

Relation & function

iv) Symmetric Relation:- $\forall (a, b) \in R \Rightarrow (b, a) \in R$, where $a \in A$
 $b \in B$
 $A = \{1, 2\}$

Ex:- $R = \{ \underline{(1, 1)} (1, 2) (2, 1) (2, 2) \}$

$-\infty \dots -3, -2, -1, 0, 1, 2, 3 \dots$ Solⁿ:- $\because (1, 2) \in R \Rightarrow (2, 1) \in R$
 $a=10, b=5 = \frac{10-5}{9-5} = \frac{5}{5} = 1$
 $\Rightarrow b-a = 5-10 = \frac{-5}{5} = -1$
 So R is symm.

OR

Ex prove:- $[R = \{(a, b) : (a-b) \text{ is divisible by } 5, a, b \in \mathbb{Z} \text{ is symm.}]$
 $\forall (2, 1) \in R \Rightarrow (1, 2) \in R \checkmark$

Solⁿ:- $\because (a, b) \in R \Rightarrow a-b \text{ is divisible by } 5 \Rightarrow \frac{a-b}{5} = k \Rightarrow a-b = 5k$

Now:- $a-b = 5k \Rightarrow -(b-a) = 5k \Rightarrow (b-a) = -5k \Rightarrow (b-a) = 5(-k) \Rightarrow b-a = 5k_1$

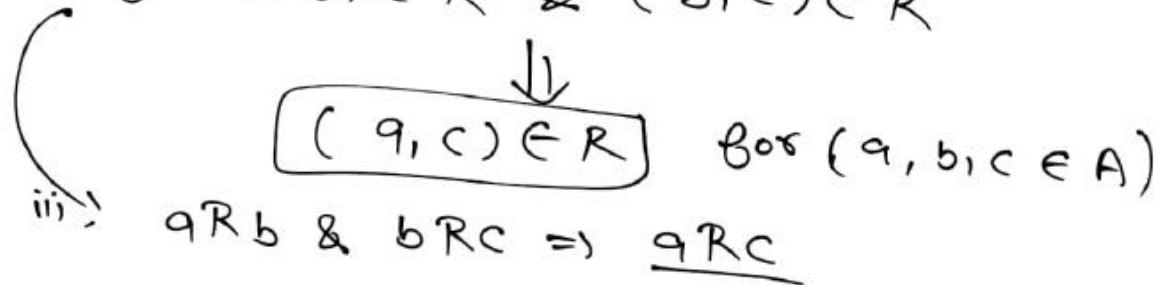
\Rightarrow So $(b-a)$ is also divisible by 5. then

$(b, a) \in R$ H.P.

Relation & function

vi Transitive

Relation: ii) if $(a, b) \in R$ & $(b, c) \in R$



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

$R = \{ \underbrace{(1,1)}_{\substack{\checkmark \\ a \ b}}, (2,2), (3,3), \underline{(1,2)}, \underline{(2,1)}, \underline{(1,3)}, \underline{(3,1)}, \underline{(2,3)}, \underline{(3,2)} \}$

Solⁿ:-

<p>ii) $(1,2) \in R \Rightarrow (a,b) \in R$ $(2,1) \in R \Rightarrow (b,c) \in R$</p> <p>ii) $(a,b) \in R \Rightarrow (2,1) \in R$ $(b,c) \in R \Rightarrow (1,3) \in R$</p> <p>iii) $(1,3) \in R \text{ \& \& } (3,1) \in R \Rightarrow (1,1) \in R$</p>	<p>$\Rightarrow (1,1) \in R \Rightarrow (3,1) \in R \text{ \& \& } (1,2) \in R \Rightarrow (3,2) \in R$ $\Rightarrow (2,3) \in R \text{ \& \& } (3,2) \in R \Rightarrow (2,2) \in R$ $\Rightarrow (3,2) \in R \text{ \& \& } (2,1) \in R \Rightarrow (3,1) \in R$ So R is Transitive.</p>
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vi) Equivalence

Relation: if a relation R is Reflexive, symm & Transitive. then it is called equi. Relation.

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

$R = \{(1,1)(1,2)(2,1)(2,2)(2,3)(\frac{3}{9}, \frac{2}{6})\}$

Sol!- Symm: $(1,2) \in R$
 $(2,1) \in R$

$(2,3) \in R$
 $(3,2) \in R$

this is symm.

iii) Tran. \rightarrow $(1,2) \in R \ \& \ (2,1) \in R \Rightarrow (1,1) \in R$
 $(2,1) \in R \ \& \ (1,1) \in R \Rightarrow (2,1) \in R$
 $(2,3) \in R \ \& \ (3,2) \in R \Rightarrow (2,2) \in R$

$(\frac{9}{3}, \frac{6}{2}) \in R \ \& \ (\frac{6}{2}, \frac{2}{1}) \in R \Rightarrow (\frac{9}{3}, \frac{2}{1}) \in R$

Tran \checkmark