken.

E.g. Find the HCF of 1363 and 1457.

Sol:

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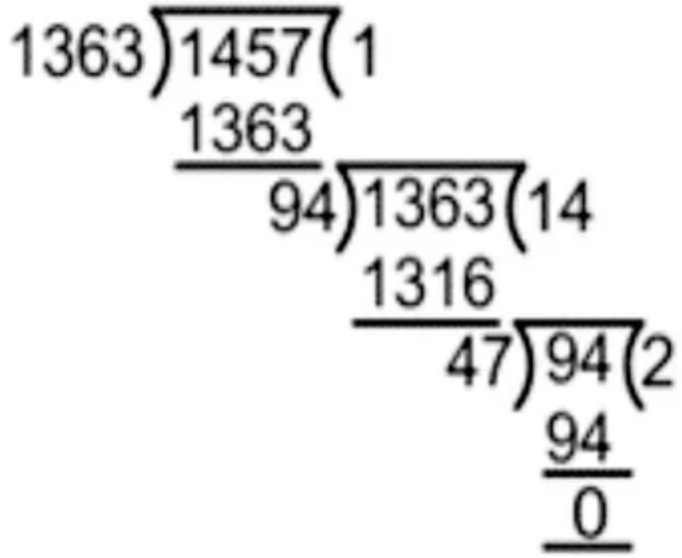

HCF (1367, 1457) = 47 (**Ans.**)

2) Difference method (Best applicable for numbers which are close to each other)

Let us take the numbers like 3800, 3600, 3672. First we have to find the minimum difference between numbers (in this case, it is 3672 – 3600 = 72). Then we have to check whether 72 or which factor (highest) of 72 is also a factor of the third number (i.e. 3800) so here, 72 = $2^3 \times 3^2$. Since 3 cannot divide 3800, no multiple of 3 can divide 3800. So, we are left with 2^3, we can see that 3800 can be divided by 8 but not by any factor of 72, bigger than 8. So, 8 is the HCF of these numbers.

Let us take another example, find the HCF of 2704, 2700, 1586. Here, the minimum difference is 4 (i.e. 2704 – 2700). Since, 4 cannot divide 1586 but its factor 2 does. And 2 is the second biggest factor of 4. So, 2 is the HCF of these numbers.

3) Factor method (Best applicable for numbers in which at least one number is small enough to calculate the factors)

Let us take numbers like 108, 288 and 360. Here the smallest number is 108 but it does not divide 288 and 360 both. Now its second biggest factor is 54, but it also cannot divide 288 and 360 both. Now its third biggest factor is 36, yes it can divide both 288 and 360. So, 36 is the HCF of given numbers.

Now, let's understand the LCM and HCF of Fractions.

LCM and HCF of Fractions

A fraction has a numerator and a denominator (≠ 0). So,

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LCM = (LCM of Numerators)/(HCF of Denominators)

HCF = (HCF of Numerators)/(LCM of Denominators)

It means, if there are numbers like a/b, c/d and e/f.

Then, LCM (a/b, c/d, e/f) = [LCM (a, c, e)]/[HCF (b, d, f)]

and HCF (a/b, c/d, e/f) = [HCF (a, c, e)]/[LCM (b, d, f)]

[**Note:** Fractions should be in reduced forms i.e. if the fraction is like x/y, x and y must be co-prime numbers]

E.g. Find the LCM of 3/7, 5/9, 4/10 and 8/9.

Sol: Here, most of the students make mistakes. They directly take the LCM of (3, 7, 4 and 8). But here, we have to first simplify the fraction. So, 4/10 will become 2/5.

Now, LCM = (LCM of 3, 5, 2, 8)/(HCF of 7, 9, 5, 9) = 120.

Now, let us just look at some properties and tricks of HCF and LCM.

Some Properties and Tricks of HCF and LCM

1) Any number which when divided by p, q or r leaving the same remainder s in each case, will be the form of k (LCM of p, q, r) + s where k = 0, 1, 2, … . If k is 0, then we get the smallest such number.

E.g. Find the smallest number which when divided by 4, 11 or 13 leaves a remainder 1 and is greater than the remainder.

Sol: Required number = LCM (4, 11, 13) + 1 = 573 (**Ans.**)

2) Any number which when divided by p, q or r leaving respective remainders of s, t and u where (p – s) = (q – t) = (r – s) = a (say), will be of the form k (LCM of p, q and r) – a. The smallest such number will be obtained by substituting k = 1.

E.g. Find the smallest numbers which when divided by 8 and 12 leave remainders of 6 and 10 respectively.

Sol: Required number = LCM (8, 12) – 2 = 22 (**Ans.**)

3) The largest number with which the numbers p, q or r are divided gives remainders of s, t and u respectively will be the HCF of the three numbers (p – s), (q – t) and (r – u).

E.g. Find the largest number which leaves the remainders of 2 and 3 when it divides 89 and 148 respectively.
Sol: Largest number = HCF (89 – 2, 148 – 3) = HCF (87, 145) = 29 (**Ans.**)

4) If there were questions like, Find the largest number with which if we divide the numbers p, q and r, the remainder are the same. Then the required number is HCF of (p – q) and (p – r) = HCF of (p – q) and (q – r) = HCF of (q – r) and (p – r). It is happening because the numbers have the same remainder, so if we subtract the remainder from the numbers, the numbers will become the multiples of that number. It means, the difference between those multiples is equal to the difference between p, q and r. And since the numbers are multiples, the difference between them is also a multiple of that number.

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E.g. Find the largest number which divides 444, 804 and 1344 leaving the same remainder in each case.

Sol: Largest number = HCF (804 – 444, 1344 – 804) = HCF (360, 540) = 180 (**Ans.**)

Now, before binding up this section, let us look at some good and interesting examples that were actually asked in WBCS exams.

Examples on LCM and HCF for Better Understanding

E.g. If x is a prime number, the LCM of x and (x + 1) is **[WBCS Exam 2021]**

Sol: x and (x + 1) must be co-prime numbers. The LCM of co-prime numbers is the product of co-prime numbers as their HCF is 1. So,

LCM = x(x + 1) (**Ans.**)

E.g. The HCF of two numbers is 4 and LCM is 520. If one of the numbers is 52, the other number is then, **[WBCS Exam 2021]**

Sol: Let, the other number is x.

We know that, LCM × HCF = Product of two numbers

⇒ 4 × 520 = 52 × x

⇒ x = (4 × 520)/52 = 40 (**Ans.**)

E.g. If the ratio of three numbers are 3 : 4 : 5 and their LCM is 1200, then the smallest number is **[WBCS Exam 2021]**

Sol: Let the numbers are 3x, 4x and 5x. So, their LCM is

⇒ LCM = (3 × 4 × 5) × x = 60x

⇒ 1200 = 60x

⇒ x = 20

⇒ Smallest Number = 20 × 3 = 60 (**Ans.**)

E.g. HCF of the fractions 2/3, 4/5 and 6/7 is **[WBCS Exam 2021]**

Sol: HCF = (HCF of Numerators)/(LCM of Denominators) = (HCF of 2, 4, 6)/(LCM of 3, 5, 7) = 2/105 (**Ans.**)

In conclusion, mastering the concepts of Lowest Common Multiple (LCM) and Highest Common Factor (HCF) is paramount for WBCS Exam success. This comprehensive guide has equipped you with the essential knowledge, problem-solving skills, and strategic approaches needed to excel in the quantitative section. As you conclude this learning journey, carry the confidence and proficiency gained here into your exam preparation. With a solid foundation in LCM and HCF, you are well-prepared to tackle mathematical challenges with ease, contributing to your overall success in the WBCS Exam.

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So, this is all for this blog. We will discuss the Remainders in our next blog of this 'Number System' blog series. Till then, keep practicing!

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