Class XI : Maths
Chapter 2 : Related And Functions

Questions and Solutions | Exercise 2.3 - NCERT Books

Question 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 ∈ A}. Write down its domain, codomain and range.
Answer
The relation R from A to A is given as
R = {(x, y): 3x − y = 0, where x, y ∈ A}
i.e., R = {(x, y): 3x = y, where x, y ∈ A}
∴R = {(1, 3), (2, 6), (3, 9), (4, 12)}
The domain of R is the set of all first elements of the ordered pairs in the relation.
∴Domain of R = {1, 2, 3, 4}
The whole set A is the codomainof the relation R.
∴Codomain of R = A = {1, 2, 3, …, 14}
The range of R is the set of all second elements of the ordered pairs in the relation.
∴Range of R = {3, 6, 9, 12}

Question 2:
Define a relation R on the set **N** of natural numbers by R = {(x, y): y = x + 5, x is a natural number less than 4; x, y ∈ **N**}. Depict this relationship using roster form. Write down the domain and the range.
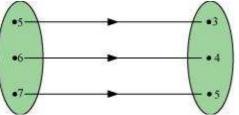Answer
R = {(x, y): y = x + 5, x is a natural number less than 4, x, y ∈ **N**}
The natural numbers less than 4 are 1, 2, and 3.
∴R = {(1, 6), (2, 7), (3, 8)}
The domain of R is the set of all first elements of the ordered pairs in the relation.
∴ Domain of R = {1, 2, 3}
The range of R is the set of all second elements of the ordered pairs in the relation.
∴ Range of R = {6, 7, 8}

Question 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 ∈ A, y ∈ B}. Write R in roster form.
Answer
A = {1, 2, 3, 5} and B = {4, 6, 9}
R = {(x, y): the difference between x and y is odd; x ∈ A, y ∈ B}
∴R = {(1, 4), (1, 6), (2, 9), (3, 4), (3, 6), (5, 4), (5, 6)}

Question 4:
The given figure shows a relationship between the sets P and Q. write this relation
(i) in set-builder form (ii) in roster form.
What is its domain and range?

Answer
According to the given figure, P = {5, 6, 7}, Q = {3, 4, 5}
(i) R = {(x, y): y = x − 2; x ∈ P} or R = {(x, y): y = x − 2 for x = 5, 6, 7}
(ii) R = {(5, 3), (6, 4), (7, 5)}
Domain of R = {5, 6, 7}
Range of R = {3, 4, 5}

Question 5:
Let A = {1, 2, 3, 4, 6}. Let R be the relation on A defined by
{(a, b): a, b ∈ 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.
Answer
A = {1, 2, 3, 4, 6}, R = {(a, b): a, b ∈ A, 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}
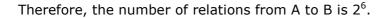(iii) Range of R = {1, 2, 3, 4, 6}

Question 6:
Determine the domain and range of the relation R defined by R = {(x, x + 5): x ∈ {0, 1, 2, 3, 4, 5}}.
Answer
R = {(x, x + 5): x ∈ {0, 1, 2, 3, 4, 5}}
∴ R = {(0, 5), (1, 6), (2, 7), (3, 8), (4, 9), (5, 10)}
∴Domain of R = {0, 1, 2, 3, 4, 5}
Range of R = {5, 6, 7, 8, 9, 10}

Question 7:
Write the relation R = {(x, x^3): x is a prime number less than 10} in roster form.
Answer
R = {(x, x^3): x is a prime number less than 10}
The prime numbers less than 10 are 2, 3, 5, and 7.
∴R = {(2, 8), (3, 27), (5, 125), (7, 343)}

Question 8:
Let A = {x, y, z} and B = {1, 2}. Find the number of relations from A to B.
Answer
It is given that A = {x, y, z} and B = {1, 2}.
∴ A × B = {(x, 1), (x, 2), (y, 1), (y, 2), (z, 1), (z, 2)}
Since n(A × B) = 6, the number of subsets of A × B is 2^6.

Therefore, the number of relations from A to B is 2^6.

Question 9:
Let R be the relation on **Z** defined by R = {(*a*, *b*): *a*, *b* ∈ **Z**, *a* − *b* is an integer}. Find the domain and range of R.
Answer
R = {(*a*, *b*): *a*, *b* ∈ **Z**, *a* − *b* is an integer}
It is known that the difference between any two integers is always an integer.
∴Domain of R = **Z**
Range of R = **Z**