Activity 9

Objective

To verify the algebraic identity :

$a^3 + b^3 = (a + b)(a^2 - ab + b^2)$

Material Required

Acrylic sheet, glazed papers, saw, adhesive, cellotape, coloured papers, sketch pen, etc.

Method of Construction

1. Make a cube of side a units and another cube of side b units as shown in Fig. 1 and Fig. 2 by using acrylic sheet and cellotape/adhesive.
2. Make a cuboid of dimensions $a \times a \times b$ [see Fig. 3].
3. Make a cuboid of dimensions $a \times b \times b$ [see Fig. 4].
4. Arrange these cubes and cuboids as shown in Fig. 5.

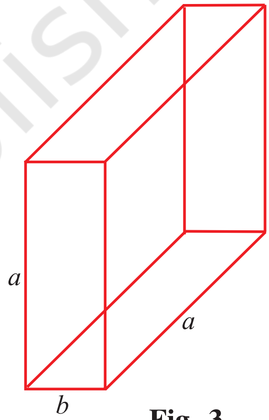

Fig. 3

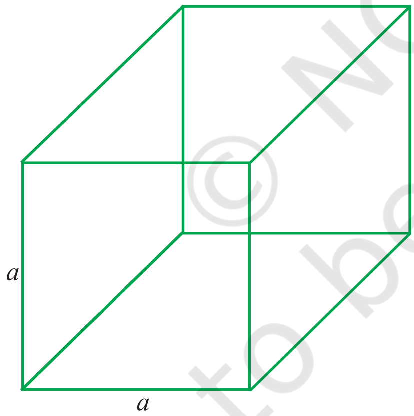

Fig. 1

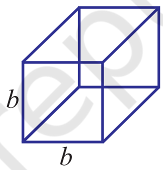

Fig. 2

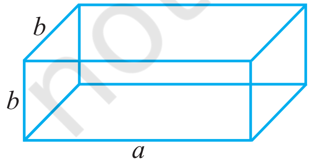

Fig. 4

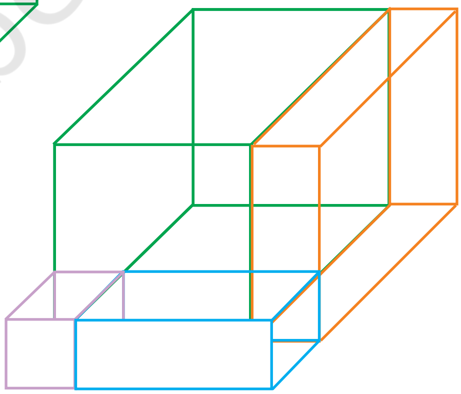

Fig. 5

DEMONSTRATION

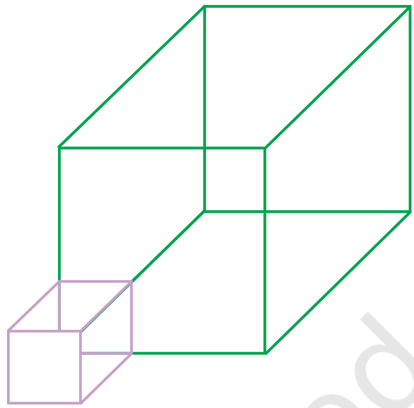

Fig. 6

Volume of cube in Fig. 1 = a^3

Volume of cube in Fig. 2 = b^3

Volume of cuboid in Fig. 3 = a^2b

Volume of cuboid in Fig. 4 = ab^2

Volume of solid in Fig. 5 = $a^3+b^3+a^2b+ab^2$ $= (a+b)(a^2+b^2)$

Removing cuboids of volumes a^2b and ab^2, i.e., $ab\ (a+b)$ from solid obtained in Fig. 5, we get the solid in Fig. 6.

Volume of solid in Fig. 6 = $a^3 + b^3$.

Therefore, $a^3 + b^3 = (a+b)(a^2+b^2) - ab(a+b)$

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

Here, volumes are in cubic units.

OBSERVATION

On actual measurement:

$a =$ ...., $b =$ ....,

So, $a^3 =$ ...., $b^3 =$ ...., $(a+b) =$ ...., $(a+b)a^2 =$ ....,

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

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

Therefore, $a^3 + b^3 = (a+b)(a^2+b^2-ab)$.

APPLICATION

The identity may be used in simplification and factorisation of algebraic expressions.