SpeedLabs
MATHS

CBSE 11th

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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.

Ans. 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 codomain of 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}

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.

Ans. 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}

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.

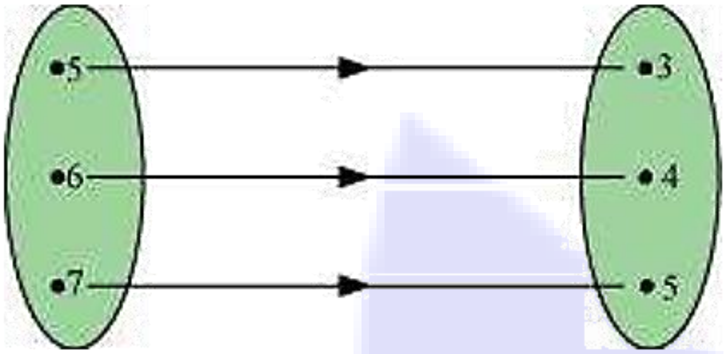
Ans. A = {1, 2, 3, 5} and B = {4, 6, 9}

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)}

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?



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}

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.

Ans. 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}

6. Determine the domain and range of the relation R defined by R = {(x, x + 5): x ∈ {0, 1, 2, 3, 4, 5}}.

Ans. 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}

7. Write the relation R = {(x, x3): x is a prime number less than 10} in roster form.

Ans. R = {(x, x3): 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)}

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

Ans. 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.

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.

Ans. 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