CLASS - XII
MATHEMATICS

Relation and Mapping

1. **Let relation R in a set A = {2, 3, 4, 5} defined by 'a and b are prime to each other', a, b ∈ A.**

   (i) Find R,

   (ii) Find R⁻¹.

Ans. (i) Since the relation is 'prime to each other'

∴ In set A,

R = {(2, 3), (2, 5), (3, 2), (3, 4), (3, 5), (4, 3), (4, 5), (5, 2), (5, 3), (5, 4)}.

(ii) R^{-1} = {(3, 2), (5, 2), (2, 3), (4, 3), (5, 3), (3, 4), (5, 4), (2, 5), (3, 5), (4, 5)} = R

2. **If A = {1, 3, 5, 7} and B = {0, 1, 2, 3, 4}, then find the element of (A∩B) × (A−B) in which the relation is 'less than'.**

Ans. ∵   A = { 1, 3, 5, 7} & B = {0, 1, 2, 3, 4}

∴ $A \cap B$ = {1, 3} & $A–B$ = {5, 7}

Let the relation 'less than' is denoted by R

∵ $(A \cap B) \times (A - B)$ = {1, 3} × {5, 7} = {(1, 5), (1, 7), (3, 5), (3, 7)}

and each element of this set satisfies the relation 'less than'

∴ R = {(1,5), (1,7), (3,5), (3,7)}

3. **A = { 4, 9, 16, 25}, B = {1, 2, 3, 4} and the relation R from A to B is 'square of'. Find R, domain & range of R.**

Ans. ∵ $R = \{(a,b) : a = b^2, a \in A, b \in B\}$

∴ $R = \{(4,2),(9,3),(16,4)\}$

∴   Domain of R = {4,9,16} and range of R = {2, 3, 4}

4. **Let the function f = {(0, −1), (1, 2), (−1, −4), (2, 5), (−2, −7)} such that $f(x)=ax + b$, where a, b ∈ Z. Find a & b.**

Ans. Here, $f(0) = -1, f(1) = 2, f(-1) = - 4, f(2)=5$ and $f(-2) = -7$

∵ $f(x) = ax + b,$

∴ $f(0) = 0 + b$ and $f(1) = a + b$

or, $-1 = 0+b$

or, $b = -1$ or, $2 = a - 1$ [∵ $b = - 1$]

∴ $f(x) = 3x - 1$ or, $a = 3$

Clearly $f(-1) = -4, f(2) = 5, f(-2) = - 7$, which is true.

∴ $a = 3, b = - 1.$

5. **f : R → R defined as f (x) = 2x + 3, x ∈ R ; f⁻¹ (7) = ?**

Ans.: ∵ $f(2) = 2 \times 2 + 3 = 4 + 3 = 7$

∴ $f^{-1}(7) = 2.$