Rational Numbers

Rational Numbers are those Real numbers that can be written in $\frac{p}{q}$ form, where p and q are integers and $q \neq 0$

y: law followed , n : law not followed

	Closure law				Commutative				Associative			
Number system	A	S	M	D	A	S	M	D	A	S	M	D
Natural (N)	y	n	y	n	y	n	y	n	y	n	y	n
Whole (w)	y	n	y	n	y	n	y	n	y	n	y	n
Integer (Z)	y	y	y	n	y	n	y	n	y	n	y	n
Rational (Q)	y	y	y	n	y	n	y	n	y	n	y	n

For any 2 rational numbers a and b :

Closure law: a+ b (sum) , a-b (difference) and a x b (product) is rational

$\frac{a}{0}$ is not defined , however excluding zero, collection of other rational numbers is closed under division

commutative law : a + b = b + a and a x b = b x a

associative law : a + (b + c) = (a + b) + c and a x (b x c) = (a x b) x c

0 is the additive identity for rational numbers
1 is multiplicative identity for rational numbers

If $\frac{a}{b}$ denotes a rational number :

additive inverse of $\frac{a}{b}$ is $-\frac{a}{b}$ and vice versa

$\frac{a}{b} + (-\frac{a}{b}) = 0 = (-\frac{a}{b}) + \frac{a}{b}$

reciprocal or multiplicative inverse of $\frac{a}{b}$ is $\frac{b}{a}$

$\frac{a}{b} \times \frac{b}{a} = 1 = \frac{b}{a} \times \frac{a}{b}$

All rational numbers except zero have a reciprocal

Distributive property of multiplication over addition and subtraction :

For any three rational numbers a, b and c

a(b + c)= ab + ac

a (b – c) = ab – ac

All rational numbers can be represented on the number line

Between any two rational numbers there are infinite rational numbers

If a and b are two rational numbers ,

$c = \frac{a+b}{2}$ is also rational , where a< c < b ; c is the mean of a and b