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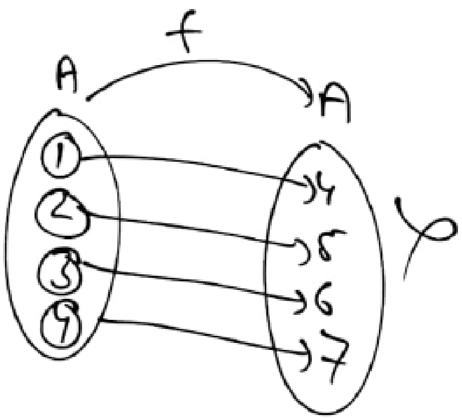
Relation & Function

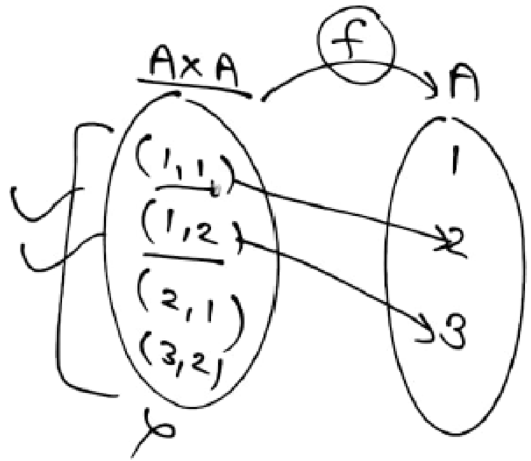
Binary operation:-

a Binary operation * on a set A is a function as:- $*: A \times A \to A$ and we will denoted * as $(a, b) = a * b$

Ex:- $A = \{1, 2, 3\}$, $A = \{1, 2, 3\}$

$A \times A = \{(1,1)(1,2)(1,3)(2,1)(2,2)(2,3)(3,1)(3,2)(3,3)\}$





$a * b = a + b$

$(1,1) = (1 * 1) = 1 + 1 = 2$

$(1,2) = (1 * 2) = 1 + 2 = 3$

Relation & Function

Ex:- Show that:- add., sub. & multi. are B.O. on (R) but div. is not a B.O. on R.

Solⁿ:- + is a B.O. if

$+ : R \times R \to R$ given by $(a, b) = a+b$

⇒ it is clear that + is a function.

So it is a B.O. Ans.

⇒ Sub → (−) → − is a B.O. if:-

$- : R \times R \to R$ → given by :- $(a, b) = a - b$

it is clear it is also B.O.

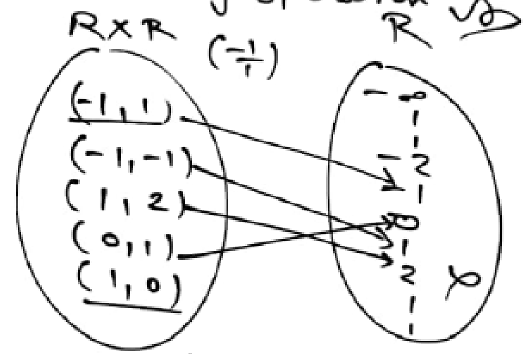
⇒ × → it is a B.O. if fun. $\times : R \times R \to R$ given by:- $(a, b) = a \times b$

So it is clear that × is also a B.O.

⇒ ÷ is a B.O. if fun. → $\div : R \times R \to R$

∵ it is clear that for (1, 0) there is no image in R so: ÷ is not a function.

Hence not a binary operation Ans.



$\frac{1}{0} = \infty$

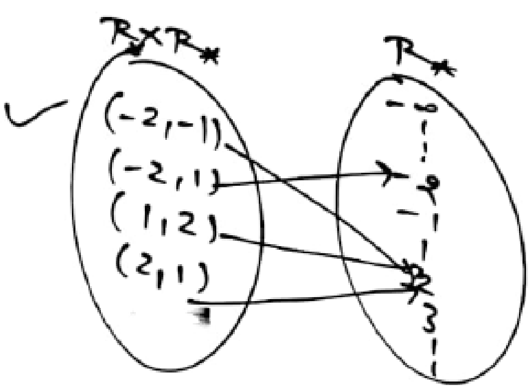
Relation & Function :-

Ex:- Show that:- add., sub. & multi. are B.O. on R. but div. is not a B.O. on R.

Show that:- division is a binary operation on set R_* of nonzero Real no.

Soln:- ∵ ÷ is a B.O. iff

function:- $\div : R_* \times R_* \to R_*$ is define.



Here is it clear that for all non-zero real no. there is a unique image of element $R_* \times R_*$ in R_*. so it is a function & hence B.O. Ans

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Relation & Function :-

Ex:- Show that :-

Sub. & div. are not B.O. in N.

Sol^n:- $\because$ $- : N \times N \to N$ given by $\to$ $(a, b) = a - b$

Here it is clear it is not a function.

So not a B.O. Ans

$a = 5,\ b = 1$

$(a, b) = (5, 1) = 5 - 1 = 4$

Now $a = 3,\ b = 5$

$(3, 5) \in N$

$(3, 5) = 3 - 5 = -2 \notin N$

$\div : N \times N \to N$ $\to$ given by $(a, b) = a/b$

let $a = 5,\ b = 1 \Rightarrow \frac{a}{b} = \frac{5}{1} = 5 \in N$

let $a = 5,\ b = 2 \Rightarrow a/b = 5/2 \notin N$

Hence it is not a fun and also not a B.O. Ans