CH:- RELATION & FUNCTION.

Excercise → 1.1

(i) R set $A = \{1, 2, 3, \ldots, 13, 14\}$
$R = \{(x, y) : 3x - y = 0\}$.

⇒ $\{(1,3), (2,6), (3,9), (4,12)\}$.

∴ Reflexive ⇒ $(x, y) \in R$ then $(x, x) \in R$.
Here, $(1,3) \in R$ but $(1,1) \notin R$.
So, it is not Reflexive.

∴ Symmetric ⇒ $(x, y) \in R$ then $(y, x) \in R$.
Here, $(1,3) \in R$ ~~then~~ but $(3,1) \notin R$
So, it is not Symmetric

∴ Transitive ⇒ $(x, y) \in R$, $(y, z) \in R$ then $(x, z) \in R$.
Here, $(1,3) \in R$, $(3,9) \in R$ but $(1,9) \notin R$
So, it is not Transitive.

(ii) R → N
$\{(x, y) : y = x + 5$ and $x < 4$.

$y = 1 + 5 \Rightarrow 6$
$y = 2 + 5 \Rightarrow 7$
$y = 3 + 5 \Rightarrow 8$
$\{(1,6), (2,7), (3,8)\}$

∴ Reflexive ⇒ $(x, y) \in R$ then $(x, x) \in R$.
Here, $(1,6) \in R$ but $(1,1) \notin R$
So, it is not Reflexive

∴ Symmetric ⇒ $(x, y) \in R$ then $(y, x) \in R$.
⇒ $(1,6) \in R$ but $(6,1) \notin R$
So, it is not Symmetric

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$\therefore$ Transitive $\Rightarrow$ $(x,y) \in R$, $(y,z) \in R$ then $(x,z) \in R$.
$\Rightarrow$ $(1,6) \in R$, & there is no other set which belongs to this case.
So, it is not Transitive.

(iii) $A = \{1,2,3,4,5,6\}$
$R = \{(x,y) : y$ is divisible of $x\}$.

~~(x,y)~~ ~~(1,1)~~ :
$\{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6), (2,4)$
$(2,6), (3,6)\}$.

$\Rightarrow$ $\therefore$ Reflexive $\Rightarrow$ $(x,y) \in R$ then $(x,x) \in R$.
Here $\Rightarrow$ $(1,2) \in R$ then $(1,1) \in R$.
So, it is Reflexive.

$\therefore$ Symmetric $\Rightarrow$ $(x,y) \in R$ then $(y,x) \in R$
Here $\Rightarrow$ $(1,2) \in R$ then $(2,1) \notin R$
So, it is not Symmetric

$\therefore$ Transitive $\Rightarrow$ $(x,y) \in R$, $(y,z) \in R$ then $(x,z) \in R$
Here $\Rightarrow$ $(1,1) \in R$, $(1,2) \in R$ then $(1,2) \in R$.
So, it is Transitive.

(iv) $z \to I$.
$R = \{(x,y) : x - y$ is an Integer$\}$

$f(1) \Rightarrow x = y$.
for Reflexive :- $(x,y) \in R$ $\Rightarrow$ ~~if~~ $(x-x) \in$ an integer
$0 \in Z$

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Symmetric $\Rightarrow$ $(x,y) \in R \Rightarrow (y,x) \in R$.

$(x-y) \in z \Rightarrow (y-x) \in Z$

$(2-3) \in z \Rightarrow (3-2) \in z$

Transitive $\Rightarrow$ $(x,y) \in R, (y,z) \in R$ and $(x,z) \in R$

$(x-y) \in z$, $(y-z) \in R$

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

$(1-3) \in z \Rightarrow (x,z) \in Z$

$\Rightarrow (x,z) \in R$.

(v) (a) $R = \{(x,y) :$ x and y work at same place $\}$.

Reflexive :- $(x,y) \in R$ then $(x,x) \in R$.

Here, $(x,y) \in W$ then $(x,x) \in R$.

yes it is Reflexive.

Symmetric :- $(x,y) \in R$ then $(y,x) \in R$

Here, $(x,y) \in W$ then $(y,x) \in R$

yes it is symmetric.

Transitive :- $(x,y) \in R$, $(y,z) \in R$ then $(x,z) \in R$

Here, $(x,y) \in W$ & $(y,z) \in W$ then $(x,z) \in W$.

yes it is transitive.

(b) $R = \{(x,y) :$ x and y live at same locality $\}$.

same as ques (a).

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Reflexive :- $(x,y) \in R$ then $(x,x) \in R$.

$\Rightarrow$ yes it is Reflexive.

Symmetric :- $(x,y) \in R$ then $(y,x) \in R$.

$\Rightarrow$ yes it is symmetric

Transitive :- $(x,y) \in R$, $(y,z) \in R$ then $(x,z) \in R$.

$\Rightarrow$ yes it is also transitive

(c) $R = \{(x,y) : x$ is exactly 7cm taller than $y\}$.

Reflexive :- $(x,y) \in R$ then $(x,x) \in R$.

Here, x is 7cm taller than y. so by its comparison $(x,x) \notin R$.

it is not Reflexive.

Symmetric :- $(x,y) \in R$ then $(y,x) \in R$.

Here, x is 7cm taller than y but y is not taller than x.

so, Here $(x,y) \in R$ but $(y,x) \notin R$.

It is not symmetric.

Transitive :- $(x,y) \in R$, $(y,z) \in R$ then $(x,z) \in R$

It is not transitive.

(d) $R = \{(x,y) : x$ is wife of $y\}$.

$\therefore$ Reflexive :- $(x,y) \in R$ ~~then~~ $\Rightarrow$ $(x,x) \in R$.

Here, x is wife of y but not the wife of her own.

$(x,y) \in R$ but $(x,x) \notin R$.

It is not Reflexive.

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$\therefore$ Symmetric :- $(x,y) \in R \Rightarrow (y,x) \in R$.
Here, $(x,y) \in R$ but $(y,x) \notin R$
It is not symmetric.
$\therefore$ Transitive :- $(x,y) \in R$, $(y,z) \in R \Rightarrow (x,z) \in R$.
Here there is no third person which is related to x.
so, It is not Transitive

e) $R = \{(x,y) : x \text{ is father of } y\}$.
$\therefore$ Reflexive :- $(x,y) \in R \Rightarrow \forall (x,x) \in R$.
Here x is father of y not of his own
$(x,y) \in R$ but $(x,x) \notin R$.
It is not Reflexive.
$\therefore$ Symmetric :- $(x,y) \in R \Rightarrow (y,x) \in R$
Here x is father of y but not y is father of x.
$(x,y) \in R$ but $(y,x) \notin R$.
It is not Symmetric
$\therefore$ Transitive :- $(x,y) \in R$, $(y,z) \in R \Rightarrow (x,z) \in R$
Here x is father of y but he is not related to third person.
So $(x,y) \in R$, $(y,z) \in R$ but $(x,z) \notin R$
So, It is not Transitive.

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