3. HCF and LCM

- **Prime numbers** are numbers having exactly two factors: 1 and the number itself. For example, the factors of 23 are 1 and 23 only. So, 23 is a prime number.
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- **Composite numbers** are numbers having more than two factors. For example, the factors of 42 are 1, 2, 3, 6, 7, 14, 21, and 42. Since there are 8 factors of 42, it is a composite number.
- 1 is neither prime nor composite as it has exactly one factor.
- The smallest prime number is 2.
- The smallest even prime number is 2 and the smallest odd prime number is 3.
- All even numbers except 2 are composite.
- The pairs of prime numbers whose difference is 2 are known as **twin primes**. For example, 11 and 13 are twin primes.

- Expressing a number as the product of prime numbers is known as **prime factorisation**. To find the prime factorisation of a number, we need to divide it by prime numbers that are factors of the given number, till we get 1.

  For example, the prime factorisation of 840 can be done as follows:

2	840
2	420
2	210
3	105
5	35
7	7
	1

  So, the prime factorisation of 840 is :

  $840 = 2 \times 2 \times 2 \times 3 \times 5 \times 7$

- The **highest common factor** (HCF) of two or more given numbers is the highest of their common factors.

- The **lowest common multiple** (LCM) of two or more given numbers is the least of their common multiples.

- We can find the HCF and LCM of given numbers by any of the following methods-

  1. **Prime factorisation method**

  2. **Common division method**

Example 1:

Find the HCF of numbers 90, 120 and 150.

Solution:

First of all we need to prime factorise the given numbers.

For example, the HCF of 90, 120, 150 can be found as:

2	90
3	45
3	15
5	5
	1

2	120
2	60
2	30
3	15
5	5
	1

2	150
3	75
5	25
5	5
	1

$90 = 2 \times 3 \times 3 \times 5$
$120 = 2 \times 2 \times 2 \times 3 \times 5$
$150 = 2 \times 3 \times 5 \times 5$

∴ HCF of 90, 120 and 150 = $2 \times 3 \times 5 = 30$

Example 2:

Find the LCM of 90, 120 and 150.

Solution:

To find the LCM of 90, 120 and 150, we may proceed as follows:

2	90, 120, 150

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2 | 45, 60, 75
  ─────────────
2 | 45, 30, 75
  ─────────────
3 | 45, 15, 75
  ─────────────
3 | 15, 5, 25
  ─────────────
5 | 5, 5, 25
  ─────────────
5 | 1, 1,5
  ─────────────
  | 1, 1, 1
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∴ LCM of 60 and 120 = 2 × 2 × 2 × 3 × 3 × 5 × 5 = 1800

- Note: Product of LCM and HCF of two numbers = Product of the two numbers