SHORT NOTES: CLASS 10
CHAPTER 1: REAL NUMBERS

DEFINITIONS:

a) ALGORITHM: It is a series of well-defined steps that gives a procedure for solving a type of problem.

b) LEMMA: A lemma is a proven statement used to prove another statement.

EUCLID'S DIVISION LEMMA:

If $a > 0$, $b > 0$; there exists q and r such that $a = bq + r$, $0 \leq r < b$

EUCLID'S DIVISION ALGORITHMS: Deals with the divisibility of integers.

If $a > 0$, $b > 0$, and $a > b$: HCF (a, b)

Step-1: $a = bq + r$, $0 \leq r < b$

Step-2:

a) if $r = 0$, HCF (a, b) = b

b) if $r \neq 0$, Apply Euclid's division lemma to b and r.

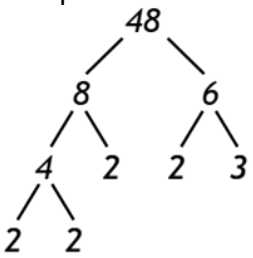
THE FUNDAMENTAL THEOREM OF ARITHMETIC: Deals with the multiplication of positive integers.

Two main applications:

a) To prove irrationality.

b) To explore when exactly the decimal expansion of a real number is terminating, and when it is non-terminating repeating.

1. Composite numbers can be written as products of primes.



2. HCF (a, b) x LCM (a, b) = a x b

X = p/q, q ≠ 0: http://www.physicsinduction.com

If the prime factorization of q is of the form $2^m \times 5^n$, then the given number is terminating else non terminating repeating.

TO PROVE: A NUMBER IS IRRATIONAL, you can assume it is rational and then show that this leads to a contradiction.

Prove that $\sqrt{3}$ is irrational.

Let $\sqrt{3}$ be a rational number

$\therefore \sqrt{3} = \frac{a}{b}$ HCF (a,b) = 1

Squaring both sides

$3 = \frac{a^2}{b^2}$

$\Rightarrow a^2 = 3b^2$ — (1)

$\Rightarrow$ 3 is a factor of a^2

$\Rightarrow$ 3 is a factor of a — (2)

$a = 3c$

Squaring both sides,

$a^2 = 9c^2$ — (3)

On comparing (1) & (3) we get

$3b^2 = 9c^2$

$\Rightarrow b^2 = 3c^2$

$\Rightarrow$ 3 is a factor of b^2

$\Rightarrow$ 3 is a factor of b — (4)

from (2) & (4)

3 is a common factor of a & b

This contradicts the fact that a & b have no common factor other than 1

$\Rightarrow \sqrt{3}$ is not a rational no.

$\Rightarrow \sqrt{3}$ is an irrational number

p: prime number and a > 0:

p divides a^2

⇨ p divides a

OPERATIONS ON REAL NUMBERS: R- Rational number and IR – Irrational number

a) IR + R = R

b) IR -R = IR

c) IR X R = IR

d) IR ÷R = IR

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