CBSE Class–11 Mathematics

NCERT Solutions

Chapter - 2 Relations and Functions

Exercise 2.2

1. Let A = {1, 2, 3, ..., 14}. Define a relation R from A to A by R = $\{(x, y): 3x - y = 0,$ where $x, y \in A\}$. Write down its domain co-domain and range.

Ans. Given: A = {1, 2, 3, ..., 14}

The ordered pairs which satisfy $3x - y = 0$ are (1, 3), (2, 6), (3, 9) and (4, 12).

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

Domain = {1, 2, 3, 4}

Range = {3, 6, 9, 12}

Co-domain = {1, 2, 3, ..., 14}

2. Define a relation R on the set N of natural numbers R = $\{(x, y): y = x + 5, x$ is a natural number less than 4: $x, y \in N\}$. Depict this relationship using roster form. Write down the domain and the range.

Ans. Given: R = $\{(x, y: y = x + 5, x \text{ is a natural number less than } 4: x, y \in N)\}$

Putting x = 1, 2, 3 in $y = x + 5,$ we get y = 6, 7, 8

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

Domain = {1, 2, 3}

Range = {6, 7, 8}

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: $x \in A, y \in B\}$. Write R in roster form.

Ans. Given: A = {1, 2, 3, 5} and B = {4, 6, 9}, $x \in$ A, $y \in$ B

$\therefore x - y$ = (1 – 4), (1 – 6), (1 – 9), (2 – 4), (2 – 6), (2 – 9), (3 – 4), (3 – 6) (3 – 9),

(5 – 4), (5 – 6), (5 – 9)

$\Rightarrow x - y = -3, -5, -8, -2, -4, -7, -1, -3, -6, 1, -1, -4$

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

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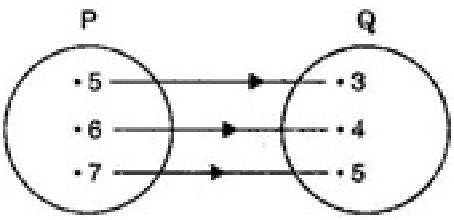
4. Figure shows a relationship between the sets P and Q. Write this relation:

(i) in set-builder form

(ii) roster form



What is its domain and range?

Ans. (i) Relation R in set-builder form is R = $\{(x, y) : y = x - 2 : x = 5, 6, 7\}$

(ii) Relation R in roster form is R = {(5, 3), (6, 4), (7, 5)}

Domain = {5, 6, 7}

Range = {3, 4, 5}

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

(i) Write R in roster form.

(ii) Find the domain of R.

(iii) Find the range of R.

Ans. Given: A = {1, 2, 3, 4, 6}

A set of ordered pairs (a, b) where b is exactly divisible by a.

(i) R = {(1, 1), (1, 2), (1, 3), (1, 4), (1, 6), (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}

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6. Determine the domain and range of the relation R defined by

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

Ans. Given: R = $\{(x, x+5) : x \in (0, 1, 2, 3, 4, 5)\}$ = $\{(a, b) : a = 0, 1, 2, 3, 4, 5\}$

$\therefore a = x$ and $b = x+5$

Putting $a = 0, 1, 2, 3, 4, 5$ we get $b = 5, 6, 7, 8, 9, 10$

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

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

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7. Write the relation R = $\{(x, x^3) : x$ **is a prime number less than** $10\}$ **in roster form.**

Ans. Given: R = $\{(x, x^3) : x \text{ is a prime number less than } 10\}$

Putting x = 2, 3, 5, 7

R = {(2, 8), (3, 27),(5, 125), (7, 343)}

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

Ans. Given: A = $\{x, y, z\}$ and B = {1, 2}

Number of elements in set A = 3 and Number of elements in set B = 2

$\therefore$ Number of subsets of $A \times B = 3 \times 2 = 6$

Number of relations from A to $B = 2^6$.

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9. Let R be the relation on Z defined by R = {(a,b):a,b $\in \mathbf{Z}$ is an integer}. Find the domain and range of R.

Ans. Given: R = $\{(a, b): a, b \in Z, a - b \text{ is an integer}\}$

= $\{(a, b): a, b \in Z, \text{ both } a \text{ and } b \text{ are even or both } a \text{ and } b \text{ are odd}\}$

= $\{(a, b): a, b \in Z, (a \text{ and } b \text{ are even}) \cup (a \text{ and } b \text{ are odd})\}$

$\therefore$ Domain of R = Z

Range of R = Z