Name of College = L.S. College [illegible]
Deptt – Mathematics
Topic – Binary operation (Algebra)
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<u>Binary operation</u> :- Let A be a given set.
A mapping * given by
$*: A \times A \to A$
is called a binary operation

On set A.
if $a \in A$, $b \in A$
$a * b \in A$.

Ex:- + is a binary operation
On the set I
since sum of two integer is
also an integer.

+ is a binary operation on
the set E (set of even integers)
since sum of two even integer is also
an even integer.

O = set of odd integers
then + is not a binary operation
on set O as sum of two odd number
is not an odd No.

Laws of Operation :→

If $*$ is a binary operation on set A and $a, b, c \in A$,

Then $a*(b*c) = (a*b)*c$ (Associative Law)

$a*b = b*a$ (Commutative law)

Identity Element –

e is called an identity element of $*$

if $a*e = e*a = a$

Ex → If I = set of integer
+ is a binary operation ON I

Now $\forall a \in I$

$a+0 = 0+a = a \quad \forall a \in I$

$\Rightarrow 0$ is the ~~identity~~ identity element.

Inverse – If a set A contains an identity e for the binary operation $*$

and if $a*b = b*a = e \quad \forall a, b \in A$,

then a and b are inverse to each other

Ex + is binary operation on set I

then $a+(-a) = (-a)+a = 0$ for all $a, -a \in I$

$\Rightarrow -a$ is additive inverse of a.

and a is additive inverse of $-a$

Since $a \cdot \frac{1}{a} = \frac{1}{a} \cdot a = 1$

$\Rightarrow 1$ is Identity element.

a and $1/a$ is inverse of each other under the binary opera