

NCERT Solutions for Class-XI Maths

Chapter-2 Exercise-2.2 NCERT Math Class 11

- Let $A = \{1, 2, 3, \dots, 14\}$. Define a relation R from A to A by $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}$. Write down its domain, codomain and range.
- The relation R from A to A is given as $R = \{(x, y) : 3x - y = 0, \text{ where } x, y \in A\}$
i.e., $R = \{(x, y) : 3x = y, \text{ where } x, y \in A\}$
 $\therefore R = \{(1, 3), (2, 6), (3, 9), (4, 12)\}$
The domain of R is the set of all first elements of the ordered pairs in the relation.
 \therefore Domain of $R = \{1, 2, 3, 4\}$
The whole set A is the codomain of the relation R .
 \therefore Codomain of $R = A = \{1, 2, 3, \dots, 14\}$
The range of R is the set of all second elements of the ordered pairs in the relation.
 \therefore Range of $R = \{3, 6, 9, 12\}$
- Define a relation R on the set N of natural numbers by $R = \{(x, y) : y = x + 5, x \text{ is a natural number less than } 4; x, y \in N\}$. Depict this relationship using roster form. Write down the domain and the range.
- $R = \{(x, y) : y = x + 5, x \text{ is a natural number less than } 4; x, y \in N\}$.
As x is a natural number which is less than 4.
Hence the relation in roster form, $R = \{(1, 6), (2, 7), (3, 8)\}$
As Domain of $R =$ set of all first elements of the order pairs in the relation.
 \Rightarrow Domain of $R = \{1, 2, 3\}$
Range of $R =$ set of all second elements of the order pairs in the relation.
 \Rightarrow range of $R = \{6, 7, 8\}$.
- $A = \{1, 2, 3, 5\}$ and $B = \{4, 6, 9\}$. Define a relation R from A to B by $R = \{(x, y) : \text{the difference between } x \text{ and } y \text{ is odd}; x \in A, y \in B\}$. Write R in roster form.
- $A = \{1, 2, 3, 5\}$ and $B = \{4, 6, 9\}$
 $R = \{(x, y) : \text{the difference between } x \text{ and } y \text{ is odd}; x \in A, y \in B\}$
 $\therefore R = \{(1, 4), (1, 6), (2, 9), (3, 4), (3, 6), (5, 4), (5, 6)\}$

4. The Fig 2.7 shows a relationship between the sets P and Q. Write this relation

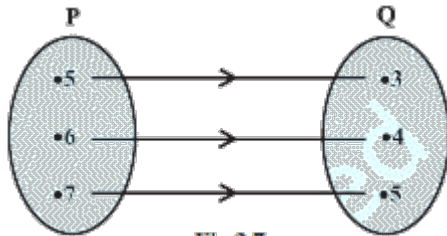


Fig 2.7

(i) in set-builder form (ii) roster form.

What is its domain and range?

4. **Given:**

As we see in given figure: $P = \{5, 6, 7\}$, $Q = \{3, 4, 5\}$

(i) Hence the relation in set builder form, $R = \{(x, y): y=x-2; x \in P\}$

or $R = \{(x, y): y=x-2; \text{ for } x = 5, 6, 7\}$

(ii) And the relation in roster form, $R = \{(5, 3), (6, 4), (7, 5)\}$

As Domain of R = set of all first elements of the order pairs in the relation.

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

Range of R = set of all second elements of the order pairs in the relation.

\Rightarrow range of R = $\{3, 4, 5\}$.

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

(i) Write R in roster form

(ii) Find the domain of R

(iii) Find the range of R.

5. $A = \{1, 2, 3, 4, 6\}$, $R = \{(a, b): a, b \in A, b \text{ is exactly divisible by } a\}$

(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

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

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

Hence the relation in roster form, $R = \{(0, 5), (1, 6), (2, 7), (3, 8), (4, 9), (5, 10)\}$

As Domain of R = set of all first elements of the order pairs in the relation.

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

Range of R = set of all second elements of the order pairs in the relation.

\Rightarrow range of $R = \{5, 6, 7, 8, 9, 10\}$.

7. Write the relation $R = \{(x, x^3) : x \text{ is a prime number less than } 10\}$ in roster form.
7. $R = \{(x, x^3) : x \text{ is a prime number less than } 10\}$ The prime numbers less than 10 are 2, 3, 5, and 7.
 $\therefore R = \{(2, 8), (3, 27), (5, 125), (7, 343)\}$
8. Let $A = \{x, y, z\}$ and $B = \{1, 2\}$. Find the number of relations from A to B.
8. **Given:** $A = \{x, y, z\}$ and $B = \{1, 2\}$
 $\therefore A \times B = \{(x, 1), (x, 2), (y, 1), (y, 2), (z, 1), (z, 2)\}$
 $\Rightarrow n(A \times B) = 6$
Then number of subsets of set $(A \times B) = 2^n = 2^6$
 \Rightarrow number of relations from A to B = 2^6 .
9. Let R be the relation on \mathbf{Z} . defined by $R = \{(a, b) : a, b \in \mathbf{Z}, a - b \text{ is an integer}\}$. Find the domain and range of R .
9. $R = \{(a, b) : a, b \in \mathbf{Z}, a - b \text{ is an integer}\}$
It is known that the difference between any two integers is always an integer.
 \therefore Domain of $R = \mathbf{Z}$
Range of $R = \mathbf{Z}$