



PARSHVANATH CHARITABLE TRUST'S
A.P. SHAH INSTITUTE OF TECHNOLOGY
Department of Computer Science and Engineering
Data Science

Semester: III

Subject: DSGT

Academic Year: 2022-2023

* Properties of Binary operations -

i) Commutativity :-

A binary operation on set A is called commutative if

$$a * b = b * a \quad \text{for all element } a \text{ \& } b \text{ of } A$$

ex. The binary operation $*$

i) addition in \mathbb{Z} is commutative ?

$$a * b = b * a$$

$*$ is $+$

$$a + b = b + a$$

$$a = 2 \quad b = 3$$

$$2 + 3 = 3 + 2 = 5$$

yes $*$ is commutative if

binary opⁿ $+$ is applied in \mathbb{Z} .

ii) division in \mathbb{Z} ?

$$a * b = b * a$$

$$* \text{ } a / b = b / a$$

$$a = 6 \quad b = 2$$

$$a / b = 6 / 2 = 3$$

$$b / a = 2 / 6 = 0.3$$

No, $/$ is not binary opⁿ on \mathbb{Z}
& it is not commutative.



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2> Associativity -

A binary operation $*$ on a set A is said to be associative, if

$$| a * (b * c) = (a * b) * c |$$

for all $a, b, c \in A$.

ex. ① is the binary operation of addition on \mathbb{Z} associative?

$$\therefore a + (b + c) = (a + b) + c$$

for all $a, b, c \in \mathbb{Z}$

the opⁿ addition is associative.

3> Distributive.

Distributive property of multiplication over addition is, $a \times (b + c) = (a \times b) + (a \times c)$ & over subtraction is, $a \times (b - c) = (a \times b) - (a \times c)$.

Note :- N : set of positive numbers $N = \{1, 2, 3, \dots\}$

W : set of natural nos along with 0 $W = \{0, 1, 2, 3, \dots\}$

Z = set of integers $Z = \{\dots, -3, -2, -1, 0, 1, 2, 3, \dots\}$

\mathbb{Q} = set of rational no (fraction no.)

$$\mathbb{Q} = \{-3, 0, -6, 5/3, 3.23\}$$