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Real Numbers Class 10 Notes: Chapter 1

Method of Finding HCF

H.C.F can be found using two methods – Prime factorisation and Euclid's division algorithm.

- Prime Factorisation:
  - Given two numbers, we express both of them as products of their respective prime factors. Then, we select the prime factors that are common to both the numbers
  - Example – To find the H.C.F of 20 and 24
    $20=2\times2\times5$ and $24=2\times2\times2\times3$
  - The factor common to 20 and 24 is 2×2, which is 4, which in turn is the H.C.F of 20 and 24.
- Euclid's Division Algorithm:
  - It is the repeated use of Euclid's division lemma to find the H.C.F of two numbers.
  - Example: To find the HCF of 18 and 30
    Finding the HCF of 18 and 30
  - The required HCF is **6**.

Revisiting Irrational Numbers

Irrational Numbers

Any number that cannot be expressed in the form of p/q (where p and q are integers and $q\neq0$.) is an irrational number. Examples $\sqrt{2}, \pi$, e and so on.

Number theory: Interesting results

- If a number p (a prime number) divides a_2, then p divides a. Example: 3 divides 6_2 i.e 36, which implies that 3 divides 6.
- The sum or difference of a rational and an irrational number is irrational
- The product and quotient of a non-zero rational and irrational number are irrational.
- $\sqrt{p}$ is irrational when 'p' is a prime. For example, 7 is a prime number and $\sqrt{7}$ is irrational. The above statement can be proved by the method of "Proof by contradiction".

Proof by Contradiction

In the method of contradiction, to check whether a statement is TRUE

(i) We assume that the given statement is TRUE.

(ii) We arrive at some result which contradicts our assumption, thereby proving the contrary.

Eg: Prove that $\sqrt{7}$ is irrational.

Assumption: $\sqrt{7}$ is rational.

Since it is rational $\sqrt{7}$ can be expressed as

$\sqrt{7} = a/b$, where a and b are co-prime Integers, $b \neq 0$.

On squaring, $a^2/b^2=7$

$\Rightarrow a^2=7b^2$.

Hence, 7 divides a. Then, there exists a number c such that a=7c.

Then, $a^2=49c^2$.

Hence, $7b^2 = 49c^2$ or $b^2 = 7c^2$

Hence 7 divides b.

Since 7 is a common factor for both a and b,

it contradicts our assumption that a and b are co-prime integers.

Hence, our initial assumption that $\sqrt{7}$ is rational is wrong. Therefore, $\sqrt{7}$ is irrational.