

Unit 3Ex: 3.1

Q1)  $A = \{1, 3\}, B = \{0, 2, 4\}$  n)  $n(C) = 7$  m)  $D = \{1, 3, 5\}$

$$A \times B = \{(1, 0), (1, 2), (1, 4), (3, 0), (3, 2), (3, 4)\}$$

$$n(A) = 2, n(B) = 3$$

$$A \times B = 2 \times 3 = 6$$

$$A \times B = 2^{n(A \cup B)}$$

$$A \times B = 2^6$$

$$A \times B = 64 \text{ Ans.}$$

ii)  $n(C) = 7$

$$C \times C = 2^{n(C \cup C)}$$

$$C \times C = 2^{7 \times 7}$$

$$C \times C = 2^{49} \text{ Ans.}$$

iii)  $D = \{1, 3, 5\}$

$$n(D) = 3, n(D) = 3$$

$$D \times D = 3 \times 3$$

$$D \times D = 9$$

$$D \times D = 2^{n(D \cup D)}$$

$$D \times D = 2^9$$

$$D \times D = 2^9 \text{ Ans.}$$

Q 2 i)  $A = \{\sqrt{2}, \sqrt{3}, \sqrt{5}\}, B = \{\sqrt[3]{5}\}$

$A \times B = \{(\sqrt{2}, \sqrt[3]{5}), (\sqrt{3}, \sqrt[3]{5}), (\sqrt{5}, \sqrt[3]{5})\}$

$A \times B = 3 \times 1 = 3$

$A \times B = 2^{n(A \times B)}$

$A \times B = 2^3$

$A \times B = 8$

$R_1 = \emptyset, R_2 = \{(\sqrt{2}, \sqrt[3]{5})\}, R_3 = \{(\sqrt{3}, \sqrt[3]{5})\}$

$R_4 = \{(\sqrt{5}, \sqrt[3]{5})\}, R_5 = \{(\sqrt{2}, \sqrt[3]{5}, \sqrt{2}, \sqrt[3]{5})\}$

$R_6 = \{(\sqrt{2}, \sqrt[3]{5}, \sqrt{3}, \sqrt[3]{5})\}, R_7 = \{(\sqrt{3}, \sqrt[3]{5}, \sqrt{5}, \sqrt[3]{5})\}$

$R_8 = \{(\sqrt{2}, \sqrt[3]{5}, \sqrt{3}, \sqrt[3]{5}, \sqrt{5}, \sqrt[3]{5})\}$  Ans.

$C = \{\pi, e\}$

$C = \{\pi, e\}, C = \{\pi, e\}$

$C \times C = \{(\pi, \pi), (\pi, e), (e, \pi), (e, e)\}$

$C \times C = 2 \times 2 = 4$

$C \times C = 2^{n(C \times C)}$

$C \times C = 2^4$

$C \times C = 16$

$R_1 = \emptyset, R_2 = \{(\pi, \pi)\}, R_3 = \{(\pi, e)\}, R_4 = \{e, \pi\}$

$R_5 = \{e, e\}, R_6 = \{(\pi, \pi, \pi, e)\}, R_7 = \{(\pi, \pi, e, \pi)\}$

$R_8 = \{(\pi, \pi, e, e)\}, R_9 = \{(\pi, e, e, \pi)\}, R_{10} = \{(\pi, e), (e, e)\}$

$R_{11} = \{(e, \pi, e, e)\}, R_{12} = \{(\pi, \pi, \pi, e, e, \pi)\}, R_{13} = \{(\pi, \pi, \pi, e, e)\}$

$R_{14} = \{(\pi, e, e, \pi, e, e)\}, R_{15} = \{(\pi$

$R_{14} = \{\pi, \pi, e, \pi, e, e\}, R_{13} = \{\pi, e, e, \pi, e, e\}, R_{16} = \{\pi, \pi, \pi, e, e, \pi, e, e\}$  Ans

Unit 3

Ex 3.4.

ii)  $D = \{5\}, E = [1, 10]$

$$D \times E = \{(5, \Delta) \mid (5, 10)\}$$

$$DXE = 1 \times 2 = 2$$

$$DXE = 2^{n(D \times E)} = DXE = 2^2$$

$$DXE = 4$$

~~$$D \times E = \{5\} \times [1, 10]$$~~

~~$$R_1 = \emptyset, R_2 = \{5\}, R_3 = [1, 10]$$~~

~~$$R_4 = \{(5, 1, 10)\}$$~~

$$D \times E = \{(5, \Delta) \mid (5, 10)\}$$

$$R_1 = \emptyset, R_2 = \{(5, \Delta)\}$$

$$R_3 = \{(5, 10)\}, R_4 = \{(5, \Delta) \mid (5, 10)\}$$

Q<sub>3</sub>  $P = \{7, 8, 9\}$

$$P = \{7, 8, 9\}, P = \{7, 8, 9\}$$

$$P \times P = \{(7, 7) \mid (7, 8) \mid (7, 9) \mid (8, 7) \mid (8, 8) \mid (8, 9) \mid (9, 7) \mid (9, 8) \mid (9, 9)\}$$

~~$$R_1 = \{(7, 7) \mid (7, 8)\}$$~~ Domain of  $R_1 = \{7\}$  Range of  $R_1 = \{7, 8\}$

$$R_2 = \{(7, 9) \mid (8, 7) \mid (8, 8)\}$$

Domain of  $R_2 = \{7, 8\}$  Range of  $R_2 = \{(9, 7) \mid (8, 8)\}$

Q17 Let  $H = \{5, 6, 7, 8, 9\}$  and  $G = \{5, 7, 9, 11\}$ . Write the following relation from  $H$  to  $G$  in tabular form

i) is equal to.

$$H \times G = (5, 5) (5, 7) (5, 9) (5, 11) (6, 5) (6, 7) (6, 9) (6, 11) \\ (7, 5) (7, 7) (7, 9) (7, 11) (8, 5) (8, 7) (8, 9) (8, 11) (9, 5) (9, 7) \\ (9, 9) (9, 11)$$

$H$  to  $G$  is equal to =  $(5, 5), (7, 7), (9, 9)$

ii) is less than.

$$H \text{ to } G \text{ is less than} = (5, 7) (5, 9) (5, 11) (6, 7) (6, 9) (6, 11) \\ (7, 9) (7, 11) (8, 9) (8, 11) (9, 11)$$

iii) is greater than.

$$H \text{ to } G \text{ is greater than} = (6, 5) (7, 5) (8, 5) (8, 7) (9, 5) (9, 7)$$

iv) is one less than.

$$H \text{ to } G \text{ is one less than} = (6, 7) (8, 9)$$

v) is one greater than.

$$H \text{ to } G \text{ is one greater than} = (6, 5) (8, 7)$$

vi) is two less than than

H to G is two less than = (5,7) (7,9) (9,11) Ans

Q5 Let  $C = \{2, 4, 6\}$ ,  $D = \{4, 6, 8, 9, 12\}$  and  $R = \{(x, y) / x \in C, y \in D \text{ and } x \text{ is factor of } y\}$ .

$R \subset C \times D = (2, 4) (2, 6) (2, 8) (2, 9) (2, 12) (4, 4) (4, 6) (4, 8) (4, 9) (4, 12)$   
 $(6, 4) (6, 8) (6, 9) (6, 12)$

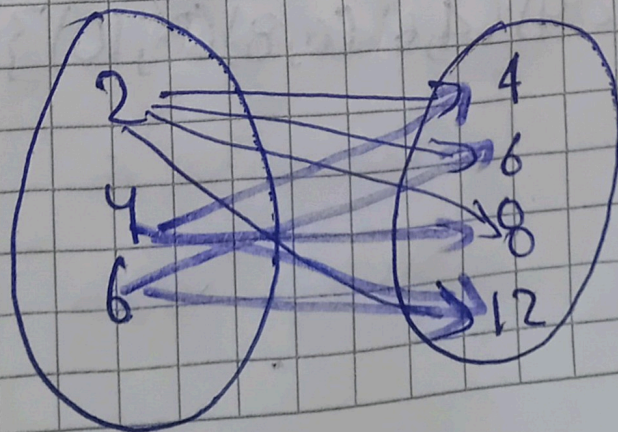
$X \text{ is factor of } y = \{(2, 4) (2, 6) (2, 8) (2, 12) (4, 4) (4, 6) (4, 8) (4, 12)$   
 $(6, 4) (6, 6) (6, 8) (6, 12)\}$

i)  $\{(2, 4) (2, 6) (2, 8) (2, 12) (4, 4) (4, 8) (4, 12) (6, 6) (6, 12)\}$

ii) Domain of  $R = \{2, 4, 6\}$  Range =  $\{4, 6, 8, 12\}$

iii)  $R^{-1} = \{(4, 2) (6, 2) (8, 2) (12, 2) (4, 4) (6, 4) (12, 4) (6, 6) (12, 6)\}$

iv)  $R$  by arrow diagram



Q 6 Let  $R = \{(2,0), (4,2), (6,4), (8,6), (10,8)\}$

i) Write  $R$  in set builder form.

$$\{(x,y) / x \in R \text{ and } y = x - 2\}$$

ii) Domain of  $R = \{2, 4, 6, 8, 10\}$

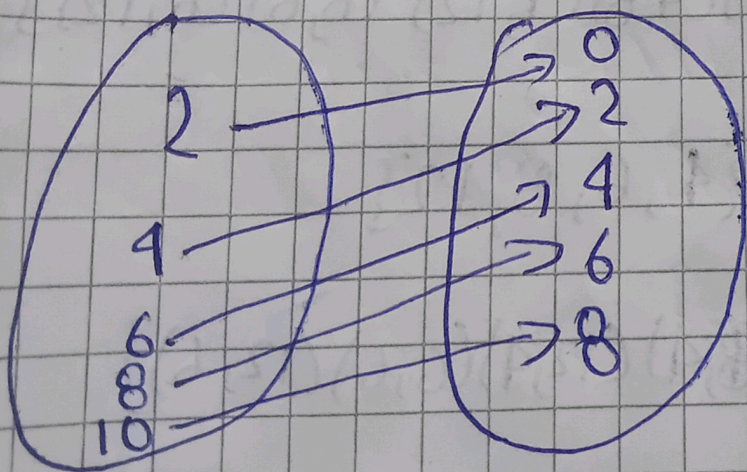
$$\text{Range of } R = \{0, 2, 4, 6, 8\}$$

iii)  $R^{-1} = \{(0,2), (2,4), (4,6), (6,8), (8,10)\}$

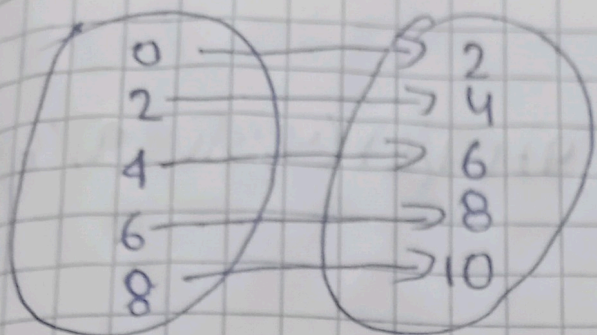
tabular form =  $\{(0,2), (2,4), (4,6), (6,8), (8,10)\}$

Set builder form =  $\{(x,y) / x \in R^{-1} \text{ and } y - x = 2\}$

iv)  $R = \{(2,0), (4,2), (6,4), (8,6), (10,8)\}$



$R^{-1} = \{(0,2), (2,4), (4,6), (6,8), (8,10)\}$



Q7 Let  $A = [0, 1, 3]$   $B = \{1, 2, 3, 5, 7\}$

$A \times B = \{(0, 1)(0, 2)(0, 3)(0, 4)(0, 5)(1, 1)(1, 2)(1, 3)(1, 5)(3, 1)(3, 2)(3, 3)(3, 5)(3, 7)\}$

$\{(x, y) / x \in A, y \in B \wedge y = 2x + 1\}$

$$2(0) + 1 \qquad 2(1) + 1$$

$$0 + 1 \qquad 2 + 1$$

$$= 1$$

$$= 3$$

$= \{(0, 1)(1, 3)(3, 7)\}$

$R^{-1} = \{ \{$

tabular form =  $\{(0, 1)(1, 3)(3, 7)\}$

$R^{-1} = \{(1, 0)(3, 1)(7, 3)\}$

$\{3^0, 3^1, 3^2\}$

8) i)  $S = \{1, 2, 4, 8\}$   $T = \{1, 3, 9\}$

$R = \{(1, 1)(1, 3)(1, 9)(2, 1)(2, 3)(2, 9)(4, 1)(4, 3)(4, 9)(8, 1)(8, 3)(8, 9)\}$

$R_1 = \{(x, y) / x \in S, y \in T \wedge x = y\}$

$R_1 = \{(1, 1)\}$  Domain of  $R_1 = \{1\}$

Range of  $R_1 = \{1\}$

$R_2 = \{(x, y) / x \in S, y \in T \wedge y < x\}$

$R_2 = \{(2, 1)(4, 1)(4, 3)(8, 1)(8, 3)\}$  Domain of  $R_2 = \{2, 4, 8\}$

Range of  $R_2 = \{1, 3\}$

iii)  $R_3 = \{(x, y) / x \in S, y \in T \wedge x + y = 9\}$

$R_3 = \{(1, 8)(2, 7)(3, 6)(4, 5)(8, 1)(8, 3)\}$  Domain of  $R_3 = \{1\}$

Range of  $R_3 = \{1, 3, 9\}$

iv)  $R_4 = \{(x, y) / x \in S, y \in T \wedge x \cdot y = 0\}$

$R_4 = \{(1, 1)(1, 3)(1, 9)\}$  Domain of  $R_4 = \{1\}$

Range of  $R_4 = \{1, 3, 9\}$



$$R_5 = \{(x, y) \mid x \in S, y \in T \wedge y > 2x\}$$

$$R_5 = \{(1, 3), (1, 9), (2, 9), (4, 9)\}$$

$$\text{Domain of } R_5 = \{1, 2, 4\}$$

$$\text{Range of } R_5 = \{3, 9\}$$