

# Activity 10

## OBJECTIVE

To verify the algebraic identity :

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

## MATERIAL REQUIRED

Acrylic sheet, sketch pen, glazed papers, scissors, adhesive, cello-tape, coloured papers, cutter.

## METHOD OF CONSTRUCTION

1. Make a cuboid of dimensions  $(a-b) \times a \times a$  ( $b < a$ ), using acrylic sheet and cello-tape/adhesive as shown in Fig. 1.
2. Make another cuboid of dimensions  $(a-b) \times a \times b$ , using acrylic sheet and cello-tape/adhesive as shown in Fig. 2.
3. Make one more cuboid of dimensions  $(a-b) \times b \times b$  as shown in Fig. 3.
4. Make a cube of dimensions  $b \times b \times b$  using acrylic sheet as shown in Fig. 4.

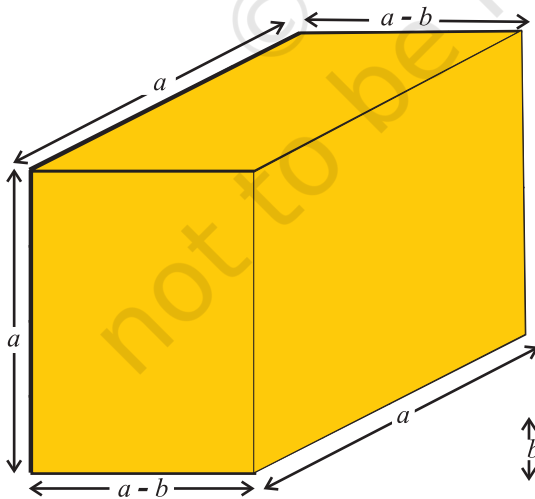


Fig. 1

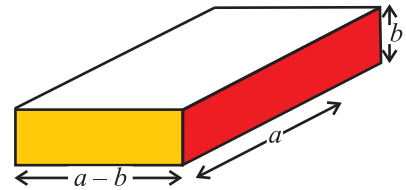


Fig. 2

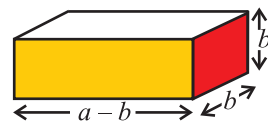


Fig. 3

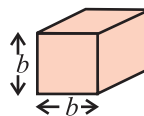


Fig. 4

5. Arrange the cubes and cuboids made above in Steps (1), (2), (3) and (4) to obtain a solid as shown in Fig. 5, which is a cube of volume  $a^3$  cubic units.

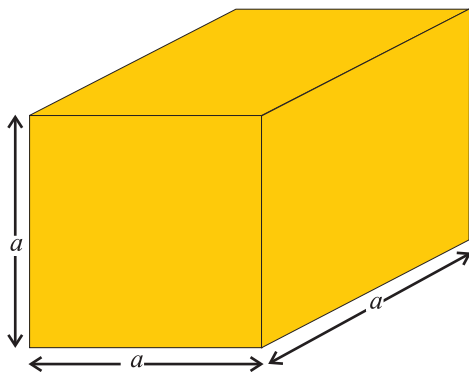


Fig. 5

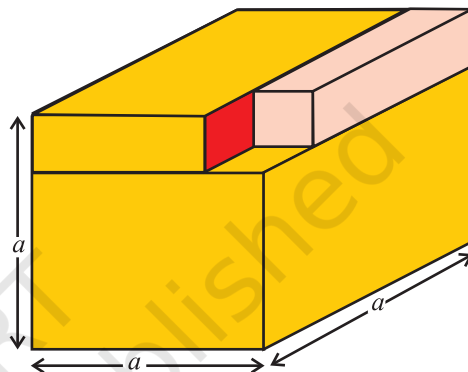


Fig. 6

### DEMONSTRATION

Volume of cuboid in Fig. 1 =  $(a-b) \times a \times a$  cubic units.

Volume of cuboid in Fig. 2 =  $(a-b) \times a \times b$  cubic units.

Volume of cuboid in Fig. 3 =  $(a-b) \times b \times b$  cubic units.

Volume of cube in Fig. 4 =  $b^3$  cubic units.

Volume of solid in Fig. 5 =  $a^3$  cubic units.

Removing a cube of size  $b^3$  cubic units from the solid in Fig. 5, we obtain a solid as shown in Fig. 6.

$$\begin{aligned} \text{Volume of solid in Fig. 6} &= (a-b) a^2 + (a-b) ab + (a-b) b^2 \\ &= (a-b) (a^2 + ab + b^2) \end{aligned}$$

$$\text{Therefore, } a^3 - b^3 = (a - b)(a^2 + ab + b^2)$$

### OBSERVATION

On actual measurement:

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

$$\text{So, } a^3 = \dots\dots\dots, \quad b^3 = \dots\dots\dots, \quad (a-b) = \dots\dots\dots, \quad ab = \dots\dots\dots,$$

$$a^2 = \dots\dots\dots, \quad b^2 = \dots\dots\dots,$$

$$\text{Therefore, } a^3 - b^3 = (a - b) (a^2 + ab + b^2).$$

### APPLICATION

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

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