**ALGEBRAIC STRUCTURE**

A non empty set S is called an algebraic structure w.r.t binary operation (\*) if it follows following axioms:

**Closure:** (a\*b) belongs to S for all a,b ∈ S.

Ex : S = {1,-1} is algebraic structure under \*

As 1\*1 = 1, 1\*-1 = -1, -1\*-1 = 1 all results belongs to S.

But above is not algebraic structure under + as 1+(-1) = 0 not belongs to S.

**SEMI GROUP**

A non-empty set S, (S,\*) is called a semigroup if it follows the following axiom:

**Closure**:(a\*b) belongs to S for all a,b ∈ S.

**Associativity**: a\*(b\*c) = (a\*b)\*c ∀ a,b,c belongs to S.

Note: A semi group is always an algebraic structure.

Ex : (Set of integers, +), and (Matrix ,\*) are examples of semigroup.

**MONOID**

A non-empty set S, (S,\*) is called a monoid if it follows the following axiom:

**Closure**:(a\*b) belongs to S for all a,b ∈ S.

**Associativity**: a\*(b\*c) = (a\*b)\*c ∀ a,b,c belongs to S.

**Identity Element**:There exists e ∈ S such that a\*e = e\*a = a ∀ a ∈ S

Note: A monoid is always a semi-group and algebraic structure.

Ex : (Set of integers,\*) is Monoid as 1 is an integer which is also identity element .

(Set of natural numbers, +) is not Monoid as there doesn’t exist any identity element. But this is Semigroup.

But (Set of whole numbers, +) is Monoid with 0 as identity element.

**GROUP**

A non-empty set G, (G,\*) is called a group if it follows the following axiom:

**Closure:** (a\*b) belongs to G for all a,b ∈ G.

**Associativity:** a\*(b\*c) = (a\*b)\*c ∀ a,b,c belongs to G.

**Identity Element:** There exists e ∈ G such that a\*e = e\*a = a ∀ a ∈ G

**Inverses:** ∀ a ∈ G there exists a-1 ∈ G such that a\*a-1 = a-1\*a = e

Note:

A group is always a monoid, semigroup, and algebraic structure.

(Z,+) and Matrix multiplication is example of group.

Abelian Group or Commutative group

**ABELIAN GROUP**

A non-empty set S, (S,\*) is called a Abelian group if it follows the following axiom:

**Closure:** (a\*b) belongs to S for all a,b ∈ S.

**Associativity:** a\*(b\*c) = (a\*b)\*c ∀ a,b,c belongs to S.

**Identity Element:** There exists e ∈ S such that a\*e = e\*a = a ∀ a ∈ S

**Inverses:** ∀ a ∈ S there exists a-1 ∈ S such that a\*a-1 = a-1\*a = e

**Commutative:** a\*b = b\*a for all a,b ∈ S

Note : (Z,+) is a example of Abelian Group but Matrix multiplication is not abelian group as it is not commutative.

For finding a set lies in which category one must always check axioms one by one starting from closure property and so on.

**HOMOMORPHISM AND ISOMORPHISM**

General definition about one to one, onto, Bijection, Injection, Surjection see this link <https://www.mathsisfun.com/sets/injective-surjective-bijective.html>

[http://nlc2cmd.us-east.mybluemix.net/#/](https://meet.google.com/linkredirect?authuser=0&dest=http%3A%2F%2Fnlc2cmd.us-east.mybluemix.net%2F%23%2F)

openAI Company

| **All Probability Formulas List in Maths** | |
| --- | --- |
| Probability Range | 0 ≤ P(A) ≤ 1 |
| Rule of Addition | P(A∪B) = P(A) + P(B) – P(A∩B) |
| Rule of Complementary Events | P(A’) + P(A) = 1 |
| Disjoint Events | P(A∩B) = 0 |
| Independent Events | P(A∩B) = P(A) ⋅ P(B) |
| Conditional Probability | P(A | B) = P(A∩B) / P(B) |
| Bayes Formula | P(A | B) = P(B | A) ⋅ P(A) / P(B) |

INHERENTLY AMBIGUOUS GRAMMER:-

If all grammer ambiguous for a language then the language is inherently ambiguous language.

For ex:- {anbncmdm,n,m>0}∪{anbmcmdn,n,m>0}

**What is the radix of the number if the solution to quadratic equation x^2 − 10x + 31 = 0 is x = 5 and x = 8?**

(A) 10 (B) 8 (C) 5 (D) 13

Explanation: If equation ax^2 + bx + c = 0, then sum of roots = -b/a and product of equations = c/a.

Given equation x^2 − 10x + 31 = 0 and roots are 5 and 8. Therefore,

sum of roots = -b/a = -(-10)/1 = (10)b = 5b + 8b implies b = 13.

Also, product of roots = c/a = 31/1 = (31)b = 5b \* 8b implies b = 13.

Answer is 13.

OPERATING SYSTEM:-

For fork command include this link for reference in fork tutorial

https://www.csl.mtu.edu/cs4411.ck/www/NOTES/process/fork/create.html