Types of Relations

A relation R on set A are subsets of $A \times A$

1) Reflexive

$$\forall \; a \in A \; , \; (a,a) \in R$$

A:

$A = \{1, 2, 3\}$

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

$R_3 = \{(1,1), (2,2), (3,3)\}$

$R_1 = \{(1,1), (1,3), (2,2)\} \qquad \times \text{ Reflexive}$

$R_2 = \{(1,1), (2,3), (2,2), (3,3)\}$

eg. $A = \{$ set of straight lines in a plane $\}$.

$A = \{l_1, l_2, l_3, l_4 - - - - , l_n\}$

R is defined : $\quad R = \{(l_1, l_2) : l_1 \text{ is } || l_2\}$

$R = \{(l_1, l_1), (l_2, l_2) - - - - (l_n, l_n) - - - \}$

if $(l_1, l_2) \in R$. & $(l_2, l_3) \in R$.

$l_1 || l_2 \qquad\qquad l_2 || l_3$

2) Symmetric Relation.

A relation R on set A is symmetric relation.

if $(a,b) \in R \implies (b,a) \in R$

eg : $A = \{1,2,3,4\}$

$R_1 = \{ (1,1), (1,2), (3,1), (2,1) \}$ ✗ Symmetric.

$R_2 = \{ (1,1), (1,2), (3,1), (1,3), (2,1) \}$ ✓ Symmetric.

3) Transitive Relation

A relation R on set A is transitive

iff $(a,b) \in R$ & $(b,c) \in R \implies (a,c) \in R$.

$A = \{1,2,3,4\}$

$R_1 = \{ (1,1), (1,2), (2,3), (1,4), (3,4) \}$ Transitive
$, (2,4), (1,3)$

4) Equivalence Relation.

If a relation R on set A is reflexive symmetric & transitive then R is said to be an equivalence relation.