

EXERCISE 2.1 (NCERT)

QNo1 If $\left(\frac{x}{3}+1, y-\frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$, find the values of x and y .

Sol. Here $\left(\frac{x}{3}+1, y-\frac{2}{3}\right) = \left(\frac{5}{3}, \frac{1}{3}\right)$

$\therefore$ By Definition of equal ordered pairs,

$$\frac{x}{3}+1 = \frac{5}{3} \quad \text{and} \quad y-\frac{2}{3} = \frac{1}{3}$$

$$\Rightarrow \frac{x}{3} = \frac{5}{3} - 1 \quad \text{and} \quad y = \frac{1}{3} + \frac{2}{3}$$

$$\Rightarrow x = \left(\frac{5-3}{3}\right) \times 3 \quad \text{and} \quad y = \frac{1+2}{3}$$

$$\Rightarrow x = 2 \quad \text{and} \quad y = 1.$$

QNo2 If the set A has 3 elements and the set $B = \{3, 4, 5\}$ then find the number of elements in $(A \times B)$

Sol No. of elements in $A = 3$
 $\therefore n(A) = 3$.

$$\text{Also } B = \{3, 4, 5\} \Rightarrow n(B) = 3$$

$$\text{Now Number of elements in } A \times B = n(A \times B) = n(A) \times n(B) \\ = 3 \times 3 = 9$$

QNo3 If $G = \{7, 8\}$ and $H = \{5, 4, 2\}$, find $G \times H$ and $H \times G$.

Sol Here $G = \{7, 8\}$ and $H = \{5, 4, 2\}$

$$\text{Now } G \times H = \{(x, y); x \in G \text{ and } y \in H\} \\ = \{(7, 5), (7, 4), (7, 2), (8, 5), (8, 4), (8, 2)\}$$

$$\text{and } H \times G = \{(x, y); x \in H \text{ and } y \in G\} \\ = \{(5, 7), (5, 8), (4, 7), (4, 8), (2, 7), (2, 8)\}$$

QNo.4 : State whether each of following statements are true or false. If the statement is false, rewrite the given statement correctly.

(i) If $P = \{m, n\}$; $Q = \{n, m\}$ then $P \times Q = \{(m, n), (n, m)\}$

(ii) If A and B are non-empty sets, then $A \times B$ is non-empty set of ordered pairs (x, y) such that $x \in A$ and $y \in B$.

(iii) If $A = \{1, 2\}$, $B = \{3, 4\}$, then $A \times (B \cap \emptyset) = \emptyset$

Sol: (i) false, Here $P = \{m, n\}$, $Q = \{n, m\}$
 $\therefore P \times Q = \{(m, n), (m, m), (n, n), (n, m)\}$ is
Correct statement.

(ii) True

(iii) True.

QNo 5: If $A = \{-1, 1\}$, find $A \times A \times A$

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

QNo 6: If $A \times B = \{(a, x), (a, y), (b, x), (b, y)\}$, find A and B .

Sol. Here $A \times B = \{(a, x), (a, y), (b, x), (b, y)\}$

$\therefore A =$ Set of first elements $= \{a, b\}$

$B =$ Set of second elements $= \{x, y\}$

QNo 7: Let $A = \{1, 2\}$; $B = \{1, 2, 3, 4\}$, $C = \{5, 6\}$, $D = \{5, 6, 7, 8\}$.

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

(ii) $(A \times C)$ is subset of $B \times D$.

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

$\therefore B \cap C = \{1, 2, 3, 4\} \cap \{5, 6\} = \emptyset$

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

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

(i) LHS $= A \times (B \cap C) = \{1, 2\} \times \emptyset = \emptyset$

RHS $= (A \times B) \cap (A \times C) = \emptyset$ [From (i) and (ii)]

$\therefore$ LHS = RHS

$$(ii) \quad B \times D = \{1, 2, 3, 4\} \times \{5, 6, 7, 8\}$$

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

Since every element of $A \times C$ is in $B \times D$.

$$\therefore A \times C \subset B \times D$$

QNo 8: Let $A = \{1, 2\}$; $B = \{3, 4\}$. Write $A \times B$. How many subsets will $A \times B$ have? List them.

Sol. Here $A = \{1, 2\}$; $B = \{3, 4\}$. $\therefore A \times B = \{1, 2\} \times \{3, 4\}$

$$\text{i.e. } A \times B = \{(1,3)(1,4)(2,3)(2,4)\}$$

Now Number of elements in $A \times B = n(A \times B) = 4$

$\therefore$ No. of Subsets of $A \times B = 2^4 = 16$.

Subsets of $A \times B$ are:

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

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

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

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

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

QNo 9. 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 A and B where x, y, z are distinct elements.

Sol.

Here $n(A) = 3$ and $n(B) = 2$.

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

$$\therefore A = \{x, y, z\}, B = \{1, 2\}$$

Q No 10

The Cartesian Product $A \times A$ has 9 elements among which are found $(-1, 0)$ and $(0, 1)$. Find the set A and Remaining elements of $A \times A$.

Sol.

Since $(-1, 0) \in A \times A$ and $(0, 1) \in A \times A$

$$\Rightarrow -1, 0 \in A \text{ and } 0, 1 \in A$$

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

Now Since $A \times A$ has 9 elements

$\Rightarrow A$ has 3 elements

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

Remaining elts of $A \times A$ are.

$$(-1, -1), (-1, 1), (0, -1), (0, 0), (1, -1), (1, 0), (1, 1)$$

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