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].

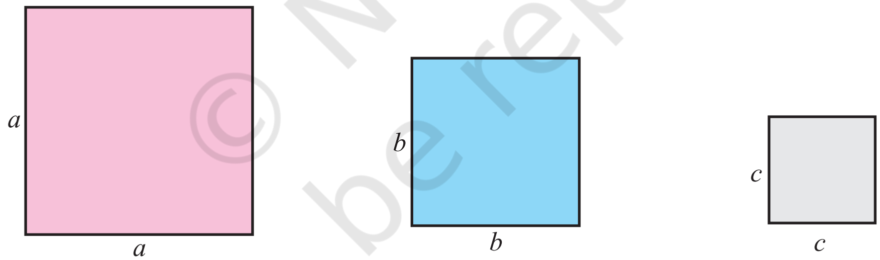

Fig. 1 **Fig. 2** **Fig. 3**

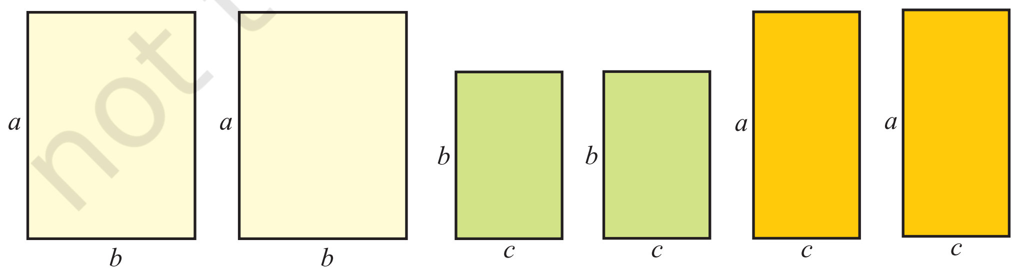

Fig. 4

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

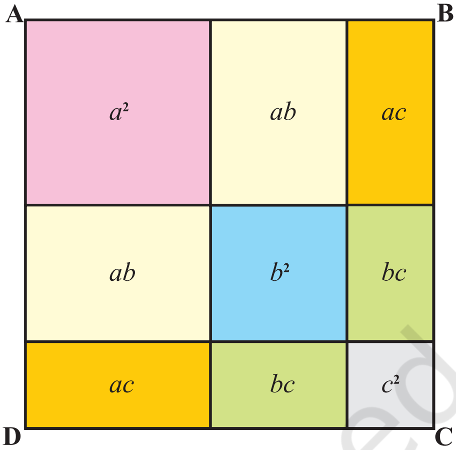

Fig. 5

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 = ..., b = ..., c = ...,

So, a^2 = ..., b^2 = ...,c^2= ...., ab= ....,

bc= ...., ca = ...,$2ab$ = ..., $2bc$ = ...,

$2ca$= ...., $a+b+c$ = ..., $(a+b+c)^2$ = ...,

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

Application

The identity may be used for

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