

Activity 4

OBJECTIVE

To verify distributive law for three given non-empty sets A, B and C, that is, $A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$

MATERIAL REQUIRED

Hardboard, white thick sheets of paper, pencil, colours, scissors, adhesive.

METHOD OF CONSTRUCTION

1. Cut five rectangular strips from a sheet of paper and paste them on the hardboard in such a way that three of the rectangles are in horizontal line and two of the remaining rectangles are also placed horizontally in a line just below the above three rectangles. Write the symbol U in the left/right top corner of each rectangle as shown in Fig. 4.1, Fig. 4.2, Fig. 4.3, Fig. 4.4 and Fig. 4.5.
2. Draw three circles and mark them as A, B and C in each of the five rectangles as shown in the figures.
3. Colour/shade the portions as shown in the figures.

DEMONSTRATION

1. U denotes the universal set represented by the rectangle in each figure.
2. Circles A, B and C represent the subsets of the universal set U.

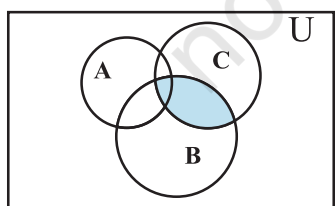


Fig. 4.1

$B \cap C$

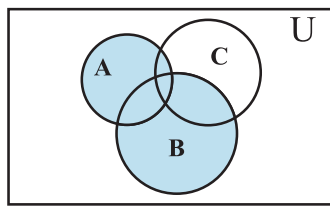


Fig. 4.2

$A \cup B$

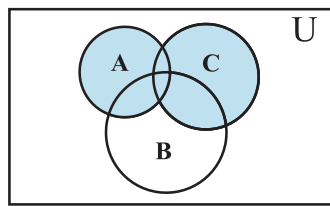


Fig. 4.3

$A \cup C$

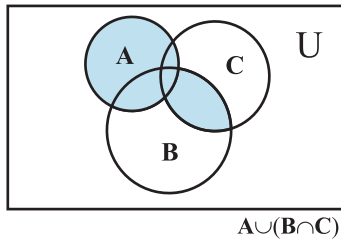


Fig. 4.4

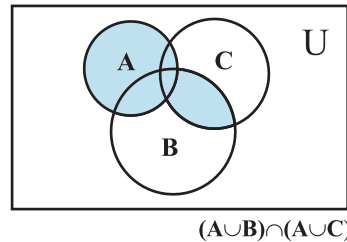


Fig. 4.5

3. In Fig. 4.1, coloured/shaded portion represents $B \cap C$, coloured portions in Fig. 4.2 represents $A \cup B$, Fig. 4.3 represents $A \cup C$, Fig. 4.4 represents $A \cup (B \cap C)$ and coloured portion in Fig. 4.5 represents $(A \cup B) \cap (A \cup C)$.

OBSERVATION

1. Coloured portion in Fig. 4.1 represents _____.
2. Coloured portion in Fig. 4.2, represents _____.
3. Coloured portion in Fig. 4.3, represents _____.
4. Coloured portion in Fig. 4.4, represents _____.
5. Coloured portion in Fig. 4.5, represents _____.
6. The common coloured portions in Fig. 4.4 and Fig. 4.5 are _____.
7. $A \cup (B \cap C) =$ _____.

Thus, the distributive law is verified.

APPLICATION

Distributivity property of set operations is used in the simplification of problems involving set operations.

NOTE

In the same way, the other distributive law

$A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$
can also be verified.