RD Sharma Solutions Class 11 Maths Chapter 2 Ex 2.1

Class 11 Solutions Chapter 2 Relations Ex 2.1 Q1

By the definition of equality of ordered pairs

$$\left(\frac{a}{3}+1,\ b-\frac{2}{3}\right)=\left(\frac{5}{3},\ \frac{1}{3}\right)$$

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

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

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

$$\Rightarrow \quad \frac{a}{3}=\frac{2}{3} \quad \text{and} \quad b=\frac{3}{3}$$

$$\Rightarrow \quad a=2 \quad \text{and} \quad b=1$$

By the definition of equality of ordered pairs

$$(x+1,1)=(3,y-2)$$

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

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

$$\Rightarrow \quad x=2 \quad \text{and} \quad 3=y$$

$$\Rightarrow \quad x=2 \quad \text{and} \quad y=3$$

Class 11 Solutions Chapter 2 Relations Ex 2.1 Q2

We have,

$$(x,-1)\in\{(a,b): b=2a-3\}$$

and, $$(5,y)\in\{(a,b): b=2a-3\}$$

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

$$\Rightarrow \quad -1=2x-3 \quad \text{and} \quad y=10-3$$

$$\Rightarrow \quad 3-1=2x \quad \text{and} \quad y=7$$

$$\Rightarrow \quad 2=2x \quad \text{and} \quad y=7$$

$$\Rightarrow \quad x=1 \quad \text{and} \quad y=7$$

Class 11 Solutions Chapter 2 Relations Ex 2.1 Q3

We have,

$$a+b=5$$

$$\Rightarrow \quad a=5-b$$

$$\therefore \quad b=0\Rightarrow a=5-0=5,$$

$$b=3\Rightarrow a=5-3=2,$$

$$b=6\Rightarrow a=5-6=-1,$$

Hence, the required set of ordered pairs (a,b) is $\{(-1,6),(2,3),(5,0)\}$

Class 11 Solutions Chapter 2 Relations Ex 2.1 Q4

We have,

$$a\in\{2,4,6,9\}$$

and, $$b\in\{4,6,18,27\}$$

Now, a/b stands for 'a divides b'. For the elements of the given sets, we find that $2/4$, $2/6$, $2/18$, $6/18$, $9/18$ and $9/27$

$\therefore$ $\{(2,4),\ (2,6),\ (2,18),\ (6,18),\ (9,18),\ (9,27)\}$ are the required set of ordered pairs (a,b).

Class 11 Solutions Chapter 2 Relations Ex 2.1 Q5

We have,

$$A=\{1,2\} \text{ and } B=\{1,3\}$$

Now, $$A\times B=\{1,2\}\times\{1,3\}$$

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

and, $$B\times A=\{1,3\}\times\{1,2\}$$

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

Class 11 Solutions Chapter 2 Relations Ex 2.1 Q6

We have,

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

$$\therefore \quad A\times B=\{1,2,3\}\times\{3,4\}$$

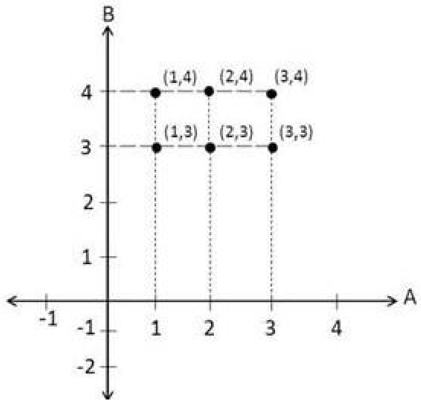
$$=\{(1,3),\ (1,4),\ (2,3),\ (2,4),\ (3,3),\ (3,4)\}$$

In order to represent $A \times B$ graphically, we follow the following steps:

(a) Draw two mutually perpendicular line one horizontal and other vertical.

(b) On the horizontal line represent the element of set A and on the vertical line represent the elements of set B.

(c) Draw vertical dotted lines through points representing elements of A on horizontal line and horizontal lines through points representing elements of B on the vertical line points of intersection of these lines will represent $A \times B$ graphically.



Class 11 Solutions Chapter 2 Relations Ex 2.1 Q7

We have,

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

$\therefore \quad A \times B = \{1,2,3\} \times \{2,4\}$

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

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

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

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

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

$B \times B = \{2,4\} \times \{2,4\}$

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

and, $(A \times B) \cap (B \times A)$

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

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

$\Rightarrow \quad (A \times B) \cap (B \times A) = \{(2,2)\}.$

Class 11 Solutions Chapter 2 Relations Ex 2.1 Q8

We have,

$n(A) = 5$ and $n(B) = 4$

We know that, if A and B are two finite sets, then $n(A \times B) = n(A) \times n(B)$

$\therefore \quad n(A \times B) = 5 \times 4 = 20$

Now,

$n[(A \times B) \cap (B \times A)] = 3 \times 3 = 9$ $\quad [\because A$ and B have 3 elements in common$]$

Class 11 Solutions Chapter 2 Relations Ex 2.1 Q9

Let (a,b) be an arbitrary element of $(A \times B) \cap (B \times A)$. Then,

$(a,b) \in (A \times B) \cap (B \times A)$

$\Leftrightarrow \quad (a,b) \in A \times B$ and $(a,b) \in B \times A$

$\Leftrightarrow \quad (a \in A$ and $b \in B)$ and $(a \in B$ and $b \in A)$

$\Leftrightarrow \quad (a \in A$ and $a \in B)$ and $(b \in A$ and $b \in B)$

$\Leftrightarrow \quad a \in A \cap B$ and $b \in A \cap B$

Hence, the sets $A \times B$ and $B \times A$ have an element in comon have an element in common.

Chapter 2 Relations Ex 2.1 Q10

Since $(x,1)$, $(y,2)$, $(z,1)$ are elements of $A \times B$. Therefore, $x, y, z \in A$ and $1, 2 \in B$

It is given that $n(A) = 3$ and $n(B) = 2$

$\therefore \quad x, y, z \in A$ and $n(A) = 3$

$\Rightarrow \quad A = \{x, y, z\}$

$1, 2 \in B$ and $n(B) = 2$

$\Rightarrow \quad B = \{1, 2\}$.

Chapter 2 Relations Ex 2.1 Q11

We have,

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

and, $R = \{(a,b) = a \in A,\ b \in A,\ a \text{ divides } b\}$

Now,

a/b stands for 'a divides b'. For the elements of the given sets, we find that $1/1$, $1/2$, $1/3$, $1/4$, $2/2$, $3/3$ and $4/4$

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

Chapter 2 Relations Ex 2.1 Q12

We have,

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

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

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

Chapter 2 Relations Ex 2.1 Q13

(i) False,

If $P = \{m, n\}$ and $Q = \{n, m\}$,

Then,

$P \times Q = \{(m,n),\ (m,m),\ (n,n),\ (n,m)\}$

(ii) False,

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

(iii) True

Chapter 2 Relations Ex 2.1 Q14

We have,

$A = \{1, 2\}$

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

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

Chapter 2 Relations Ex 2.1 Q15

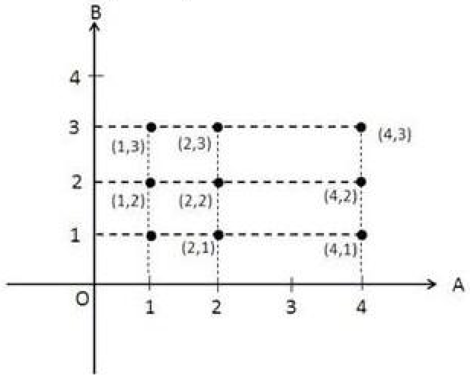
We have,

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

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

Hence, we represent A on the horizontal line and B on vertical line.

Graphical representation of $A \times B$ is as shown below:



We have,

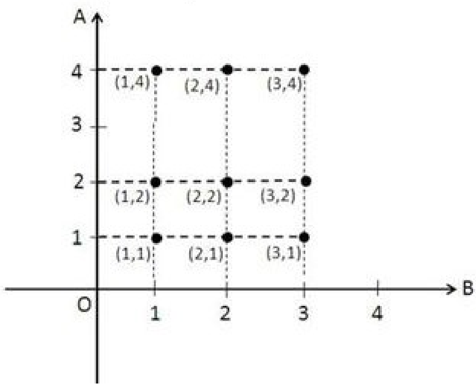
$A = \{1, 2, 4\}$ and $B = \{1, 2, 3\}$

$\therefore \quad B \times A = \{1, 2, 3\} \times \{1, 2, 4\}$

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

Hence, we represent B on the horizontal line and A on vertical line.

Graphical representation of $B \times A$ is as shown below:



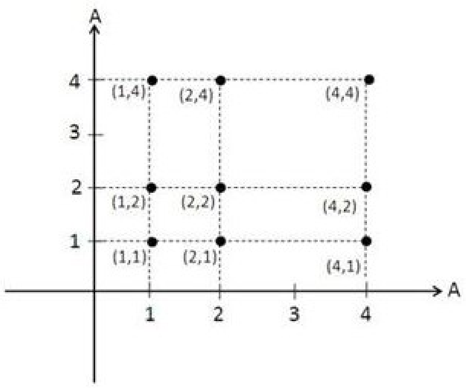
We have,

$A = \{1, 2, 4\}$

$\therefore \quad A \times A = \{1, 2, 4\} \times \{1, 2, 4\}$

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

Graphical representation of $A \times A$ is shown below:



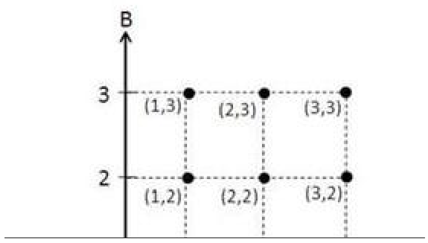
We have,

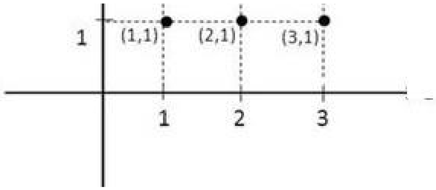
$B = \{1, 2, 3\}$

$\therefore \quad B \times B = \{1, 2, 3\} \times \{1, 2, 3\}$

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

Graphical representation of $B \times B$ is shown below:





1
(1,1)
(2,1)
(3,1)
1
2
3