Chapter 1: Real Numbers - Formula.

1. **Euclid's Division Lemma:**
    - For any two positive integers aaa and b,, there exist unique integers qqq and rrr such that: a=bq+r where≤r<ba = bq + r \quad \text{where} \quad 0 \leq r < ba=bq+where0≤r<b
    - Here, a is the dividend, b is the divisor, q is the quotient, and r is the remainder..
2. **Euclid's Division Algorithm:**
    - This is an application of Euclid's division lemma to find the Highest Common Factor (HCF) of two given positive integers aaa and b. It involves repeated use of the division lemma.
    - Steps:
        - Apply a=bq+ra = bq + ra=bq+r.
        - Replace aaa with b and b with r.
        - Repeat the process until r=0r = 0r=0.
        - The last non-zero remainder is the HCF of aaa and b.
3. **Fundamental Theorem of Arithmetic:**
    - Every composite number can be expressed (factorized) as a product of prime numbers, and this factorization is unique, apart from the order of the prime factors.
    - For example: 30=2×3×530 = 2 \times 3 \times 530=2×3×5.
4. **LCM and HCF Relationship:**
    - For any two positive integers aaa and b: LCM(a,b)×HCF(a,b)=a×b\text{LCM}(a, b) \times \text{HCF}(a, b) = a \times bLCM(a,b)×HCF(a,b)=a×b
5. **Properties of Rational and Irrational Numbers:**
    - A number is rational if it can be expressed in the form pq\frac{p}{q}qp where ppp and qqq are integers and q≠0q \new 0q=0.
    - A number is irrational if it cannot be expressed as pq\frac{p}{q}qp.
    - The sum or difference of a rational and an irrational number is irrational.
    - The product or quotient of a non-zero rational number and an irrational number is irrational.
6. **Decimal Representation of Rational Numbers:**
    - A rational number is either terminating or non-terminating, repeating (recurring).
        - Terminating decimal: If the prime factorization of the denominator (after simplifying the fraction) has only 2 and/or 5 as its prime factors.
        - Non-terminating repeating decimal: If the prime factorization of the denominator (after simplifying the fraction) has prime factors other than 2 and 5.

Key Points to Remember:

- **Prime Numbers:** Numbers greater than 1 that have no divisors other than 1 and themselves.

- **Composite Numbers:** Numbers greater than 1 that are not prime.
- **HCF (Highest Common Factor):** The largest number that divides two or more numbers without leaving a remainder.
- **LCM (Least Common Multiple):** The smallest number that is a multiple of two or more numbers.