* Scalars	$\alpha, \beta$ are eleme	ents of fleids, rir	igs, etc.													
Field  Rational numbers Real numbers Complex numbers	The state of the s	Unital Ring/Ring Ring The set of all square n-by-n matrices with entries from R	Commutative Ring/Rng  Even integers with the ordinary addition and multiplication of integers	Ring/Rng  Set of 3-by-3 real matrices whose bottom row is zero	3. Additive inverse $x + x' = x' + x = 0$ 4. Commutativity of the addit	R with "xy-x" as a binary operation	The set of positive integers with addition.  Ideal of a ring with the multiplication of the ring. (e.g. 2Z of Z)		Group  Symmetry group of a triangle  Permutation group  Free group	Abelian group  Integers with addition  Non-negative integers with multiplication  Cyclic group  Free abelian group	Vector/Linear space (over a field) $\mathbb{R}^n \text{ Field: } \mathbb{R} \text{   very common: just vectors}$ Polynomial vector space $\mathbb{F}[x]$ Field: $\mathbb{F}$ Matrices $M_{n \times m}(\mathbb{F})$ Field: $\mathbb{F}$ Solution space of a linear system $Ax = 0$ $ \text{Module (over a ring)} $ Abelian group may be considered as a module over $\mathbb{Z}$	Algebra (over a field)  Lie algebra: instead of associativity it satisfies the Jacobi identity $[x,[y,z]]+[y,[z,x]]+[z,[x,y]]=0$ and also Anticommutativity $[x,y]=-[y,x]$ Vectors in 3D space with cross product as a product and vector addition as addition (also Lie)  Algebra (over a ring)  Polynomial ring $\mathbb{Z}[x]$ is $\mathbb{Z}$ -algebra				
					5. Associativity of scalar mult $\alpha(\beta x) = (\alpha \beta)x$ 6. Distributivity of scalar mult $(\alpha + \beta)x = \alpha x + \beta x$ 7. Distributivity of scalar mult $\alpha(x + y) = \alpha x + \alpha y$ 8. Unitarity $1x = x$ 9. Compatibility with scalar m $(\alpha x)(\beta y) = (\alpha \beta)(xy)$ 10. Right distributivity $(x + y)z = xz + yz$ 11. Left distributivity $z(x + y) = zx + zy$	ciplication o	over vectors  https://www	v.youtube.com/@vektorfeld			Module (over an algebra)  Group representations as modules over group algebras		Associative Algebra Algebra of Square Matrices	Commutative Algebra  Jordan algebra	Unital Algebra Split-Octonions	Division Algebra Octonions
					12. Associativity of multiplication $(xy)z = x(yz)$ 13. Commutativity of multiplication $(xy)z = x(yz)$											
					15. Multiplicative inverse $xx' = x'x = e$											