Cube Root of Negative Perfect Cube

Understanding the Concept

- Cube root of a negative perfect cube is a negative number.
- When a negative number is multiplied by itself three times the result is a negative perfect cube.

  Example (–2) × (–2) × (–2) = –8 so $\sqrt[3]{-8}$ = –2
- Cube root of a negative number exists and is unique.
- This property is different from square roots where negative numbers do not have real square roots.

Important Points

- Cube root of a negative number is negative.
- Only one real cube root exists for any negative number.
- Cube root of –a = – (cube root of a)
- Useful when solving problems involving negative volumes or values.
- Negative perfect cubes are –1, –8, –27, –64, –125 etc.

Examples with Solutions

Example Easy Level

➢ **Find $\sqrt[3]{-27}$**

Solution: –3 × –3 × –3 = –27

Thus $\sqrt[3]{}$–27 = –3

Example Easy Level

➢ **Find $\sqrt[3]{-64}$**

Solution: –4 × –4 × –4 = –64

Thus $\sqrt[3]{}$–64 = –4

Example Moderate Level

- **Find $\sqrt[3]{-125}$**

Solution: –5 × –5 × –5 = –125

Thus $\sqrt[3]{-125}$ = –5

Example Moderate Level

- **Find $\sqrt[3]{-1000}$**

Solution: –10 × –10 × –10 = –1000

Thus $\sqrt[3]{-1000}$ = –10

Example Word Problem

- **The volume of a cube is –343 cubic meters Find the side length**

Solution: $\sqrt[3]{-343}$ = –7

Thus side length is –7 meters

Summary Points

- Cube root of a negative perfect cube is a negative number
- Only one real cube root exists for each negative number
- Use the rule $\sqrt[3]{-a} = -\sqrt[3]{a}$
- Examples of negative perfect cubes are –1, –8, –27, –64, –125.
- Useful in real–world cases like decrease in volume or values