CLASS : XI CHAPTER - 2 RELATIONS & FUNCTIONS

EXERCISE 2.2 (NCERT)

QNo 1 Let $A = \{1, 2, 3 \cdots, 14\}$ Define a relation R from A to A by $R = \{(x, y); 3x - y = 0 ; x, y \in A\}$, Write down its domain, Codomain and Range.

Sol:

$A = \{1, 2, 3, \cdots 14\}$

$R = \{(x, y); 3x - y = 0 ; x, y \in A\}$

$\therefore \quad 3x - y = 0 \Rightarrow y = 3x ; x, y \in A$

Put $x = 1, 2, 3, \cdots 14$

We get $y = 3, 6, 9, \cdots 42$

For $x = 5, 6, 7 \cdots 14$, We get $y = 15, 18, \cdots 42$ which do not belong to set A.

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

Domain of R = Set of first elements $= \{1, 2, 3, 4\}$

Range of R = Set of Second elements $= \{3, 6, 9, 12\}$

Codomain of $R = \{1, 2, 3, \cdots 14\}$

QNo 2. Define a relation R on set N of natural Nos by $R = \{(x, y); y = x + 5, x$ is natural no. less than 4; $x, y \in N\}$ Depict this relationship using roster form. Write down the domain and Range.

Sol:

$R = \{(x, y); y = x + 5, x$ is natural no. less 4; $x, y \in N\}$

$\therefore y = x + 5$ where $x = 1, 2, 3$ and $x, y \in N$

$\Rightarrow y = 1+5, 2+5, 3+5$ i.e. $y = 6, 7, 8.$

$\therefore$ In Roster form $R = \{(1, 6) (2, 7) (3, 8)\}$

Domain of $R = \{1, 2, 3\}$, Range of $R = \{6, 7, 8\}$.

QNo.3: $A = \{1, 2, 3, 5\}$ and $B = \{4, 6, 9\}$. Define a Relation R from A to B by $R = \{(x, y)$; the difference between x and y is odd; $x \in A$ and $y \in B\}$. Write R in Roster form.

Sol:

$A = \{1, 2, 3, 5\}$; $B = \{4, 6, 9\}$

$R = \{(x, y)$; the difference between x and y is odd. $x \in A, y \in B\}$

Now

$4-1=3$	$4-2=2$	$4-3=1$	$5-4=1$
$6-1=5$	$6-2=4$	$6-3=3$	$6-5=1$
$9-1=8$	$9-2=7$	$9-3=6$	$9-5=4$

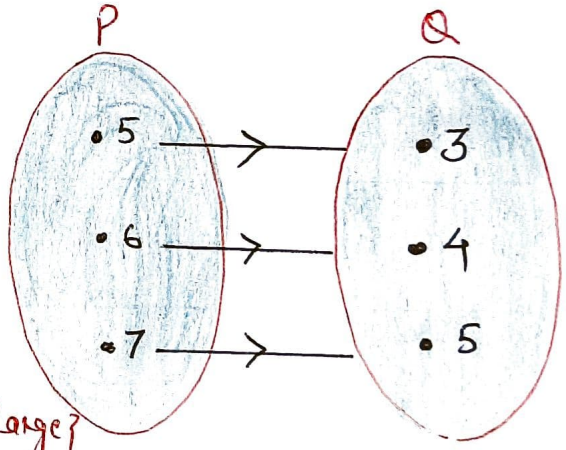
$\therefore R = \{(1,4), (1,6), (2,9), (3,4), (3,6), (5,4), (5,6)\}$

QNo 4 The fig. shows a relationship between the sets P and Q. Write this relation

(i) In set builder form

(ii) Roster form.

What is its domain and Range?



Sol.

(i) Relation consists of elements (x, y) where $y = x - 2$.

$\therefore$ Set-Builder form of $R = \{(x, y)$; $y = x-2$, $x \in A$, $y \in Q\}$

(ii) In Roster form:

$R = \{(5,3)(6,4)(7,5)\}$

Domain of $R = \{5, 6, 7\}$

Range of $R = \{3, 4, 5\}$

QNo 5: Let $A = \{1, 2, 3, 4, 6\}$ Let R be the relation on A defined by $\{(a, b)$; $a, b \in A$ and b is exactly divisible by $a\}$

(i) Write R in Roster form.

(ii) Find Domain of R (iii) find Range of R.

Sol. Here $A = \{1, 2, 3, 4, 6\}$

$R = \{(a, b); a, b \in A, b \text{ is exactly divisible by } a\}$

(i) Roster form : $R = \{(1,1)(1,2)(1,3)(1,4)(2,2)(2,4)(2,6)(3,3)(3,6)(4,4),(6,6)\}$

(ii) Domain of $R = \{1, 2, 3, 4, 6\}$

(iii) Range of $R = \{1, 2, 3, 4, 6\}$

QNo.6 Determine the range and domain of relation R defined by $R = \{(x, x+5); x \in \{0, 1, 2, 3, 4, 5\}\}$

Sol : Here $R = \{(x, x+5); x \in \{0, 1, 2, 3, 4, 5\}\}$

$\therefore$ Roster form of $R = \{(0,5), (1,6)(2,7), (3,8), (4,9)(5,10)\}$

[on put $x = 0, 1, 2, 3, 4, 5$

$\therefore$ Domain of $R = \{0, 1, 2, 3, 4, 5\}$

Range of $R = \{5, 6, 7, 8, 9, 10\}$

QNo.7 Write the relation $R = \{(x, x^3); x \text{ is prime number less than } 10\}$ in Roster form.

Sol. Prime numbers less than 10 are 2, 3, 5, 7

Here $R = \{(x, x^3); x \text{ is prime number less than } 10\}$

$\therefore$ R in Roster form is $R = \{(2,8)(3,27),(5,125),(7,343)\}$

QNo 8 : Let $A = \{x, y, z\}$ and $B = \{1, 2\}$. find the number of relations from A to B.

Sol. $A = \{x, y, z\}$ $\therefore n(A) = 3$

$B = \{1, 2\}$ $\therefore n(B) = 2$

$\therefore n(A \times B) = n(A) \times n(B) = 3 \times 2 = 6$

Now as number of relations from A to B is the number of subsets of AXB.

As AXB has 6 elements.

$\therefore$ Number of Subsets of AXB $= 2^6 = 64$.

$\therefore$ No. of relations from A into B $= 64$.

QNo 9: Let R be a relation on Z defined by

$R = \{(a,b);\ a,b \in Z,\ a-b \text{ is an integer}\}$

Find the domain and Range of R.

Sol.

$R = \{(a,b);\ a,b \in Z,\ a-b \text{ is an integer}\}$

Now Since $\forall\ a,b \in Z,\ a-b \in Z$.

ie For any integer a and b, a-b is also an integer.

$\therefore$ Domain of $R = Z$

Range of $R = Z$

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