Unit–5   Sets and Functions

Ordered Pairs   (K.B)

Any two numbers x and y, written in the form (x, y) is called an ordered pair. In an ordered pair (x, y), the order of numbers is important.

For example: $(3,2)$ is different from $(2,3)$.

Hence $(x, y) \neq (y, x)$ unless $x = y$.

Cartesian Product   (K.B)
(FSD 2015, D.G.K 2015, 17)

Cartesian product of two non-empty sets A and B denoted by $A \times B$ consists of all the ordered pairs (x, y) such that $x \in A$ and $y \in B$

i.e $A \times B = \{(x, y) \mid x \in A \wedge y \in B\}$

For example:

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

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

Exercise 5.4

Q.1   Given $A = \{a, b\}$ (GRW 2014) **(A.B)**

$B = \{c, d\}$ (RWP 2015)

To Find

(i) $A \times B$
(ii) $B \times A$

Solution:

(i) $A \times B = \{a, b\} \times \{c, d\}$

$= \{(a,c), (a,d), (b,c), (b,d)\}$

(ii) $B \times A = \{c, d\} \times \{a, b\}$

$= \{(c,a), (c,b), (d,a), (d,b)\}$

Q.2   Given $A = \{0, 2, 4\}$ **(A.B)**

$B = \{-1, 3\}$

(FSD 2015, SWL 2017, BWP 2015)

To Find

$A \times B$ $B \times A$ $A \times A$ $B \times B$

Solution:

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

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

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

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

(iii) $A \times A = \{0, 2, 4\} \times \{0, 2, 4\}$

$= \{(0,0), (0,2), (0,4), (2,0), (2,2), (2,4), (4,0), (4,2), (4,4)\}$

(iv) $B \times B = \{-1, 3\} \times \{-1, 3\}$

$= \{(-1, -1), (-1, 3), (3, -1), (3, 3)\}$

Q.3   **(A.B)**

(i)   Given $(a - 4, b - 2) = (2, 1)$

(GRW 2016, 17, FSD 2017, SWL 2015, SGD 2017, MTN 2016)

Required

Values of a and b

Solution:

Given that

$(a - 4, b - 2) = (2, 1)$

By comparing, we get

$a - 4 = 2$ and $b - 2 = 1$

$a = 2 + 4$ $b = 1 + 2$

$\Rightarrow a = 6$, $b = 3$

(ii)   Given $(2a + 5, 3) = (7, b - 4)$ **(A.B)**

(SWL 2017, MTN 2017, RWP 2016, D.G.K 2015)

Required

Values of a and b

Solution:

Given that

$(2a + 5, 3) = (7, b - 4)$

By comparing, we get

$2a + 5 = 7$ and $3 = b - 4$

$2a = 7 - 5$ $3 + 4 = b$

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2a = 2   7 = b
a = 1   b = 7

(iii) **Given** $(3-2a, b-1) = (a-7, 2b+5)$

(GRW 2014) (A.B)

Required
Values of a and b =?
Solution:
Given that
$(3-2a, b-1) = (a-7, 2b+5)$

By comparing, we get
$3-2a = a-7$ and $\quad b-1 = 2b+5$
$-2a-a = -7-3 \qquad b-2b = 5+1$
$-3a = -10 \qquad\qquad -b = 6$
$a = \dfrac{-10}{-3} \qquad\qquad b = -6$

$\Rightarrow a = \dfrac{10}{3}$

Q.4 **Given**
$X \times Y = \{(a,a),(b,a),(c,a),(d,a)\}$

(A.B)

Required
Set X and Y
Solution:
Given that
$X \times Y = \{(a,a),(b,a),(c,a),(d,a)\}$

$X = \{a,b,c,d\}$

$Y = \{a\}$

Q.5 **Given** $X = \{a,b,c\}$ **(A.B)**

$\qquad\qquad Y = \{d,e\}$

Required
Number of elements in
(i) $\quad X \times Y$
(ii) $\quad Y \times X$
(iii) $\quad X \times X$
Solution:
(i) $\quad X \times Y$

$n(X) = 3$

$n(Y) = 2$

$n(X \times Y) = n(X) \times n(Y)$
$\qquad\qquad = 3 \times 2$
$\qquad\qquad = 6$

Method-2 **(K.B)**

(i) Number of elements in $X \times Y = m \times n$
$\qquad\qquad\qquad\qquad\qquad = 3 \times 2$
$\qquad\qquad\qquad\qquad\qquad = 6$

(ii) Number of elements in $Y \times X = m \times n$
$\qquad\qquad\qquad\qquad\qquad = 2 \times 3$
$\qquad\qquad\qquad\qquad\qquad = 6$

(iii) Number of elements in $X \times X = m \times n$
$\qquad\qquad\qquad\qquad\qquad = 3 \times 3$
$\qquad\qquad\qquad\qquad\qquad = 9$