

**CHAPTER 07****Cubes and Cube Roots****Perfect Cube:**

The cube of a natural number is called a perfect cube or a cube number.

**Example:**

$$1 \times 1 \times 1 = 1; 2 \times 2 \times 2 = 8, 3 \times 3 \times 3 = 27 \text{ and } 4 \times 4 \times 4 = 64$$

We can write the cubes in exponential form as,

$$1 = 1^3$$

$$8 = 2^3$$

$$27 = 3^3$$

$$64 = 4^3$$

Therefore, 1, 8, 27 and 64 are perfect cubes of the numbers 1, 2, 3 and 4 respectively.

**In order to check if a number is a perfect cube:**

**Step (I):** First express the number as a product of its prime factors.

**Step (II):** Then, group them together in triplets.

**Step (III):** If no factor is left out, the number is a perfect cube.

**Example (1):**

Is 64 a perfect cube?

**Step (I):**  $64 = 2 \times 2 \times 2 \times 2 \times 2 \times 2$  (Prime factorization)

**Step (II):**  $64 = (2 \times 2 \times 2) \times (2 \times 2 \times 2)$  (Grouping together triplets)

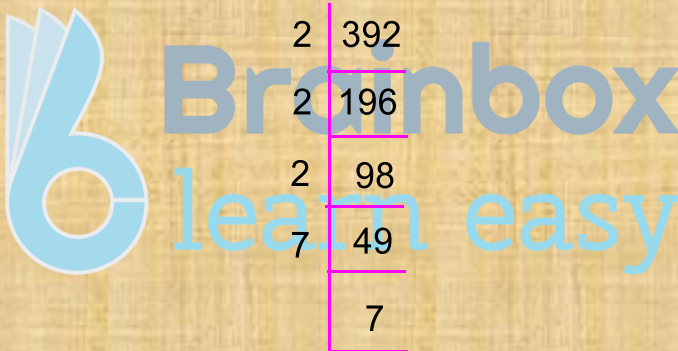
**Step (III):** So, 64 is a perfect cube as none its prime factors is left out

## Prime factorization

$$\begin{array}{r|l}
 2 & 64 \\
 \hline
 2 & 32 \\
 \hline
 2 & 16 \\
 \hline
 2 & 8 \\
 \hline
 2 & 4 \\
 \hline
 2 & 2 \\
 \hline
 & 1
 \end{array}$$

### Example (2):

Is 392 a perfect cube?



$$\begin{array}{r|l}
 2 & 392 \\
 \hline
 2 & 196 \\
 \hline
 2 & 98 \\
 \hline
 7 & 49 \\
 \hline
 & 7
 \end{array}$$

**Step (I):**  $392 = 2 \times 2 \times 2 \times 7 \times 7$  (Prime factorization)

**Step (II):**  $392 = (2 \times 2 \times 2) \times 7 \times 7$  (Grouping together triplets)

**Step (III):** The factor 7 do not form triple, so 392 is not perfect cube.