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Section - 3

Q1 Ring - A non empty set is a ring if it is equipped with two binary operation called addition and multiplication & def denoted by '+' and '.' respectively ie for all $a, b \in R$ we have $a+b \in R$ and $a.b \in R$ and it satisfies the following properties:

i) Addition is associative i.e
$(a+b)+c = a+(b+c) \; \forall \; a, b, c \in R$

ii) Addition is Commutative
$a+b = b+a \; \forall \; a, b \in R$

iii) There exists an element $0 \in R$ such that
$0+a = a = a+0, \; \forall \; a \in R$

To each element a in R there exists an element $-a$ in R such that $a+(-a) = -$

v) Multiplication is Associative i.e.

$a.(b.c) = (a.b).c, \; \forall \; a, b, c \in R$

vi) Multiplication is distributive with respect to addition i.e for all $a, b, c \in R$

Example of ring with zero divisors
R = (a set of 2×2 matrices)
Field ⇒ A ring R with at least two elements is called a field if it has following properties

i) R is commutative
R has unity
R is such that each non-zero element possesses multiplicative inverse.

For ~~ex~~ example - The ring of real numbers and complex numbers are also fiels.