MIND MAP

Relations

1. Cartesian Product of two sets

Let A and B be any two non empty sets.

The set of all ordered pairs (a, b) such that $a \in A$ and $b \in B$ is called as cartesian product of sets A and B and is denoted by $A \times B$.

2. Relation

Every non-zero subset of $A \times B$ defines a relation from set A to set B.

3. Total Number of Relation from A to B

Let A contain 'm' elements and B contain 'n' elements.

Number of elements in $A \times B \longrightarrow m \times n$

Number of non void subsets

$= {}^{mn}C_1 + {}^{mn}C_2 + \dots\dots + {}^{mn}C_{mn} = 2mn - 1$

4. Domain & Range of Relation

If R be a relation from a set A to set B. Then set of all first components or coordinates of ordered pairs is called the domain of R. While the set of all second components or coordinates of the ordered pairs is called as range of relation.

$R = \{(3,2),(5,2),(5,4),(7,2),(7,4),(7,6)\}$

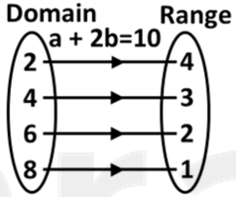
Domain $= \{3,5,7\}$

Range $= \{2,4,6\}$

5. Inverse of a Function

If R is a relation defined from $A \longrightarrow B$ then R^{-1} is a relation defined from $B \longrightarrow A$ as

$\boxed{R^{-1} = \{(b,a) : (a,b) \in R\}}$



i.e. Doman of R = Range of R^{-1}

Range of R = Domain of R^{-1}

N is a set of first 10 natural nos.

$aRb \Rightarrow a + 2b = 10$

$N = \{1,2,3,\dots,10\}$ & $a, b \in N$

$R = \{(2,4),(4,3),(6,2),(8,1)\}$

Inverse relation is $R^{-1} \longrightarrow \{(1,8),(2,6),(3,4),(4,2)\}$

6. Types of Relation

(i) Identity Relation

A relation defined on a set A is said to be an Identity relation if every element of A is related to itself and only to itself.

(ii) Reflexive Relation

A relation defined on a set A is said to be an reflexive relation if each & every element of A is related to itself.

Note

Every identity relation is a reflexive relation but every reflexive relation need not be an identity.

(iii) Symmetric Relation

A relation defined on a set is said to be symmetric if $aRb \Rightarrow bRa$

Note If R is symmetric then

(i) $R = R^{-1}$ (ii) Range of R = Domain of R

(iv) Transitive Relation

A relation on set A is said to be transitive if $(a,b) \in R$ & $(b,c) \in R \Rightarrow (a,c) \in R$

and (a,b,c) need not be distinct.

(v) Equivalence Relation

If a relation is Reflexive, Symmetric and Transitive then it is said to be an equivalence relation.