Topic : ..... Date. : ..... Page No. : .....

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(1)

← ULTIMATE MATHEMATICS →

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CHAPTER: RELATIONS & FUNCTIONS

(R&F - 1)

Cartesian Product of two sets

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

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

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

$\Rightarrow n(A \times B) = n(B \times A)$

$n(A \times B) = n(A) \cdot n(B) = 2 \times 2 = 4$

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

$\Rightarrow A = \{1,2\}$ & $B = \{3,4\}$

(·) $A = \{1,2,3\}$

$A \times \phi = \phi$

(·) $A = \{1,2,3\}$ $A = \{1,2,3\}$

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

(·) $A = \{1,2\}$ find $A \times A \times A$

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

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

Topic : ..... Date. : ..... Page No. : 2

R&F Class 1

Q=1 If $\left(\frac{x}{3}+1, y-\frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$ find x & y

Soln =

$\frac{x}{3}+1 = \frac{5}{3}$

$\frac{x+3}{3} = \frac{5}{3}$

$x = 2$

$y-\frac{2}{3} = \frac{1}{3}$

$\frac{3y-2}{3} = \frac{1}{3}$

$3y = 3$

$y = 1$

Q=2 Given $A \times A$ has 9 elements among which all $(0,-1)$ & $(1,0)$ find set A and remaining elements of $A \times A$

Soln =

Since $n(A \times A) = 9$

$\Rightarrow n(A) = 3$

$(0,-1)$ & $(1,0) \in A \times A$

$0,1 \in A$ and $-1,0 \in A$

$\Rightarrow -1,0,1 \in A$

also $n(A) = 3$

$\Rightarrow A = \{-1,0,1\}$

$A \times A = \{$ self $\}$

R&F class 1

RELATIONS

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

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

Relation is a subset of $A \times B$

$R_1 = \{(1,4)(1,5)\}$ ← Image

$R_2 = \{(1,5), (2,5)\}$

⋮

$2^6 = 64$ $R_{64} =$

$R \subset A \times B$

No of relation $= 2^{mn} = 2^{3\times 2} = 2^6 = 64$

$m = n(A)$

$n = n(B)$

- Relation from set A to set B
- $R = \{(a,b) : a + 2b = 3 ;\ a \in A, b \in B\}$
- Relation from A to set A (Relation on set A)
- Domain = Set of I^{st} elements of each ordered pair
- Range = Set of 2^{nd} elements of each ordered pair

Topic : ..... Date. : ..... Page No. : .....

R & F Class - 2 (3)

✓ codomain : Second set (Set B)

Q.1 $A = \{1, 2, 3, 4, \ldots 10\}$. Relation from A to A given by $R = \{(x, y) : 3x - y = 0;\ x \in A, y \in A\}$

$\hookrightarrow (y = 3x)$

(1) Write in Roster form

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

(2) Domain

$D = \{1, 2, 3\}$

(3) Range

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

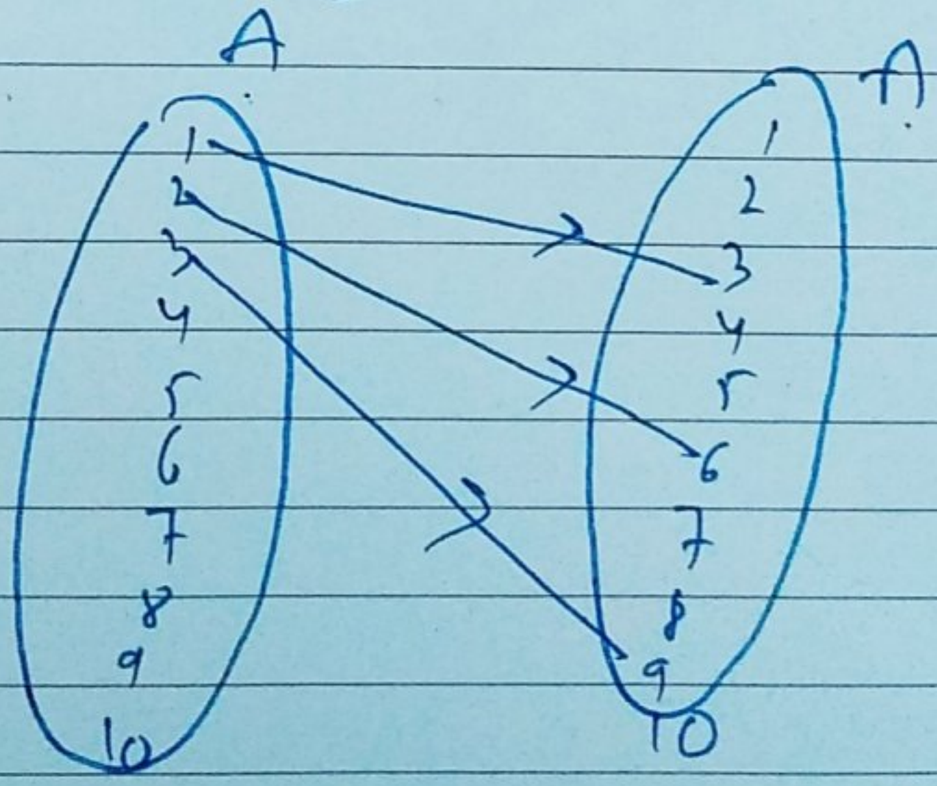
(4) Codomain

2nd set $= A = \{1, 2, 3, \ldots 10\}$

(5) No of relations $= 2^{3 \times 3}$

$= 2^{10 \times 10} = 2^{100}$

(6) Arrow diagram



Q.No: 2 → $A = \{1, 2, 3, 4, 6\}$ Relation from A to A

$R = \{(a, b) : b \text{ is exactly divisible by } a\}$ → $\left(\frac{b}{a}\right)$

Sol: (1) Roster form

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

(2) Domain

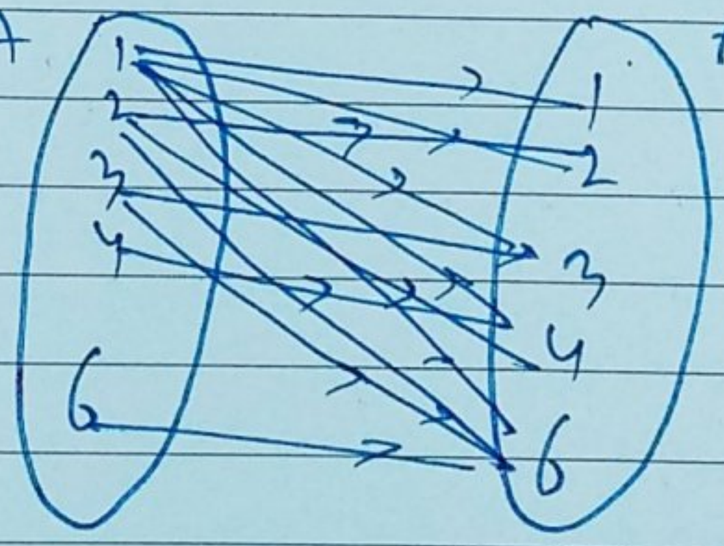
Domain $= \{1, 2, 3, 4, 6\}$

(3) Range $= \{1, 2, 3, 4, 6\}$

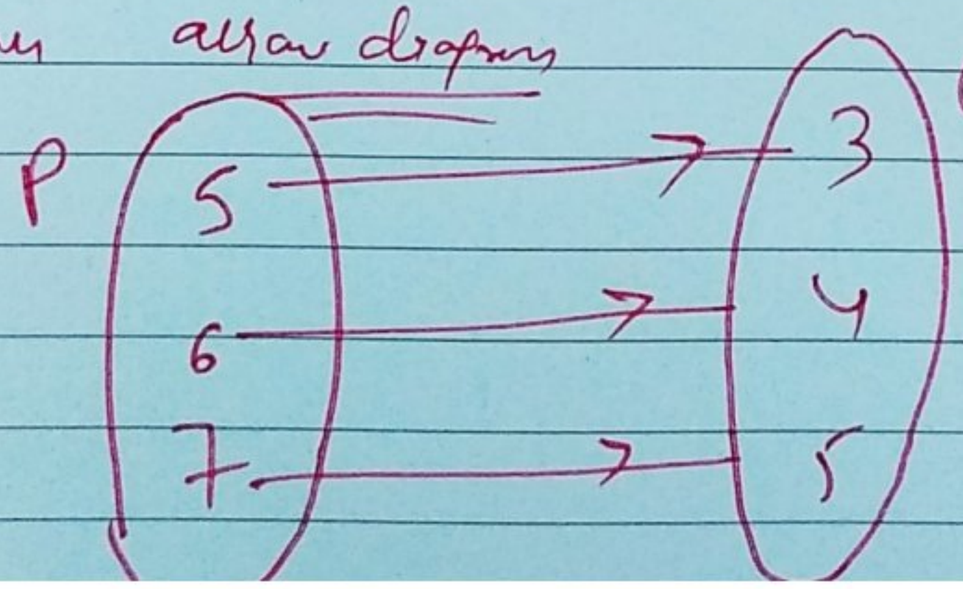
(4) Codomain $= A = \{1, 2, 3, 4, 6\}$

(5) No of relation $= 2^{mn} = 2^{5 \times 5} = 2^{25}$

(6) Arrow diagram



Q.3 Given arrow diagram



$R = \{(x, y) : x - y = 2;$
$x \in P, y \in Q\}$

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

Topic : ..... Date. : ..... Page No. : .....

ULTIMATE MATHEMATICS

RELATION & FUNCTIONS

← WORKSHEET NO: 1 →

Qn. 1 → Find x and y if

$$(x+3, 5) = (6, 2x+y)$$

Ans $x = 3, \quad y = -1$

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

Show that

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

(2) $A \times C$ is a subset of $B \times D$

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

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

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

Qn. 4 → $A = \{-1, 1\}$ Find $A \times A \times A$

Qn. 5 → Let A and B be two sets such that $n(A) = 3$ and $n(B) = 2$

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

find set A and set B

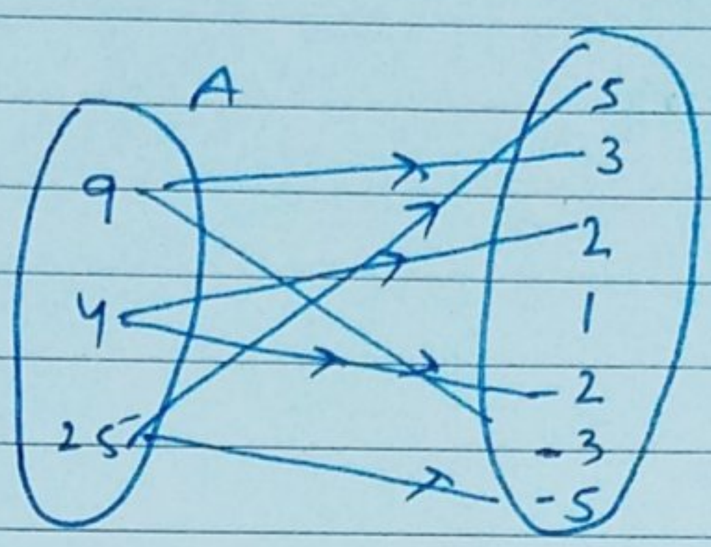
Qn 6 → If the ordered pairs $(x, -1)$ and $(5, y)$ belong to the set $\{(a, b) : b = 2a - 3\}$. Find the value of x and y

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

Worksheet No. 1 (R & F) (2)

Qn 7 → $A = \{1, 2, 3, \ldots 14\}$ Relation from A to A
$R = \{(x, y) : 3x - y = 0\}$ Find Roster form, Range, domain, No of elements

Qn 8 → Given Arrow diagram



Write Relation in
(1) Set builder form
(2) Roster form
(3) Domain
(4) Range
(5) Codomain

Qn 9 → Write the relation $R = \{(x, x^3) : x$ is a prime number less than $10\}$ in Roster form

Qn 10 → $A = \{1, 2, 3, 5\}$, $B = \{4, 6, 9\}$ Relation from A to B is $R = \{(x, y) :$ difference between x & y is odd ; $x \in A$, $y \in B\}$
Write Roster form, domain, Range, Arrow diagram

Qn 11 → Relation on N (set of natural nos) defined by
$R = \{(a, b) : a + 3b = 12 ; a \in N, b \in N\}$
Write Roster form, domain and Range

Qn 12 → Let R be the relation on set Z (set of Integers) defined by $R = \{(a, b) :$ a - b is an Integer$\}$
Find domain, Range and codomain

find domain, Range and codomain

CLASSTIME

Topic : ..... Date. : ..... Page No. : .....

Worksheet No: 1 (Rel F)

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

Find domain & Range

Qn 14 → $R = \{(a,b) : b = |a-1|,\ a \in Z \text{ and } |a| \leq 3\}$

Find domain and Range

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

Relation $R = \{(x,y) : x \text{ divides } y;\ x \in A,\ y \in B\}$

Find Roster form, domain & Range

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