

Square Root

Squares		
$1^2 = 1 \times 1 = 1$	$5^2 = 5 \times 5 = 25$	$9^2 = 9 \times 9 = 81$
$2^2 = 2 \times 2 = 4$	$6^2 = 6 \times 6 = 36$	$10^2 = 10 \times 10 = 100$
$3^2 = 3 \times 3 = 9$	$7^2 = 7 \times 7 = 49$	$11^2 = 11 \times 11 = 121$
$4^2 = 4 \times 4 = 16$	$8^2 = 8 \times 8 = 64$	$12^2 = 12 \times 12 = 144$

Square Roots		
$\sqrt{1} = \pm 1$	$\sqrt{25} = \pm 5$	$\sqrt{81} = \pm 9$
$\sqrt{4} = \pm 2$	$\sqrt{36} = \pm 6$	$\sqrt{100} = \pm 10$
$\sqrt{9} = \pm 3$	$\sqrt{49} = \pm 7$	$\sqrt{121} = \pm 11$
$\sqrt{16} = \pm 4$	$\sqrt{64} = \pm 8$	$\sqrt{144} = \pm 12$

The process by which we can make opposite of square is called finding the square root. It is the opposite of squaring. It is a number that when multiplied by itself an indicated number of times forms a product equal to a specified number.

For example:

- The square root of 9 is 3 (because $3^2 = 3 \times 3 = 9$)
- The square root of 16 is 4 (because $4^2 = 4 \times 4 = 16$)
- The square root of 36 is 6 (because $6^2 = 6 \times 6 = 36$)
- The square root of 81 is 9 (because $9^2 = 9 \times 9 = 81$)
- The square root of 100 is 10 (because $10^2 = 10 \times 10 = 100$)

$\sqrt{}$ represent the square root.

$\sqrt{25}$ means the square root of 25

$\sqrt{64}$ means square root of 64

A natural number are the perfect square root. Some of the natural numbers are 1, 4, 9, 16, etc.

For example: 1, 4, 9, 16, 25, 36, 49, 64, 81, 100 etc. are perfect squares.

A square root of a number can be done by two methods which make easy in the process of factorization. The two methods are:

1. Prime factorization method
2. Division method

Prime factorization method make easy in finding out the square root in the natural number.

- The number should be the factor of the prime number or should be expressed as the factor of a prime number.
- Make pairs of the factor and each pair should be equal.
- Take one factor from each pair.
- The product of the taken factor is the square root of the given number.

It can be shown by the numerical examples:

1. Find the square root of 36.

Solution:

$$\begin{aligned} &\sqrt{36} \\ &= \sqrt{6 \times 6} \\ &= 6 \end{aligned}$$

2. Find the square root of 2025.

Solution:

$$\begin{aligned} &\sqrt{2025} \\ &= \sqrt{9 \times 9 \times 5 \times 5} \\ &= 9 \times 5 \\ &= 45 \end{aligned}$$

5	2025
5	405
9	81
	9

Square root by the division method

1	15876	126
	1	
22	58	
	44	
126	1476	
	1476	
	0	

Division method is a faster way to find out the square root of a number. It is less time consuming then the factorization method. For example, the number 512490 is grouped into three pairs of 51, 24, 90. If the number of digits in the number is odd then the first group will have one digit and rest will have two digits. For example, the number 18021 is grouped into three groups of 1, 80, 21. Cube Root.

In this method, we make the pair of digit whose square root has to be found. While pairing the digit we do it from the right side. So that if the number of digits is even then all group will have 2 digits and if a number of digits are odd then the first group has one and other will have two digits. For example, the number 512490 is grouped into three pairs of 51, 24, 90. If the number of digits in the number is odd then the first group will have one digit and rest will have two digits. For example, the number 18021 is grouped into three groups of 1, 80, 21. Cube Root.

Examples

1. Find the square root of 441

Solution:

$$\sqrt{441}$$
$$= \sqrt{3 \times 3 \times 7 \times 7}$$
$$= 3 \times 7$$
$$= 21$$

2. Simplify: $\sqrt{4^2 \times 2^2}$

Solution:

$$\sqrt{4^2 \times 2^2}$$
$$= 4 \times 2$$
$$= 8$$

Cube Root

To find cube root, make triple of equal factors. The opposite of cubing a number is called finding the cube root. A cube root is a number, that is multiplied by itself three times in order to create a cubic value. A cube root of a number x is a number, such that a³= x. All real numbers (except zero) have exactly one real cube root.

Cube of 6 = 6³ =216

Cube root of 216 = 6

Examples

- The cube root of 64 is 4 (because 4x4x4=64)
- The cube root of 125 is 5 (because 5x5x5=125)
- The cube root of 512 is 8 (because 8x8x8=512)

The symbol, $\sqrt[3]{}$, means cube root, so $\sqrt[3]{27}$ means "cube root of 27" and $\sqrt[3]{64}$ means "Cube root of 64"

Thus $\sqrt[3]{27} = \sqrt[3]{3^3} = 3$ and $\sqrt[3]{64} = \sqrt[3]{4^3} = 4$

A natural number is known as a perfect cube or a cube number.

Cube root of a perfect cube can be found by factorization method.

- The number should be the factor of the prime number or should be expressed as the factor of the prime number.
- Make triples of the factor and each triple should be equal.
- Take one factor from each triple.
- The product is the cube root of the given number.

Examples

2

2

2

2

2

2

19

19

19

438976

219488

109744

54872

27436

13718

6859

361

19

1

$438976 = 2^3 \times 2^3 \times 19^3$

$\therefore \sqrt[3]{438976} = 2 \times 2 \times 19$

$= 76$

Example for cube root division

1. Find the cube root of 2x2x2x3x3x3
= 2 x 3
= 6

2. Find the cube root of 729.
Solution:
 $\sqrt[3]{729}$
 $= \sqrt[3]{3 \times 3 \times 3 \times 3 \times 3 \times 3}$
 $= \sqrt[3]{3^3 \times 3^3}$
 $= 3 \times 3$
 $= 9$