# **Diagonal of Cuboid and Cube**

#### **Understanding of Diagonal of Cuboid and Cube**

- A diagonal of a cuboid or cube is the straight line connecting two opposite corners passing through the interior.
- In a cuboid, all sides can be of different lengths.
- In a cube, all sides are equal, which makes its diagonal calculation simpler.
- Diagonals are calculated using the Pythagoras Theorem in 3D.



# **Important Points**

- Diagonal of cuboid =  $\sqrt{l^2 + b^2 + h^2}$  where I = length, b = breadth, h = height
- Diagonal of cube =  $\sqrt{3}$  × side
- Units for diagonal are the same as the unit of side (cm, m etc.)
- Use proper square root values for accurate results
- Diagonal gives the longest distance between two corners inside the solid

## **Examples with Solutions**

## **Example: Diagonal of a Cuboid with Simple Numbers**

Find the diagonal of a cuboid with length 3 cm, breadth 4 cm, and height 12 cm.

**Solution:** Diagonal =  $\sqrt{3^2 + 4^2 + 12^2} = \sqrt{9 + 16 + 144} = \sqrt{169} = 13$  cm

## **Example: Diagonal of a Cube**

> Find the diagonal of a cube of side 5 cm.

**Solution:** Diagonal =  $\sqrt{3} \times 5 \approx 1.732 \times 5 \approx 8.66$  cm

# **Example: Diagonal with Fractional Dimensions**

> Find the diagonal of a cuboid with length  $\frac{5}{2}$  m, breadth  $\frac{3}{2}$  m, and height 4/2 m.

Solution: Diagonal = 
$$\sqrt{\left(\frac{5}{2}\right)^2 + \left(\frac{3}{2}\right)^2 + \left(\frac{4}{2}\right)^2} = \sqrt{\frac{25}{4} + \frac{9}{4} + \frac{16}{4}}$$
  
=  $\sqrt{\frac{50}{4}} = \sqrt{12.5} \approx 3.54 m$ 

## **Example: Find Side When Diagonal is Given (Cube)**

> The diagonal of a cube is  $6\sqrt{3}$  cm. Find the side of the cube.

**Solution:** Diagonal =  $\sqrt{3}$  × side

$$6\sqrt{3} = \sqrt{3} \times \text{side}$$

Side = 6 cm

#### **Summary Points**

- Diagonal of cuboid =  $\sqrt{l^2 + b^2 + h^2}$ .
- Diagonal of cube =  $\sqrt{3}$  × side.
- Always express diagonal in same unit as sides.
- Square root calculation must be done carefully.
- Diagonal represents the longest distance inside the solid.