Chapter one
The Real numbers

Introduction :-

1. The set of Natural numbers: $N = \{0, 1, 2, 3, 4, ----\}$

   or $N = \{1, 2, 3, ----\}$

2. The set of integer numbers $Z = \{----, -3, -2, -1, 0, 1, 2, 3, ---\}$

3. The set of rational numbers.

   Def :- A number of the Form $\frac{m}{n}$ where m and n are integers, $n \neq 0$ is called rational number.

   i.e $Q = \{\frac{m}{n}, m, n \in Z, n \neq 0\}$.

4. The set of irrational numbers.

Def: A number where is not rational number is called irrational number.

Ex :- show that $\sqrt{2}$ is not rational number.

sol : suppose that $\sqrt{2}$ is rational number.

That means $\sqrt{2} = \frac{m}{n} \Rightarrow 2 = \frac{m^2}{n^2} \Rightarrow m^2 = 2n^2$

1. if m is even and n is odd.

$\therefore m = 2K \Rightarrow m^2 = 4K^2 \Rightarrow 4K^2 = 2n^2 \Rightarrow 2K^2 = n^2$

$\therefore n$ is even (contradiction).

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2. if m is odd and n are even.

we get $n = 2K \Rightarrow n^2 = 4K^2$

since $m^2 = 2n^2 \Rightarrow m^2 = 2(4K^2) \Rightarrow m^2 = 8K^2$

we get m^2 is even (contradiction).

but m is odd then m^2 is odd

3. if m and n are odd

m is odd $\Rightarrow m^2$ is odd.

but $m^2 = 2n^2$ and $2n^2$ is even.

$\therefore$ m^2 is even (contracadiction).

Then $\sqrt{2}$ is not rational number.