Lecture 9:- Relations.

What is a Set. Syntax
→ { }.
→ Unique elements. Semantics

$A = \{a_2, a_2\}$ X
$A = [a_2]$. X.
$A = \{a_2\}$ ✓.

$(a,b) \neq (b,a)$.

Discrete Mathematics.
⇒
Discrete Structure.

Singelton.

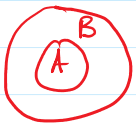
→ Set Multiplication:- $A = \{1,2\}$ $B = \{a,b\}$.

$A \times B = \{(1,a), (1,b), (2,a), (2,b)\}$.

$|A| = 2$ $|B| = 2$. $|A \times B| = |A| \times |B| = 2 \times 2 = 4$.

→ Power Set :-

Subset $A \subseteq B$. $\forall a \in A \rightarrow a \in B$.



All possible subsets of a Set.

$A = \{1,2\}$.

$pow(A) = \{\phi, \{1\}, \{2\}, \{1,2\}\}$. $\{1,2\} = \{2,1\}$

$|pow(A)| = 2^{|A|} = 2^2 = 4$.

$A = \{\}$. $|A| = 0$ $|pow(A)| = 2^{|A|} = 2^0 = 1$.

$\{\phi\}$. ✓

Power Set of $A \times B$. $A = \{1,2\}$ $B = \{a,b\}$.

$A \times B = \{(1,a), (1,b), (2,a), (2,b)\}$.

$pow(A \times B)$

$2^{|A \times B|} = 2^{|A| \times |B|} = 2^{2 \times 2} = 2^4 = 16$.

$\text{pow}(A \times B) = \{ \phi, \{(1,a)\}, \{(1,b)\}, \{(2,a)\}, \{(2,b)\},$
$\{(1,a),(1,b)\}, \{(1,a),(2,a)\}, \{(1,a),(2,b)\},$
$\{(1,b),(2,a)\}, \{(1,b),(2,b)\}, \{(2,a),(2,b)\},$
$\{(1,a),(1,b),(2,a)\}, \{(1,a),(1,b),(2,b)\},$
$\{(1,a),(2,a),(2,b)\}, \{(1,b),(2,a),(2,b)\},$
$\{(1,a),(1,b),(2,a),(2,b)\}. \}$.

$|A| = 6 \qquad |B| = 3.$

$|\text{pow}(A \times B)| = ? \qquad 2^{6 \times 3} = 2^{18} = ?$

RELATION:- A relation R (a binary relation) on $A \times B$ is any subset of $A \times B$.
$R \subseteq A \times B.$

$|A| = 0 \qquad |B| = 5.$

$|\text{pow}(A \times B)| = 2^{|A \times B|}$
$= 2^{|A| \times |B|}$
$= 2^{0 \times 5} \quad = 2^0$
$= 1.$

Quiz 3:- (i) $\exists x \, (x^3 = -1).$ 23-SEP-2022.

$x \in \mathbb{R}.$

Find truth value

(ii) $\exists x \, P(x, 3) \qquad x \in \{1,2,3\}.$

Find. Expression using $\wedge, \vee$. & $P(-,-)$?

Quiz #4:- . A Says "I am a Knave or B is a Knight"

p = B is a Knight. $\neg p =$ ---

q = A is a Knight. $\neg q =$ ----

Find A, & B. Knight = Speaks truth

Knave = a liar.