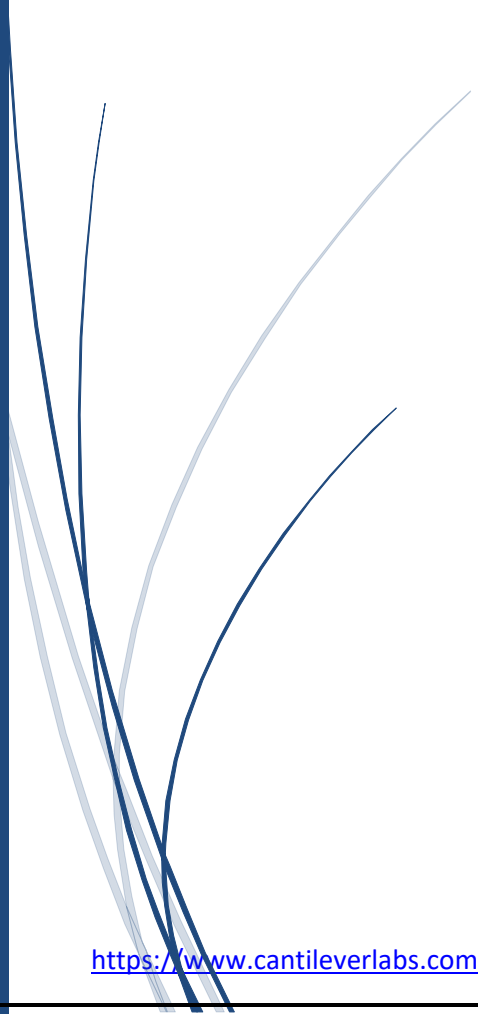
Knowledge Card

Aptitude|LCM and HCF



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Knowledge Card

LCM and HCF

- **What are Multiples –**

Multiple are series of numbers that are exactly divisible by a particular number. e.g. 8, 12, 16, 20 …. are the multiples of 4.

- **What are Factors –**

Factors for a given number are the list of numbers that would divide the larger number without leaving any remainder (Except 1 and number itself) eg. for 12 the factors would be 2, 3, 4, 6

For 6 – 12, 18, 24, 30 will be called as multiple of 6.

For 24 – 6 and 12 are Factors of 24.

- **What is LCM Lowest Common Multiple**

As the name suggests LCM is the lowest common multiple of two or more Natural Numbers for e.g. for 15 and 20, 60 is LCM (Don't worry we will explain how we calculated this)

- **What is HCF Highest Common Factor or Greatest Common Divisor(GCD)**

The Largest (Highest) common Factor of two or more numbers will be called as HCF of the number. e.g. for 12 and 15. 3 will be the HCF.

- **Prime Factors**

These are unique list prime numbers that divide the greater number e.g. for 20 – 2, 5 are the prime Factors (Don't worry below you will find how to get these)

Here are the methods we can use to find the HCF and LCM of given numbers.

○ Prime factorisation method for HCF:

Take an example of finding the highest common factor of 144, 104 and 160.
Now let us write the prime factors of 144, 104 and 160.
144 = 2 × 2 × 2 × 2 × 3 × 3
104 = 2 × 2 × 2 × 13
160 = 2 × 2 × 2 × 2 × 2 × 5
The common factors of 144, 104 and 160 are 2 × 2 × 2 = 8
Therefore, HCF (144, 104, 160) = 8

○ Division method for HCF:

Steps to find the HCF of any given numbers;

1) Larger number/ Smaller Number
2) The divisor of the above step / Remainder
3) The divisor of step 2 / remainder. Keep doing this step till R = 0(Zero).
4) The last step's divisor will be HCF.

○ LCM By Prime Factorisation:

To calculate the LCM of two numbers 60 and 45. Out of other ways, one way to find the LCM of given numbers is as below:

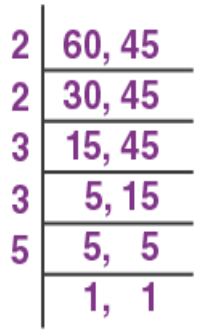
- List the **prime factors** of each number first.
  60 = 2 × 2 x 3 × 5
  45 = 3 × 3 × 5

- Then multiply each factor the **most number of times** it occurs in any number.

If the same multiple occurs more than once in both the given numbers, then multiply the factor the most number of times it occurs.
The occurrence of Numbers in the above example:
2: two times
3: two times
5: one time
LCM = 2 × 2 x 3 × 3 × 5 = 180

○ LCM By Division Method:

Let us see with the same example, which we used to find the LCM using prime factorisation.
Solve LCM of (60,45) by division method.



Therefore, LCM of 60 and 45 = 2 × 2 x 3 × 3 × 5 = 180

Formulas

Property 1 – LCM x HCF = Product of two numbers

H.C.F. and L.C.M. of Fractions:

1. H.C.F. $= \frac{\text{H.C.F. of Numerators}}{\text{L.C.M. of Denominators}}$
2. L.C.M. $= \frac{\text{L.C.M. of Numerators}}{\text{H.C.F. of Denominators}}$

Property 2 – LCM ≥ Numbers ≥ HCF

Property 3- LCM is a multiple of HCF

Property 4 – If the HCF of two numbers is 1 then they are Co-Primes.

Calculating Prime Factors

In this method, you take the lowest prime number and see if the greater number is divisible by it. If its not divisible then you move to the higher prime number.

Let us show you how to calculate the prime factors for number step by step.

Prime Factors of 12 –

- Lowest Prime number 2, 12 ÷ 2 = 6
- Again 6 ÷ 2 = 3
- Again 3 ÷ 2 is not possible so next prime number is 3
- Again 3 ÷ 3 = 1

We can write this as 12 = 2x2x3 = $2^2 \times 3$

Finding LCM of two Numbers

Let us take an example HCF of 15 and 20, first we list out all the prime factors of each

15 = 3 x 5

20 = 2 x 2 x 5 = $2^2 \times 5$

Then multiply each factor by the greatest number of times it occurs in either number.

- 2 – Occurs 2 times
- 3 – Occurs 1 time
- 5 – Occurs 1 time

So LCM is (2×2)x(3×1)x(5×1) = 60

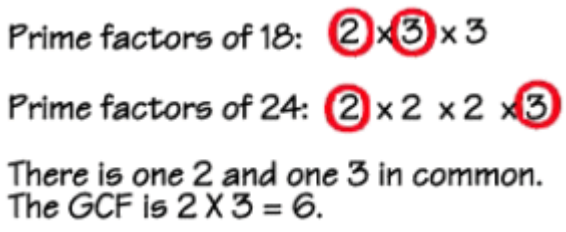
Finding HCF of two Numbers

Let us take an example HCF of 18 and 24, we already have listed out all the prime factors of each number

18 = 2 x 3 x 3

24 = 2 x 2 x 2 x 3 = $2^3 \times 3$

Now we find the factor that exists at least once in both of them.



Using Formulas of HCF and LCM in Questions

Question: Calculate the highest number that will divide 43, 91 and 183 and leaves the same remainder in each case

Options

A. 4

B. 7

C. 9

D. 13

Solution: Required number = H.C.F. of (91 – 43), (183 – 91) and (183 – 43)

H.C.F. of 48, 92 and 140 = 4.

Correct Answer: A

Question: Which of the following is greatest number of four digits which is divisible by 15, 25, 40 and 75 is:

Options

A. 9700

B. 9600

C. 9800

D. 9650

Solution: Greatest number of 4-digits is 9999.

Now, find the L.C.M. of 15, 25, 40 and 75 i.e. 600.

On dividing 9999 by 600, the remainder is 399.

Hence, Required number (9999 – 399) = 9600.

Correct Answer: B

Question: The greatest possible length which can be used to measure exactly the lengths 7 m, 3 m 85 cm, 12 m 95 cm is:

Options

A. 25 cm

B. 15 cm

C. 35 cm

D. 55 cm

Solution: Required length = H.C.F. of 700 cm, 385 cm and 1295 cm = 35 cm.

Correct Answer: C