

Number System

NOTES

FUNDAMENTALS

- A number r is called a rational number if it can be written in the form $\frac{p}{q}$, where p and q are integers and $q \neq 0$.

Example:- $\frac{1}{2}, \frac{1}{3}, \frac{2}{5}$ etc.

- Representation of Rational Number as Decimals.

- **Case I :-** When remainder becomes zero $\frac{1}{2} = 0.5, \frac{1}{4} = 0.25, \frac{1}{8} = 0.125$

It is a terminating Decimal expansion.

- **Case II :-** When Remainder never becomes zero.

Example:- $\frac{1}{3} = .3333, \frac{2}{3} = .6666$, it is a non - terminating Decimal expansion.

- There are infinitely large rational numbers between any two given rational numbers.

- **Irrational Number:-** The number which cannot be expressed in form of $\frac{p}{q}$ and neither it is terminating nor recurring, is known as irrational number.

Examples:- $\sqrt{2}, \sqrt{3}$ etc.

Rationalization :- Changing of an irrational number into rational number is called rationalization and the factor by which we multiply and divide the number is called rationalizing factor.

Example:- Rationalizing factor of $\frac{1}{2-\sqrt{3}}$ is $2+\sqrt{3}$.

Rationalizing factor of $\sqrt{3} + \sqrt{2}$ is $\sqrt{3} - \sqrt{2}$

Low of exponents for real numbers.

- $a^m \times a^n = a^{m+n}$
- $\frac{a^m}{a^n} = a^{m-n}$
- $(a^m)^n = a^{mn}$
- $a^0 = 1$

Some useful results on irrational number

- Negative of an irrational number is an irrational number.

- The sum of a rational and an irrational number is an irrational number.
- The product of a non - zero rational number and an irrational number is an irrational number.

Some results on square roots

- $(\sqrt{x})^2 = x, x \geq 0$
- $\sqrt{x} \times \sqrt{y} = \sqrt{xy}, x \geq 0 \text{ and } y \geq 0$
- $(\sqrt{x} + \sqrt{y})(\sqrt{x} - \sqrt{y}) = x - y, (x \geq 0 \text{ and } y \geq 0)$
- $(\sqrt{x} + \sqrt{y})^2 = x + y + 2\sqrt{xy}, (x \geq 0 \text{ and } y \geq 0)$
- $(\sqrt{x} - \sqrt{y})^2 = x + y - 2\sqrt{xy}, (x \geq 0 \text{ and } y \geq 0)$
- $\frac{\sqrt{x}}{\sqrt{y}} = \sqrt{\frac{x}{y}}, (x \geq 0 \text{ and } y \geq 0)$
- $(a + \sqrt{b})(a - \sqrt{b}) = a^2 - b, (b \geq 0)$
- $(\sqrt{a} + \sqrt{b})(\sqrt{c} + \sqrt{d}) = \sqrt{ac} + \sqrt{bc} + \sqrt{ad} + \sqrt{bd},$
 $(a \geq 0, b \geq 0, c \geq 0)$