Activity 3

Objective

To verify the algebraic identity :

$(a + b)^2 = a^2 + 2ab + b^2$

Material Required

Drawing sheet, cardboard, cello-tape, coloured papers, cutter and ruler.

Method of Construction

1. Cut out a square of side length a units from a drawing sheet/cardboard and name it as square ABCD [see Fig. 1].
2. Cut out another square of length b units from a drawing sheet/cardboard and name it as square CHGF [see Fig. 2].

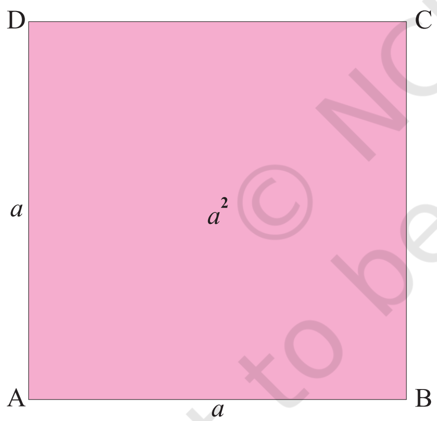

Fig. 1

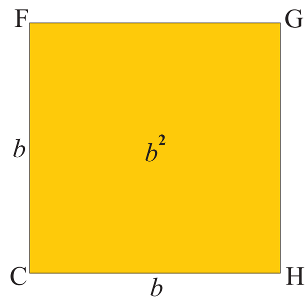

Fig. 2

3. Cut out a rectangle of length a units and breadth b units from a drawing sheet/cardbaord and name it as a rectangle DCFE [see Fig. 3].
4. Cut out another rectangle of length b units and breadth a units from a drawing sheet/cardboard and name it as a rectangle BIHC [see Fig. 4].

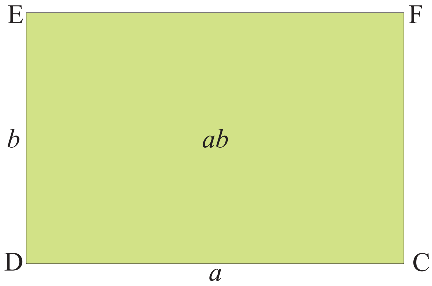

Fig. 3

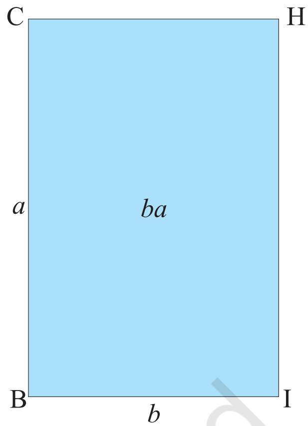

Fig. 4

5. Total area of these four cut-out figures

   = Area of square ABCD + Area of square CHGF + Area of rectangle DCFE + Area of rectangle BIHC

   = $a^2 + b^2 + ab + ba = a^2 + b^2 + 2ab$.

6. Join the four quadrilaterals using cello-tape as shown in Fig. 5.

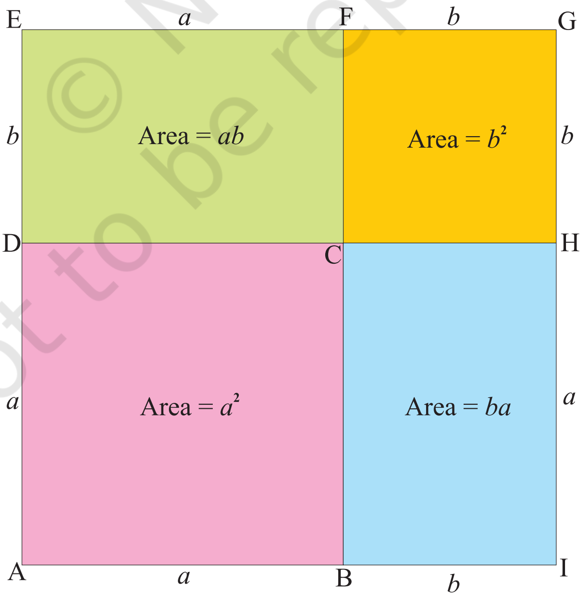

Fig. 5

Clearly, AIGE is a square of side ($a + b$). Therefore, its area is $(a + b)^2$. The combined area of the constituent units = $a^2 + b^2 + ab + ab = a^2 + b^2 + 2ab$.

Hence, the algebraic identity $(a + b)^2 = a^2 + 2ab + b^2$

Here, area is in square units.

OBSERVATION

On actual measurement:

a = ..., b = ... $(a+b)$ = ...,

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

$(a+b)^2$ = ..., $2ab$ = ...

Therefore, $(a+b)^2 = a^2 + 2ab + b^2$.

The identity may be verified by taking different values of a and b.

APPLICATION

The identity may be used for

1. calculating the square of a number expressed as the sum of two convenient numbers.
2. simplifications/factorisation of some algebraic expressions.