

Activity 2

OBJECTIVE

To verify that for two sets A and B, $n(A \times B) = pq$ and the total number of relations from A to B is 2^{pq} , where $n(A) = p$ and $n(B) = q$.

MATERIAL REQUIRED

Paper, different coloured pencils.

METHOD OF CONSTRUCTION

1. Take a set A_1 which has one element (say) a_1 , and take another set B_1 , which has one element (say) b_1 .
2. Take a set A_2 which has two elements (say) a_1 and a_2 and take another set B_3 , which has three elements (say) b_1, b_2 and b_3 .
3. Take a set A_3 which has three elements (say) a_1, a_2 and a_3 , and take another set B_4 , which has four elements (say) b_1, b_2, b_3 and b_4 .

DEMONSTRATION

1. Represent all the possible correspondences of the elements of set A_1 to the elements of set B_1 visually as shown in Fig. 2.1.



Fig. 2.1

2. Represent all the possible correspondences of the elements of set A_2 to the elements of set B_3 visually as shown in Fig. 2.2.

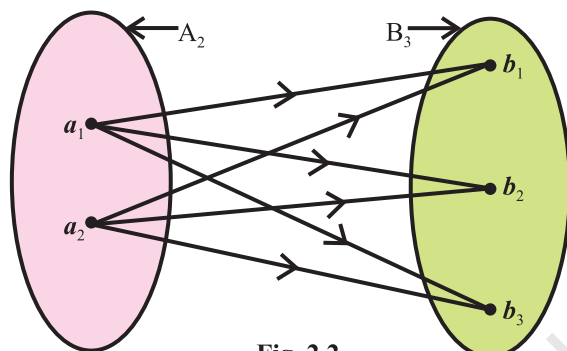


Fig. 2.2

3. Represent all the possible correspondences of the elements of set A_3 to the elements of set B_4 visually as shown in Fig. 2.3.

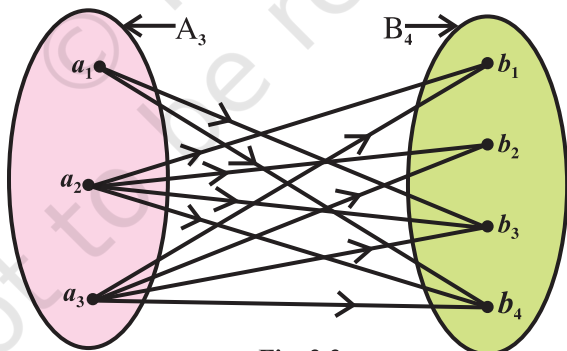


Fig. 2.3

4. Similar visual representations can be shown between the elements of any two given sets A and B.

OBSERVATION

1. The number of arrows, i.e., the number of elements in cartesian product $(A_1 \times B_1)$ of the sets A_1 and B_1 is $_ \times _$ and the number of relations is $2^{_}$.
2. The number of arrows, i.e., the number of elements in cartesian product $(A_2 \times B_3)$ of the sets A_2 and B_3 is $_ \times _$ and number of relations is $2^{_}$.
3. The number of arrows, i.e., the number of elements in cartesian product $(A_3 \times B_4)$ of the sets A_3 and B_4 is $_ \times _$ and the number of relations is $2^{_}$.

NOTE

The result can be verified by taking other sets $A_4, A_5, \dots, A_p$, which have elements 4, 5, ..., p , respectively, and the sets $B_5, B_6, \dots, B_q$ which have elements 5, 6, ..., q , respectively. More precisely we arrive at the conclusion that in case of given set A containing p elements and the set B containing q elements, the total number of relations from A to B is 2^{pq} , where $n(A \times B) = n(A) \cdot n(B) = pq$.

Activity 5

OBJECTIVE

To identify a relation and a function.

MATERIAL REQUIRED

Hardboard, battery, electric bulbs of two different colours, testing screws, tester, electrical wires and switches.

METHOD OF CONSTRUCTION

1. Take a piece of hardboard of suitable size and paste a white paper on it.
2. Drill eight holes on the left side of board in a column and mark them as A, B, C, D, E, F, G and H as shown in the Fig.5.

3. Drill seven holes on the right side of the board in a column and mark them as P, Q, R, S, T, U and V as shown in the Figure 5.

4. Fix bulbs of one colour in the holes A, B, C, D, E, F, G and H.

5. Fix bulbs of the other colour in the holes P, Q, R, S, T, U and V.

6. Fix testing screws at the bottom of the board marked as 1, 2, 3, ..., 8.

7. Complete the electrical circuits in such a manner that a pair of corresponding bulbs, one from each column glow simultaneously.

8. These pairs of bulbs will give ordered pairs, which will constitute a relation which in turn may /may not be a function [see Fig. 5].

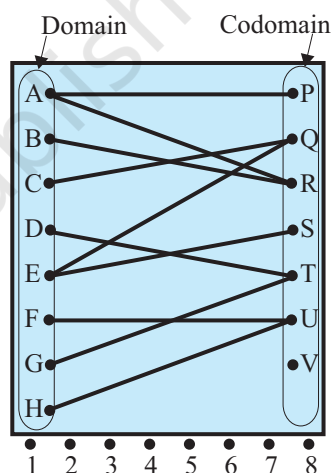


Fig. 5

DEMONSTRATION

1. Bulbs at A, B, ..., H, along the left column represent domain and bulbs along the right column at P, Q, R, ..., V represent co-domain.
2. Using two or more testing screws out of given eight screws obtain different order pairs. In Fig.5, all the eight screws have been used to give different ordered pairs such as (A, P), (B, R), (C, Q) (A, R), (E, Q), etc.
3. By choosing different ordered pairs make different sets of ordered pairs.

OBSERVATION

1. In Fig.5, ordered pairs are _____.
2. These ordered pairs constitute a _____.
3. The ordered pairs (A, P), (B, R), (C, Q), (E, Q), (D, T), (G, T), (F, U), (H, U) constitute a relation which is also a _____.
4. The ordered pairs (B, R), (C, Q), (D, T), (E, S), (E, Q) constitute a _____ which is not a _____.

APPLICATION

The activity can be used to explain the concept of a relation or a function. It can also be used to explain the concept of one-one, onto functions.

Activity 6

OBJECTIVE

To distinguish between a Relation and a Function.

MATERIAL REQUIRED

Drawing board, coloured drawing sheets, scissors, adhesive, strings, nails etc.

METHOD OF CONSTRUCTION

1. Take a drawing board/a piece of plywood of convenient size and paste a coloured sheet on it.
2. Take a white drawing sheet and cut out a rectangular strip of size $6\text{ cm} \times 4\text{ cm}$ and paste it on the left side of the drawing board (see Fig. 6.1).

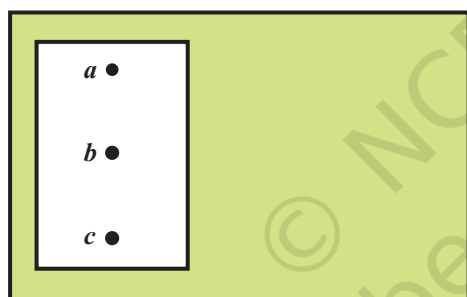


Fig. 6.1

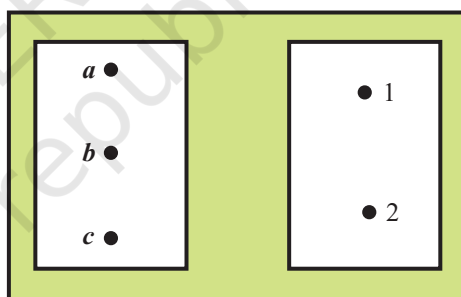


Fig. 6.2

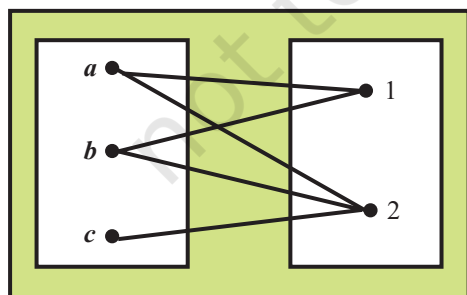


Fig. 6.3

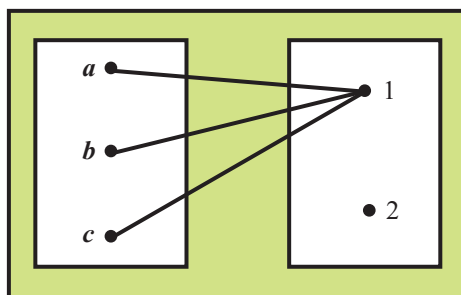


Fig. 6.4

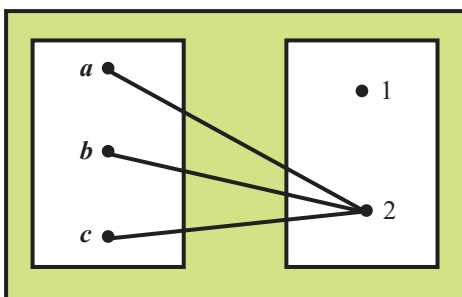


Fig. 6.5

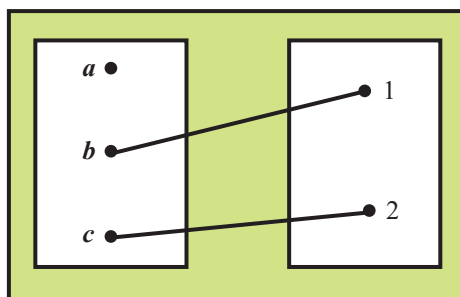


Fig. 6.6

3. Fix three nails on this strip and mark them as a , b , c (see Fig. 6.1).
4. Cut out another white rectangular strip of size $6\text{ cm} \times 4\text{ cm}$ and paste it on the right hand side of the drawing board.
5. Fix two nails on the right side of this strip (see Fig. 6.2) and mark them as 1 and 2.

DEMONSTRATION

1. Join nails of the left hand strip to the nails on the right hand strip by strings in different ways. Some of such ways are shown in Fig. 6.3 to Fig. 6.6.
2. Joining nails in each figure constitute different ordered pairs representing elements of a relation.

OBSERVATION

1. In Fig. 6.3, ordered pairs are _____.
These ordered pairs constitute a _____ but not a _____.
2. In Fig. 6.4, ordered pairs are _____. These constitute a _____ as well as _____.
3. In Fig 6.5, ordered pairs are _____. These ordered pairs constitute a _____ as well as _____.
4. In Fig. 6.6, ordered pairs are _____. These ordered pairs do not represent _____ but represent _____.

APPLICATION

Such activity can also be used to demonstrate different types of functions such as constant function, identity function, injective and surjective functions by joining nails on the left hand strip to that of right hand strip in suitable manner.

NOTE

In the above activity nails have been joined in some different ways. The student may try to join them in other different ways to get more relations of different types. The number of nails can also be changed on both sides to represent different types of relations and functions.