Exercise 2.2

Q1. 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.

A.1. Given, A ={1,2,3, …, 14}

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

={(x, y): $3x = y$; $x, y \in$ A}.

= {(1,3),(2,6),(3,9),(4,12)}

Domain of R is the set of all the first elements of the ordered pairs in R

So, domain of R={1,2,3,4}

Codomain of R is the whole set A.

So, codomain of R={1,2,3, …, 14}

Range of R is the set of all the second elements of the ordered pains in R.

So, range of R={3,6,9,12}

Q2. 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; $x, y \in$ N}. Depict this relationship using roster form. Write down the domain and the range.

A.2. Given,R ={(x, y): $y = x + 5$, x is a natural number less than 4; $x, y \in$ N}

={(x, y): $y = x + 5$; $x, y \in$ N and $x < 4$}.

={(1,1+5), (2,2+5), (3,3+5)}

={(1,6), (2,7), (3,8)}

So, domain of R = {1,2,3}

range of R = {6,7,8}

Q3. 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.

A.3. Given, A={1,2,3,5}

B={4,6,9}

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

={(x, y):$|x - y|$ is odd and $x \in$ A, $y \in$ B}

={(1,4),(1,6),(2,9),(3,4),(3,6),(5,4),(5,6)}.

Q4. The Fig 2.7 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?

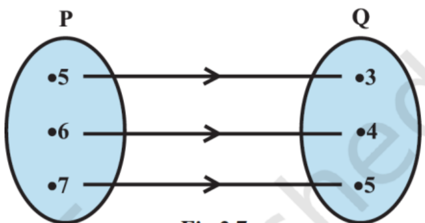

Fig 2.7

A.4. As R is a relation from set P to Q.

(i) R = {(x, y): $x - 2 = y$; $5 \le x \le 7$}

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

Domain of R={5,6,7}

range of R={3,4,5}

Q5. 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.

A.5. Given, A={1,2,3,4,6}

R={(a, b): a, $b \in$ 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}

Q6. Determine the domain and range of the relation R defined by R = {(x, x + 5) : $x \in$ {0, 1, 2, 3, 4, 5}}.

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

={(0,0+5), (1,1+5), (2,2+5), (3,3+5), (4,4+5), (5,5+5)}

={(0,5),(1,6),(2,7),(3,8),(4,9),(5,10)}

So, domain of R={0,1,2,3,4,5}

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

Q7. Write the relation R = {(x, x^3) : x is a prime number less than 10} in roster form.

A.7. Given R={(x, x^3) : x is a prime number less than 10}

R ={(x, x^3) : x = 2,3,5,7}

={(2,2^3),(3,3^3),(5,5^3),(7,7^3)}

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

Q8. Let A = {x, y, z} and B = {1, 2}. Find the number of relations from A to B.

A.8. Given, A={x, y, z} so, n(A)=3

B={1,2} so n(B)=2

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

Hence, no. of relation from A to B =Number of subsets of A × B

=2^6

=64.

Q9. Let R be the relation on Z defined by R = {(a,b): a, $b \in$ Z, a – b is an integer}. Find the domain and range of R.

A.9. Given, R={(a, b): a, $b \in$ z and a – b is an integer}

We know that, the difference of two integers is also an integer.

R={(a, b): a – $b \in$ z & a, $b \in z$}

Domain of R=Z.

Range of R= Z.