General instructions for Students: Whatever be the notes provided, everything must be copied in the Maths copy and then do the HOMEWORK in the same copy

IRRATIONAL NUMBERS – **A number cannot be expressed in the form $\frac{a}{b}$, where a and b are integers and $b \neq 0$ and a and b have no common factor except 1 is called an irrational number.**

"OR" **Non – terminating, non – repeating decimals are called irrational numbers.**

i) **$0.01001000100001\ldots\ldots\ldots\ldots$ is a non terminating and non repeating decimal and that is irrational.**

ii) **If m is a positive integer which is not a perfect square, then $\sqrt{m}$ is irrational.**

$$\sqrt{2},\quad \sqrt{3},\quad \frac{1}{\sqrt{5}},\quad 2+\sqrt{3},\ \text{etc.}$$

iii) **If m is a positive integer which is not a perfect cube, then $\sqrt[3]{m}$ is irrational.**

$$\sqrt[3]{2},\quad \sqrt[3]{3},\quad \text{etc.}$$

iv) **π is a number whose exact value is not $\frac{22}{7}$. π has value which is non terminating and non repeating, so π is irrational while $\frac{22}{7}$ is rational number.**

(If a is any natural number and p is a prime number such that p divides a^2, then p divides a.)

1. Prove that $\sqrt{2}$ is an irrational number.

If possible, let $\sqrt{2}$ be a rational number, then

$$\sqrt{2} = \frac{a}{b},\quad b \neq 0$$

Or $2 = \frac{a^2}{b^2}$ (squaring both sides)

Or $2b^2 = a^2$ .....(i)

Or 2 divides a^2

2 divides a (since 2 is prime)

Let $a = 2c$ ..... (ii)

From (i) and (ii), $2b^2 = 4c^2$

Or $b^2 = 2c^2$

Or 2 divides b^2

2 divides b

Thus, 2 is a common factor of a and b (except 1)

Contradiction

Our supposition is wrong

Hence, $\sqrt{2}$ is an irrational number .

2. Prove that $7 - 2\sqrt{3}$ is an irrational number.

If possible, let $7 - 2\sqrt{3}$ be a rational number. Then

$7 - 2\sqrt{3} = r$ (say)

Or $7 - r = 2\sqrt{3}$

Or $\frac{7-r}{2} = \sqrt{3}$

$\frac{7-r}{2}$ is rational but $\sqrt{3}$ is an irrational.

Contradiction

Our supposition is wrong

Hence, $7 - 2\sqrt{3}$ is an irrational number.

REAL NUMBERS – **The collection of all rational numbers together with all irrational numbers are called real numbers. Which are denoted by R.**

(EVERY REAL NUMBER IS EITHER RATIONAL OR IRRATIONAL NUMBER

DECIMAL EXPANSSION OF REAL NUMBERS –

CASE I – When the remainder becomes zero.

$\frac{13}{50} = 0.26$ **Terminating decimal**

CASE II – When the remainder never becomes zero.

$\frac{10}{3} = 3.333333 \ldots \ldots$

$= 3.\overleftarrow{3}$ **Non terminating recurring (repeating)**

REMARKS:

All integers positive, zero or negative are terminating decimals.

The decimal expansion of a rational $\frac{a}{b}$ where a and b are integers, $b > 0$, a, b have no Common factor other than 1 is:

Terminating if b can be expressed as $b = 2^m 5^n$ where m and n are whole numbers.

Non – terminating if b has a prime factor other than 2 or 5

HOMEWORK

EXERCIS – 1.2 : 3, 5 and 7

EXERCIS – 1.3 : 1, 3, 8, 12, 15 and 17