

## Introduction to cubes and cube roots

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### What is Cube?



The cube of a number  $n$  is its third power — the result of the number multiplied by

itself three times.

If  $n$  is a number, then the cube of  $n$  is  $n^3$

$$n^3 = n \times n \times n.$$

Example:  $5^3 = 5 \times 5 \times 5 = 125$

$12^3 = 12 \times 12 \times 12 = 1728$

### Perfect Cube

A natural number is said to be a perfect cube if it is the cube of some natural number.

A natural number  $n$  is a perfect cube if there exists a natural number  $m$  whose cube is  $n$  i.e.  $n = m^3$

Example: 8 is a perfect cube, because there is natural number 2 such that  $8 = 2 \times 2 \times 2 = 2^3$ . But, 12 is not a perfect cube, because there is no natural number whose cube is 12.

**Steps to check whether a given natural number is a perfect cube or not –**

$$64 = 4^3$$

$$125 = 5^3$$

Step I – Obtain a natural number.

**Step II** – Express the given natural number as a product of prime factors.

**Step III** – Group the factors in triplets in such a way that all the three factors in each triplet are equal.

**Step IV** – If no factor is left over in grouping in step III, and then the number is a perfect cube, otherwise not.

To find the natural number whose cube is the given number, take one factor from each triplet and multiply them. The cube of the number so obtained will be the given number.

**Example: Is 256 a perfect cube?**

Resolving 256 into prime factors, we have

$$256 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$$

Grouping the factors in triplets of equal factors, we get

$$256 = \{2 \times 2 \times 2\} \times \{2 \times 2 \times 2\} \times 2 \times 2$$

Clearly, in grouping the factors in triplets of equal factors, we are left with two factors  $2 \times 2$ .

Therefore, 256 is not a perfect cube.

### Cube Root



The inverse operation of finding a number whose cube is  $n$  is called extracting the [cube root](#) of  $n$ . It determines the side of the cube of a given volume.

A cube root of a number, denoted  $\sqrt[3]{x}$  or  $x^{1/3}$ , is a number such that  $a^3 = x$ . All real numbers have exactly one real cube root.

**Example: What is the real cube root of 8?**

The real cube root of 8 is 2 because  $2^3 = 8$ .

**Try these problems now:**

1. Is 216 a perfect cube? If yes, then what is that number whose cube is 216?  
(Answer: Yes, cube of 6)

2. What is the real cube root of 64?  
(Answer: 4)

Now try it yourself! Should you still need any help, [click here](#) to schedule live online session with e Tutor!

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**Reference Links :**

- <http://en.wikipedia.org/wiki/Cube>
- [http://en.wikipedia.org/wiki/Natural\\_number](http://en.wikipedia.org/wiki/Natural_number)
- [http://en.wikipedia.org/wiki/Prime\\_factor](http://en.wikipedia.org/wiki/Prime_factor)
- [http://en.wikipedia.org/wiki/Cube\\_root](http://en.wikipedia.org/wiki/Cube_root)

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