

CHAPTER - 2RELATIONS AND FUNCTIONSEXERCISE :- 2.1

(Q.1). $\therefore (x/3 + 1, y - 2/3) = (5/3, 1/3)$
 \therefore Corresponding terms must be equal.
 $\Rightarrow x/3 + 1 = 5/3$ and $y - 2/3 = 1/3$
 $(x+3)/3 = 5/3$ $y = 2/3 + 1/3$
 $x+3 = 5$ $y = 3/3$
 $x = 2$ $y = 1$

(Q.2). $n(A) = 3$, $n(B) = 3$
 $n(A \times B) = n(A) \times n(B)$
 $= 3 \times 3$
 $\Rightarrow n(A \times B) = 9$
 \therefore No. of elements in $(A \times B) = 9$.

(Q.3). $G = \{7, 8\}$, $H = \{5, 4, 2\}$

$$G \times H = \{(7, 5), (7, 4), (7, 2), (8, 5), (8, 4), (8, 2)\}$$

$$H \times G = \{(5, 7), (5, 8), (4, 7), (4, 8), (2, 7), (2, 8)\}$$

(Q.4). (i). False.

Correct statement :- If $P = \{m, n\}$ and $Q = \{n, m\}$, then $P \times Q = \{(m, n), (m, m), (n, m), (n, n)\}$

(ii). True.

(iii). True.

Q.5). $A = \{-1, 1\}$

$$\begin{aligned} A \times A \times A &= \{-1, 1\} \times \{-1, 1\} \times \{-1, 1\} \\ &= \{(-1, -1, -1), (-1, -1, 1), (-1, 1, -1), \\ &\quad (-1, 1, 1), (1, -1, -1), (1, -1, 1), \\ &\quad (1, 1, -1), (1, 1, 1)\} \end{aligned}$$

Q.6). \therefore elements of $(A \cdot B)$ are in pairs.
 $\therefore n(A) = 2$

$$n(A \cdot B) = n(A) \cdot n(B)$$

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

$$2 = n(B)$$

$$\Rightarrow \text{no. of elements in } B = 2$$

$\therefore A$ is multiplied by B .

\therefore 1 element must belong to A & 2nd to B .

$$\Rightarrow A = \{a, b\} \quad \& \quad B = \{x, y\}$$

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

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

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

$$= \phi \quad \Rightarrow A \times (B \cap C) = \phi \quad \dots (i)$$

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

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

$$= \phi$$

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

Thus proved.

(ii) $(A \times C)$

$$= \{1, 2\} \times \{5, 6\}$$

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

 $(B \times D)$

$$= \{1, 2, 3, 4\} \times \{5, 6, 7, 8\}$$

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

$$\therefore (B \times D) \cap (A \times C) = (A \times C)$$

$\Rightarrow B \times D$ contains all the elements of $(A \times C)$

$$\therefore (A \times C) \subseteq (B \times D)$$

Q.8) $n(A \cdot B) = n(A) \cdot n(B)$

$$A = 2 \times 2 = 4$$

$$\text{no. of subsets of } (A \cdot B) = 2^n = 2^4 = 16$$

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

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

$$\begin{aligned} \text{Subsets of } (A \cdot B) = & \phi, \{(1, 3)\}, \{(1, 4)\}, \{(2, 3)\}, \\ & \{(2, 4)\}, \{(1, 3), (1, 4)\}, \{(1, 3), (2, 3)\}, \\ & \{(1, 3), (2, 4)\}, \{(1, 3), (1, 4), (2, 3)\}, \\ & \{(1, 3), (1, 4), (2, 4)\}, \{(1, 3), (2, 3), (2, 4)\}, \\ & \{(1, 4), (2, 3), (2, 4)\}, \{(1, 4), (2, 3)\}, \\ & \{(1, 4), (2, 4)\}, \{(2, 3), (2, 4)\}, \\ & \{(1, 3), (1, 4), (2, 3), (2, 4)\} \end{aligned}$$

(Q.9) $\therefore n(A) = 3$ & x, y and z are 3 distinct elements.

$$\therefore A = \{x, y, z\}$$

$$\& B = \{1, 2\}$$

(Q.10) $n(A) \times n(A) = 9$

$$n^2(A) = 9$$

$$n(A) = 3$$

$\therefore 1, 0, -1$ are 3 different numbers found in the product of A, A .

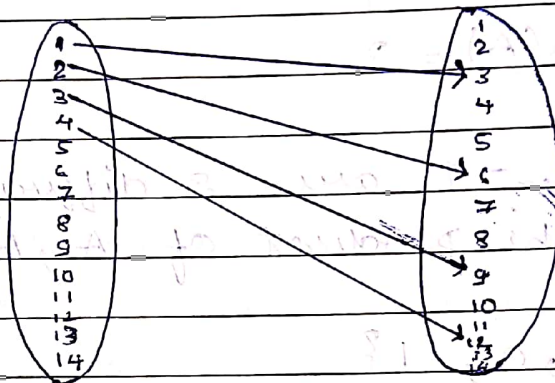
$$\therefore A = \{-1, 0, +1\}$$

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

$$= \{(1, 1), (1, 0), (1, -1), (0, 1), (0, 0), (0, -1), (-1, 1), (-1, 0), (-1, -1)\}$$

EXERCISE :- 7.2

Q.1. if $x = 1$, $y = 1 \times 3 = 3$ ($x, y \in A$)
 $x = 2$, $y = 2 \times 3 = 6$ ($x, y \in A$)
 $x = 3$, $y = 3 \times 3 = 9$ ($x, y \in A$)
 $x = 4$, $y = 4 \times 3 = 12$ ($x, y \in A$)
 $x = 5$, $y = 5 \times 3 = 15$ ($x \in A, y \notin A$)



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

$$\text{Codomain} = \{1, 2, 3, \dots, 14\}$$

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

Q.2. $R = \{(1, 6), (2, 7), (3, 8)\}$

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

$$\text{Range} = \{6, 7, 8\}$$

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

Q.4. $R = \{(x, y) : x = y + 2, 2 < y < 6\}$

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

$$\text{Domain} = \{5, 6, 7\}$$

$$\text{Range} = \{3, 4, 5\}$$

Q. 5. - : Find

Q.5. (i). $R = \{1, 2, 3, 4, 6\}$

(ii). Domain = $\{0, 1, 2, 3, 4, 6\}$

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

Q.6. domain = $\{0, 1, 2, 3, 4, 5\}$

Range = $\{5, 6, 7, 8, 9, 10\}$

Q.7. $R = \{(2, 8), (3, 27), (5, 125), (7, 343)\}$

Q.8. $n(A \cdot B) = n(A) \cdot n(B)$

$n = 2 \times 3 = 6$

no. of relations between A & B = 2^n

$(n = n(A \cdot B)) = \underline{\underline{2^6}}$

Q.9. Range of $R = Z$.

Domain of $R = Z$:

$[0, \infty)$

EXERCISE :- 2.3

Q.1. (i). $\{(2,1), (5,1), (8,1), (11,1), (14,1), (17,1)\}$

Yes.

$$\text{Domain} = \{2, 5, 8, 11, 14, 17\}$$

$$\text{Range} = \{1\}$$

(ii). Yes.

$$\text{Domain} = \{2, 4, 6, 8, 10, 12, 14\}$$

$$\text{Range} = \{1, 2, 3, 4, 5, 6, 7\}$$

(iii). NO. Because there is no definite relation between x, y and x & y of successive x .

Q.2. (i). Domain = \mathbb{R}

$$\text{Range} = [-\infty, 0)$$

(ii). Domain = ~~$\{-3, -2, -1, 0, 1, 2, 3\}$~~ $[-3, 3]$

$$\text{Range} = [-3, 3]$$

Q.3. (i). $f(0)$: i.e. when $x=0$

$$f(0) = 2 \times 0 - 5 = -5$$

(ii). $f(7)$

$$f(7) = 2 \times 7 - 5 = 14 - 5 = 9$$

(iii). $f(-3)$

$$f(-3) = 2 \times (-3) - 5 = -6 - 5 = -11$$

Q.4. (i). $x(0)$:- $[t(0) = \frac{9C}{5} + 32]$

$$x(0) = \frac{9 \times 0}{5} + 32 = 32$$

$$(ii) \quad T(28)$$

$$T(28) = \frac{9 \times 28}{5} + 32$$

$$= 9 \times 5.6 + 32$$

$$= 50.4 + 32 = 82.4$$

$$(iii) \quad T(-10)$$

$$T(-10) = \frac{9 \times (-10)}{5} + 32$$

$$= -18 + 32$$

$$= 14$$

$$(iv) \quad T(C) = 212$$

$$212 = \frac{9C}{5} + 32$$

$$212 - 32 = 9C/5$$

$$\frac{20}{180} \times 5 = C \Rightarrow \boxed{C = 100}$$

$$Q.5) (i) \quad \text{Range} = (-\infty, 0]$$

$$(ii) \quad \text{Range} = [2, \infty)$$

$$(iii) \quad \text{Range} = 0$$