NCERT Solutions Class 12 Maths Chapter 1 Relations and Functions

Question 1:
Determine whether each of the following relations are reflexive, symmetric and transitive.

(i)   Relation R in the set $A = \{1, 2, 3, \ldots, 13, 14\}$ defined as
$$R = \{(x, y) : 3x - y = 0\}$$

(ii)   Relation R in the set of N natural numbers defined as
$$R = \{(x, y) : y = x + 5 \text{ and } x < 4\}$$

(iii) Relation R in the set $A = \{1, 2, 3, 4, 5, 6\}$ defined as
$$R = \{(x, y) : y \text{ is divisible by } x\}$$

(iv) Relation R in the set of Z integers defined as
$$R = \{(x, y) : x - y \text{ is an integer}\}$$

(v)   Relation R in the set of human beings in a town at a particular time given by

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

     (b) $R = \{(x, y) : x \text{ and } y \text{ live in the same locality}\}$

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

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

     (e) $R = \{(x, y) : x \text{ is father of } y\}$

Solution:

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

R is not reflexive because $(1, 1), (2, 2) \ldots$ and $(14, 14) \notin R$

R is not symmetric because $(1, 3) \in R$, but $(3, 1) \notin R$. [since $3(3) \neq 0$]

R is not transitive because $(1, 3), (3, 9) \in R$, but $(1, 9) \notin R$. [$3(1) - 9 \neq 0$]

Hence, R is neither reflexive nor symmetric nor transitive.

(ii) $R = \{(1, 6), (2, 7), (3, 8)\}$

R is not reflexive because $(1, 1) \notin R$

R is not symmetric because $(1, 6) \in R$ but $(6, 1) \notin R$.

R is not transitive because there isn't any ordered pair in R such that $(x, y), (y, z) \in R$, so $(x, z) \notin R$.

Hence, R is neither reflexive nor symmetric nor transitive.

(iii) $R = \{(x, y) : y \text{ is divisible by } x\}$

We know that any number other than 0 is divisible by itself.

Thus, $(x, x) \in R$

So, R is reflexive.

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