Number System

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- Real No. (Represented on no. line)
  - Rational No.(R)
    - $X = \frac{p}{q}$; $q \neq 0$; $p, q \in I$
      - Non-Terminating Recurring
        - $x = \frac{p}{q \neq 0}$
        - q is not in $2^m \times 5^n$
        - e.g:- $\frac{5}{11}$
      - Terminating
        - $x = \frac{p}{q \neq 0}$
        - q is in form $2^m \times 5^n$
        - e.g:- $\frac{3}{20} = \frac{3}{2^2 \# 5^1}$
      - Integers (I or Z) {eg. -3,-2,-1,0,1,2,...}
        - Positive
          - Whole No.(W) {eg:- 0,1,2,3.....}
            - Natural No. (N) {eg:- 1,2,3.....}
              - Prime No. {Exactly have 2 distinct factors 1 & itself. e.g. 2,3,5,7,11....}
              - One (Exception) Neither Prime nor Composite
              - Composite No. {More than 2 distinct factors e.g. 4,9,15....}
        - Negative
      - Non-Integers {eg. $\frac{\forall 1}{2}, \frac{3}{2}$ }
        - Decimal No eg. $3.65, 4.\overline{67}$
          - Terminating eg. 3.65
          - Non-terminating but recurring
            - Conversion : Decimal → Fraction
            - (i) $x = 0.\overline{6}$
              $= 0.666..$
            - (ii) Multiply by 10
              $10x = 6.666.....$
            - (iii) Subtract (ii),(i)
              $9x = 6$
            - (iv) $x = \frac{2}{3} = 0.\overline{6}$
  - Non-terminating & non-recuring (eg. 3.14285763)
- Imaginary No. (Not represented on number line)
  - Irrational No.
    - Cannot be $\frac{p}{q! 0}$; e.g $\sqrt{2}$, π
    - Insertion of irrational between 2 real no.
      $a,b \in$ Real
      Irrational $= \sqrt{a \times b}$
    - Surds
      - Irrational of form $\sqrt[n]{a}$
        - a= Radicand
        - $\sqrt[n]{\ }$ is radical sign
        - n = order
      - Laws of Surds
        - (i) $\sqrt[n]{a^n} = a$; (ii) $\sqrt[n]{a} \times \sqrt[n]{b} = \sqrt[n]{ab}$
        - (iii) $\sqrt[n]{a} \div \sqrt[n]{b} = \sqrt[n]{\frac{a}{b}}$
        - (iv) $\sqrt[n]{\sqrt[m]{a}} = \sqrt[nm]{a}$
        - (v) $\sqrt[n]{a} = \sqrt[n \times p]{a^p}$
        - (vi) $\sqrt[n]{a^m} = \sqrt[n \times p]{a^{m \times p}}$
      - (a) Addition & subtraction
        eg. $\sqrt{32} + \sqrt{18} - \sqrt{50}$
      - (b) Multiply & divide
        eg. $\sqrt[3]{2} \times \sqrt[4]{3} \div \sqrt[5]{10}$
      - (c) Comparison
        eg. $\sqrt[3]{6} >$ or $< \sqrt[5]{8}$
      - (d) Rationalization
        eg. $\frac{1}{7 \exists \sqrt{5}} \# \frac{7 \forall \sqrt{5}}{7 \forall \sqrt{5}}$

$a,b \in R$; $a < b$
n rational no between integer
$a = a \times \frac{(n \exists 1)}{(n \exists 1)}$ & $b = b \times \frac{(n \exists 1)}{(n \exists 1)}$
Rational no between 2 integral no.