

Class–10 Mathematics
Revision Notes
CHAPTER 01
REAL NUMBERS

- **Natural numbers:** Counting numbers are called Natural numbers. These numbers are denoted by $N = \{1, 2, 3, \dots\}$
- **Whole numbers:** The collection of natural numbers along with 0 is the collection of Whole number and is denoted by W .
- **Integers:** The collection of natural numbers, their negatives along with the number zero are called Integers. This collection is denoted by Z .
- **Rational number:** The numbers, which are obtained by dividing two integers, are called Rational numbers. **Division by zero is not defined.**
- **Coprime:** If HCF of two numbers is 1, then the two numbers are called relatively prime or coprime.

1. Euclid's division lemma :

For given positive integers 'a' and 'b' there exist unique whole numbers 'q' and 'r' satisfying the relation $a = bq + r, 0 \leq r < b$.

Theorem: If a and b are non-zero integers, the least positive integer which is expressible as a linear combination of a and b is the HCF of a and b , i.e., if d is the HCF of a and b , then there exist integers x and y , such that $d = ax + by$ and d is the smallest positive integer which is expressible in this form.

The HCF of a and b is denoted by $HCF(a,b)$.

2. Euclid's division algorithms :

HCF of any two positive integers a and b . With $a > b$ is obtained as follows:

Step 1 : Apply Euclid's division lemma to a and b to find q and r such that

$$a = bq + r, 0 \leq r < b$$

b = Divisor

q = Quotient

r = Remainder

Step II: If $r = 0$, $\text{HCF}(a,b)=b$ if $r \neq 0$, apply Euclid's lemma to b and r.

Step III: Continue the process till the remainder is zero. The divisor at this stage will be the required HCF.

3. The Fundamental Theorem of Arithmetic :

Every composite number can be expressed (factorized) as a product of primes and this factorization is unique, apart from the order in which the prime factors occur.

Ex: $24=2 \times 2 \times 2 \times 3=3 \times 2 \times 2 \times 2$ Ex: $24=2 \times 2 \times 2 \times 3=3 \times 2 \times 2 \times 2$

4. Let $x=\frac{p}{q}, x=\frac{p}{q}, q \neq 0$ to be a rational number, such that the prime factorization of 'q' is of the form $2^m \times 5^n$, where m, n are non-negative integers. Then x has a decimal expansion which is terminating.

5. Let $x=\frac{p}{q}, q \neq 0$ be a rational number, such that the prime factorization of q is not of the form $2^m \times 5^n$, where m, n are non-negative integers. Then x has a decimal expansion which is non-terminating repeating.

6. \sqrt{p} is irrational, which p is a prime. A number is called irrational if it cannot be written in the form $\frac{p}{q}$ where p and q are integers and $q \neq 0$.

8. If a and b are two positive integers, then $\text{HCF}(a, b) \times \text{LCM}(a, b) = a \times b$

i.e., (HCF x LCM) of two integers = Product of integers.

9. A rational number which when expressed in the lowest term has factors 2 or 5 in the denominator can be written as terminating decimal otherwise a non-terminating recurring decimal. In other words, if the rational number $\frac{a}{b}$ is, such that the prime factorization of b is of

form $2^m \cdot 5^n$, where m and n are natural numbers, then $\frac{ab}{ab}$ has a terminating decimal expansion.

10. We conclude that every rational number can be represented in the form of terminating or non-terminating recurring decimal.

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