

Relation & function

Ex:- If T is a set of all Δ in a plane & R is a Relation such that
 $R = \{ (T_1, T_2) ; T_1 \& T_2 \text{ are Congruent } \Delta. \}$ Comment about Relation.

Solⁿ:- $\therefore R = \{ (T_1, T_2) ; T_1 \& T_2 \text{ are Congruent} \}$

i) Refl. \rightarrow If $(T_1, T_2) ; T_1 \& T_2$ are Congruent.

$\therefore (T_1, T_1) ; T_1 \& T_1$ are also Congruent. So reflexive. \checkmark

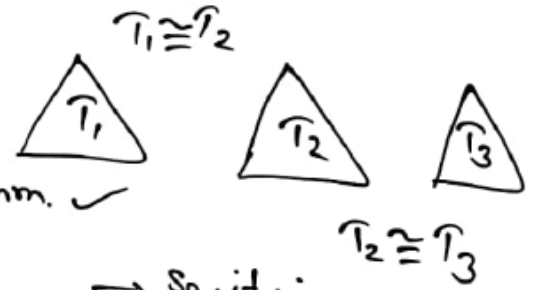
ii) Symm. \rightarrow For $(a, b) \in R \Rightarrow (b, a) \in R$

$\therefore (T_1, T_2) ; T_1 \& T_2$ are Congruent.

$\therefore (T_2, T_1) ; T_2 \& T_1$ are also Congruent. \rightarrow So Symm. \checkmark

iii) Tran. \rightarrow If $T_1 \& T_2$ are Cong. & $T_2 \& T_3$ are also Congruent.

So we can say $T_1 \& T_3$ are also Congruent. \rightarrow So it is Tran.



\rightarrow So it is an Equivalence Relation

Relation & function

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

& $R_1 = \{ (1,1), (1,2), (2,3), (1,3), (2,2), (3,3), (4,4) \}$
 Refl. ✓ → Symm. ✗ , Trans. ✓

Identity →
 For all element of A, A is relate with itself only.

- $(1,1) \in R$
- $(2,2) \in R$
- $(3,3) \in R$
- $(4,4) \in R$

2) Symm → if $(a,b) \in R \Rightarrow (b,a) \in R$

$(1,2) \in R \Rightarrow (2,1) \notin R \rightarrow$ non. Symm. ✓

3) Transitive :- if $(a,b) \in R \& (b,c) \in R \Rightarrow (a,c) \in R$

$\Rightarrow [(1,2) \in R \& (2,3) \in R] \Rightarrow (1,3) \in R$ ✓

so it is Transitive ✓

Identity Relation :- $R = \{ (1,1), (2,2), (3,3), (4,4) \}$

i) Refl. ✓ ii) Symm. $(1,1) \in R \Rightarrow (1,1) \in R$

iii) Trans. → $(1,1) \in R \& (1,1) \in R \Rightarrow (1,1) \in R$

Set = $\{1, 1, 1, 2\}$
 $= \{1, 2\}$

Relation & function

$$\text{if } A = \{a, b, c\}$$

$$\& R = \{(a, c), (c, c), (b, a), \underline{(c, a)}, (a, a), (b, b), (a, b)\}$$

i) Ref. $\rightarrow (a, a), (b, b), (c, c) \in R \checkmark$

ii) Symm. $\rightarrow (a, c) \in R \Rightarrow (c, a) \in R$
 $(b, a) \in R \Rightarrow (a, b) \in R$
 $(c, a) \in R \Rightarrow (a, c) \in R \checkmark$
 $(a, b) \in R \Rightarrow (b, a) \in R$

iii) Trans. $\Rightarrow (a, c) \in R \& (c, a) \Rightarrow (a, a) \in R \checkmark$
 $(b, a) \in R \& (a, b) \Rightarrow (b, b) \in R \checkmark$
 $(c, a) \in R \& (a, c) \Rightarrow (c, c) \in R$
 $(c, a) \in R \& (a, b) \Rightarrow (c, b) \notin R$

Relation & function

Ex:- i) $A = \{1, 2, 3, \dots, 13, 14\}$

$R = \{(x, y) : 3x - y = 0\}$

→

Solⁿ:-

$A = \{1, 2, 3, 4, \dots, 13, 14\}$

$R = \{(x, y) : 3x - y = 0\}$

$\Rightarrow 3x = y$

$R = \{(1, 3)(2, 6)(3, 9)(4, 12)\}$

\Rightarrow Ref. $\rightarrow \because (1, 1)(2, 2)(3, 3) \dots (14, 14) \notin R \ \neq$

\Rightarrow Symm $\rightarrow (1, 3) \in R \Rightarrow (3, 1) \notin R \ \neq$

\Rightarrow Tran. $\rightarrow \boxed{(1, 3) \in R \ \& \ (3, 9) \in R} \Rightarrow (1, 9) \notin R \ \neq$

Ex:- i) $A = \{5, 6, 7, 9\}$

$R = \{(5, 5)(6, 6)(7, 7)(9, 9)\}$

What should be added to R to make it ref. & symm.

ii) $A = \{0, 1, 2, 3, \dots, 11, 12\}$

$R = \{(a, b) : (a - b) \text{ is multiple of } 4\}$

→ Check Relation.