

# Activity 6

## OBJECTIVE

To verify the algebraic identity :

$$(a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

## MATERIAL REQUIRED

Hardboard, adhesive, coloured papers, white paper.

## METHOD OF CONSTRUCTION

1. Take a hardboard of a convenient size and paste a white paper on it.
2. Cut out a square of side  $a$  units from a coloured paper [see Fig. 1].
3. Cut out a square of side  $b$  units from a coloured paper [see Fig. 2].
4. Cut out a square of side  $c$  units from a coloured paper [see Fig. 3].
5. Cut out two rectangles of dimensions  $a \times b$ , two rectangles of dimensions  $b \times c$  and two rectangles of dimensions  $c \times a$  square units from a coloured paper [see Fig. 4].

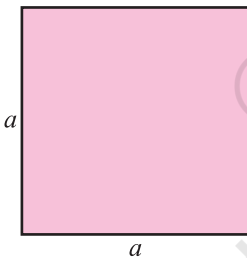


Fig. 1

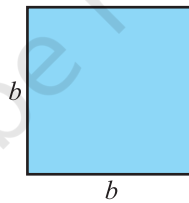


Fig. 2

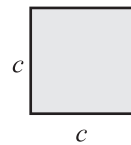


Fig. 3

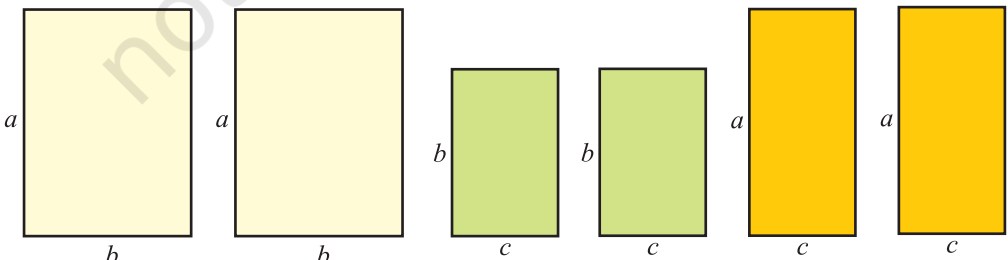


Fig. 4

6. Arrange the squares and rectangles on the hardboard as shown in Fig. 5.

### DEMONSTRATION

From the arrangement of squares and rectangles in Fig. 5, a square ABCD is obtained whose side is  $(a+b+c)$  units.

Area of square ABCD =  $(a+b+c)^2$ .

Therefore,  $(a+b+c)^2 =$  sum of all the squares and rectangles shown in Fig. 1 to Fig. 4.

$$= a^2 + ab + ac + ab + b^2 + bc + ac + bc + c^2$$

$$= a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

Here, area is in square units.

### OBSERVATION

On actual measurement:

$$a = \dots\dots\dots, \quad b = \dots\dots\dots, \quad c = \dots\dots\dots,$$

$$\text{So, } a^2 = \dots\dots\dots, \quad b^2 = \dots\dots\dots, \quad c^2 = \dots\dots\dots, \quad ab = \dots\dots\dots,$$

$$bc = \dots\dots\dots, \quad ca = \dots\dots\dots, \quad 2ab = \dots\dots\dots, \quad 2bc = \dots\dots\dots,$$

$$2ca = \dots\dots\dots, \quad a+b+c = \dots\dots\dots, \quad (a+b+c)^2 = \dots\dots\dots,$$

$$\text{Therefore, } (a+b+c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$$

### APPLICATION

The identity may be used for

1. simplification/factorisation of algebraic expressions
2. calculating the square of a number expressed as a sum of three convenient numbers.

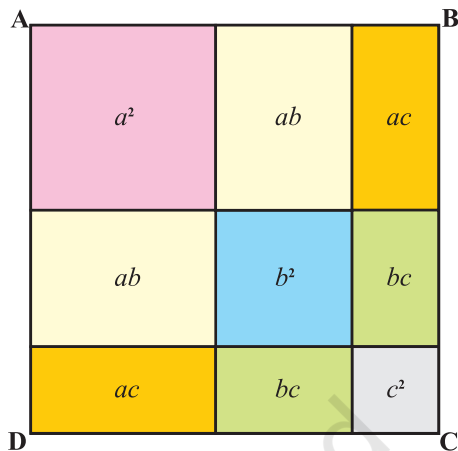


Fig. 5