Relation & Function

← SOLUTION of WORKSHEET NO: 1 →

Qn 1. given $(x+3, 5) = (6, 2x+y)$

$\Rightarrow x+3 = 6$ and $5 = 2x+y$

$\Rightarrow x = 3$ and $5 = 6+y$

$y = -1$

$\therefore x = 3$ and $y = -1$ __ANS__

Qn 2→ $A = \{(1,2\}$, $B = \{1,2,3,4\}$, $C = \{5,6\}$, $D = \{5,6,7,8\}$

(i) __LHS__ $A \times (B \cap C)$

$= \{1,2\} \times \{\} = \{1,2\} \times \phi = \phi$

__RHS__ $(A \times B) \cap (A \times C)$

$A \times B = \{(1,1)(1,2)(1,3)(1,4)(2,1)(2,2)(2,3),(2,4)\}$

$A \times C = \{(1,5)(1,6)(2,5)(2,6)\}$

Clearly $(A \times B) \cap (A \times C) = \phi$

$LHS = RHS$ __ANS__

(ii) $B \times D = \{(1,5)(1,6)(1,7)(1,8),(2,5)(2,6)(2,7)(2,8),$

$(3,5)(3,6)(3,7)(3,8)(4,5)(4,6)(4,7)(4,8)\}$

Clearly $A \times C \subseteq B \times D$ __Ans__

Qn 3→ $A = \{1,2,3\}$, $B = \{4\}$, $C = \{5\}$

(i) $A \times (B \cup C)$

$B \cup C = \{4,5\}$

$A \times (B \cup C) = \{1,2,3\} \times \{4,5\} = \{(1,4),(1,5)(2,4)(2,5)(3,4)$
$(3,5)\}$

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Rhs $A \times B = \{1,2,3\} \times \{4\} = \{(1,4)\,(2,4)\,(3,4)\}$

$A \times C = \{1,2,3\} \times \{5\} = \{(1,5)\,(2,5)\,(3,5)\}$

$(A \times B) \cup (A \times C) = \{(1,4)(2,4)(3,4)(1,5)(2,5)(3,5)\}$

$\qquad LHs = Rhs \qquad \underline{Ans}$

(ii) $A \times (B-C)$

$B-C = \{ \} = \phi$

$A \times (B-C) = A \times \phi = \phi$

$A \times B = \{(1,4)\,(2,4)\,(3,4)\}$

$A \times C = \{(1,5)\,(2,5)\,(3,5)\}$

$(A \times B) - (A \times C) = \phi$

$\qquad LHs = RHs \qquad \underline{Ans}$

On 4 $A = \{-1, 1\}$

$A \times A = \{(-1,-1)\,(-1,1)\,(1,-1)\,(1,1)\}$

$A \times A \times A = \{(-1,-1,-1)\,(-1,-1,1)\,(-1,1,-1)\,(-1,1,1)\,(1,-1,-1)$
$\qquad (1,-1,1)\,(1,1,-1)\,(1,1,1)\} \qquad \underline{Ans}$

On 5 $n(A) = 3, \quad n(B) = 2$

$(x,1),\ (y,2)\ (z,1) \in A \times B$

$\Rightarrow x, y, z \in A \qquad$ and $\qquad 1, 2 \in B$

also $\quad n(A) = 3 \qquad$ and $\qquad n(B) = 2$

$\therefore A = \{x, y, z\} \qquad$ and $\qquad B = \{1, 2\} \quad \underline{Ans}$

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Qns 6 → $\{(a,b) : b = 2a - 3\}$

$(x, -1)$ & $(5, y)$ belong to the above set

put $a = x$ & $b = -1$ | put $a = 5$ & $b = y$

$-1 = 2x - 3$ | $y = 10 - 3$

$x = 1$ | $y = 7$

$\therefore x = 1, \quad y = 7 \quad$ **Ans**

Qn. 7 → $R = \{(x, y) : 3x - y = 0\}$ $A = \{1, 2, 3, \cdots 14\}$

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

Domain $= \{1, 2, 3, 4\}$

Range $= \{3, 6, 9, 12\}$

No of relation $= 2^{mn} = 2^{14 \times 14} = 2^{196}$ **Ans**

Qn-8 → (1) Set builder form

$R = \{(x, y) : x = y^2 \; ; \; x \in A, \; y \in B\}$

(2) Roster form

$R = \{(9, 3)(9, -3)(4, 2)(4, -2), (25, 5)(25, -5)\}$

(3) Domain $= \{9, 4, 25\}$

(4) Range $= \{3, -3, 2, -2, 5, -5\}$

(5) Codomain Set $B = \{5, 3, 2, 1, -2, -3, -5\}$

Qn. 9 → $R = \{(x, x^3) : x \text{ is a prime number less than } 10\}$

$R = \{(2, 8)(3, 27)(5, 125), (7, 343)\}$ **Ans**
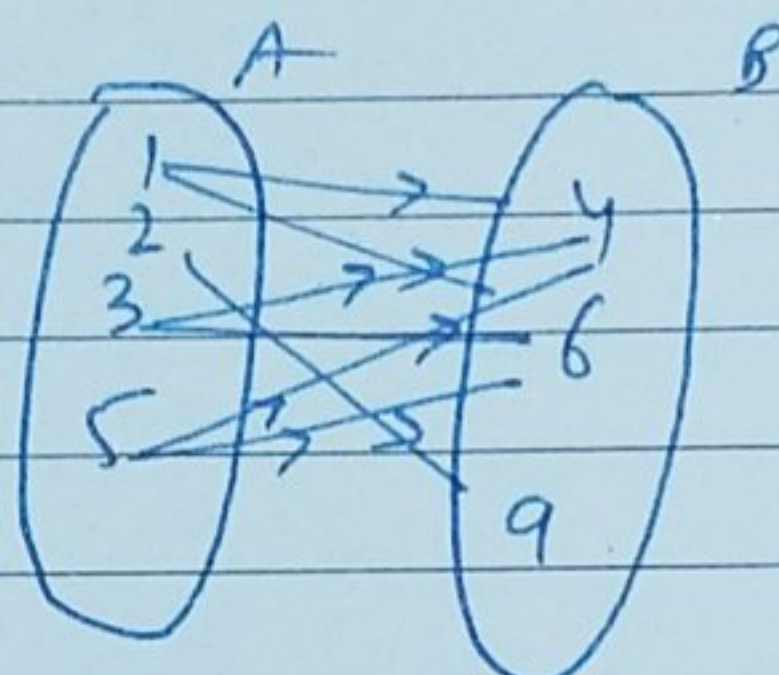
Qn 10 → $A = \{1, 2, 3, 5\}$ $B = \{4, 6, 9\}$

$R = \{(x, y) : $ difference b/w x & y is odd $\}$

$R = \{(1, 4)\ (1, 6)\ (2, 9)\ (3, 4)\ (3, 6)\ (5, 4)\ (5, 6)\}$

Domain = $\{1, 2, 3, 5\}$

Range = $\{4, 6, 9\}$

Arrow diagram

ANS

Qn 11 → $R = \{(a, b) : a + 3b = 12\}$ $\Rightarrow$ $\boxed{a = 12 - 3b}$

$R = \{(9, 1)\ (6, 2)\ (3, 3)\}$ ANS

Domain = $\{9, 6, 3\}$ Range = $\{1, 2, 3\}$

Qn 12 → $R = \{(a, b) : a - b$ is an Integer $\}$

If a & b are integer then $a - b$ are always an integer $\therefore a \in Z$, $b \in Z$

$a - b \in Z$

$\therefore$ Domain = Z

Range = Z

Codomain = Z ANS

Qn 13 → $R = \{(a, b) : a \in N,\ a < 5,\ b = 4\}$

$R = \{(1, 4)\ (2, 4)\ (3, 4)\ (4, 4)\}$

Relation function

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Domain = $\{1, 2, 3, 4\}$ Ans

Range = $\{4\}$

Qn. 14 → $R = \{(a, b): b = |a-1| ; a \in z, |a| \leq 3\}$

$\because |a| \leq 3$

then   a   can take values $-3, -2, -1, 0, 1, 2, 3$

$a = -3$ then $b = |-3-1| = 4$

$a = -2$ then $b = |-2-1| = 3$

$a = -1$, $b = 2$

$a = 0$, $b = 1$

$a = 1$,   , $b = 0$

$a = 2$, $b = 1$

$a = 3$, $b = 2$

$\therefore R = \{(-3, 4) (-2, 3) (-1, 2) (0, 1) (1, 0) (2, 1) (3, 2)\}$

Domain = $\{-3, -2, -1, 0, 1, 2, 3\}$

Range = $\{4, 3, 2, 1, 0\}$ Ans

Qn. 15 → $A = \{2, 3, 4, 5\}$ $B = \{3, 6, 7, 10\}$

$R = \{(x, y): x \text{ divides } y\}$ $\Rightarrow$ $\left(\dfrac{y}{x}\right)$

$R = \{(2, 6) (2, 10) (3, 3) (3, 6) (5, 10)\}$

Domain = $\{2, 3, 5\}$

Range = $\{6, 10, 3\}$ Ans