Activity 7

Objective

To verify the algebraic identity :

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

Material Required

Acrylic sheet, coloured papers, glazed papers, saw, sketch pen, adhesive, Cello-tape.

Method of Construction

1. Make a cube of side a units and one more cube of side b units ($b < a$), using acrylic sheet and cello-tape/adhesive [see Fig. 1 and Fig. 2].
2. Similarly, make three cuboids of dimensions $a \times a \times b$ and three cuboids of dimensions $a \times b \times b$ [see Fig. 3 and Fig. 4].

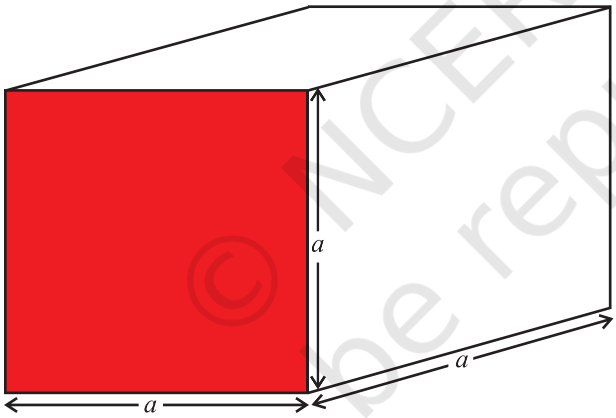

Fig. 1

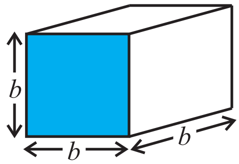

Fig. 2

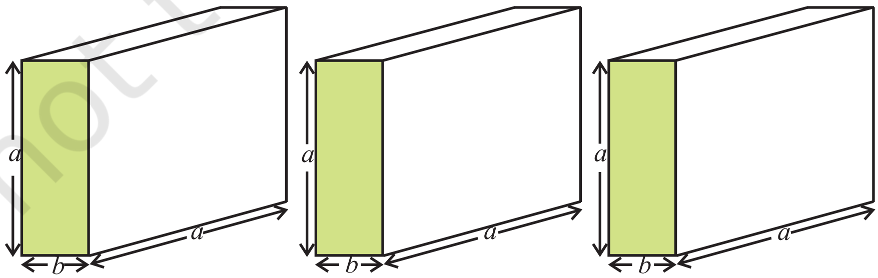

Fig. 3

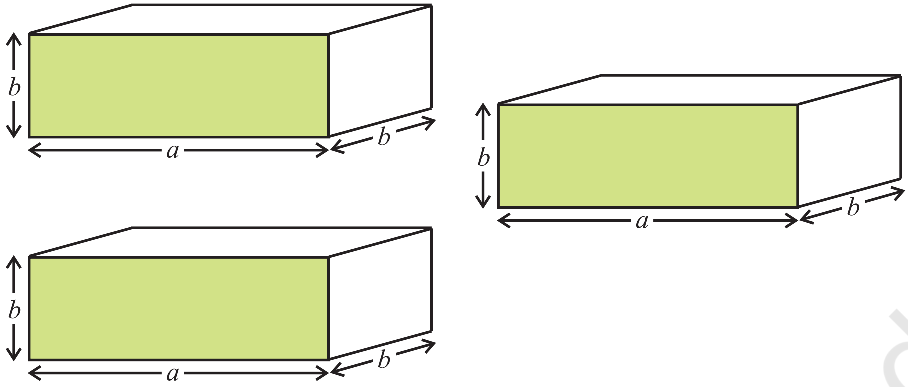

Fig. 4

3. Arrange the cubes and cuboids as shown in Fig. 5.

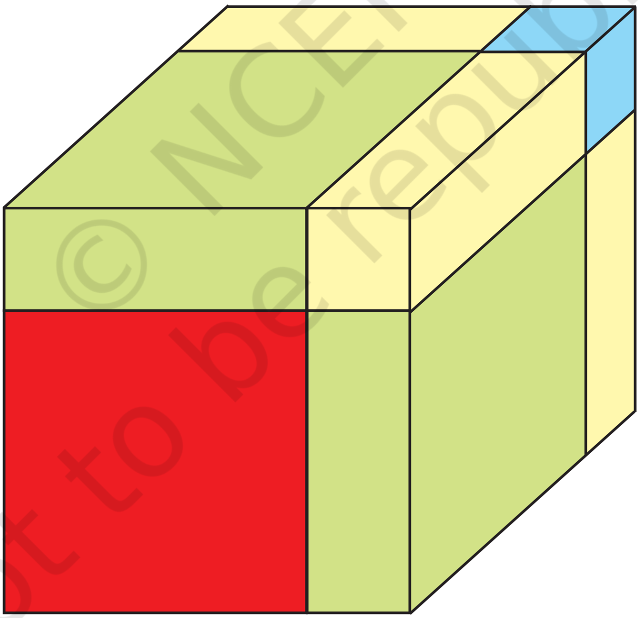

Fig. 5

Demonstration

Volume of the cube of side $a = a \times a \times a = a^3$, volume of the cube of side $b = b^3$

Volume of the cuboid of dimensions $a \times a \times b = a^2b$, volume of three such cuboids $= 3a^2b$

Volume of the cuboid of dimensions $a \times b \times b = ab^2$, volume of three such cuboids $= 3ab^2$

Solid figure obtained in Fig. 5 is a cube of side $(a + b)$

Its volume $= (a + b)^3$

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

Here, volume is in cubic units.

Observation

On actual measurement:

a = ..., b = ..., a^3 = ...,

So, a^3 = ..., b^3 = ..., a^2b = ..., $3a^2b$ = ...,

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

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

Application

The identity may be used for

1. calculating cube of a number expressed as the sum of two convenient numbers
2. simplification and factorisation of algebraic expressions.