English Spanish

6.3b Real Numbers

Check It Out Lesson Tutorials BigIdeasMath.com

A **cube root** of a number is a number that when multiplied by itself, and then multiplied by itself again, equals the given number. A **perfect cube** is a number that can be written as the cube of an integer.

EXAMPLE 1 Finding Cube Roots

Find the cube root of each number.

a. 8

$2 \cdot 2 \cdot 2 = 8$

∴ So, the cube root of 8 is 2.

b. −27

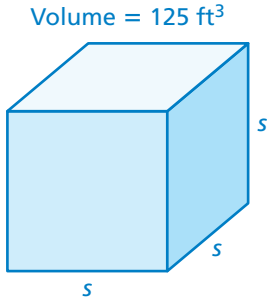
$-3 \cdot (-3) \cdot (-3) = -27$

∴ So, the cube root of −27 is −3.

The symbol $\sqrt[3]{\ }$ is used to represent a cube root. Cubing a number and finding a cube root are inverse operations. Use this relationship to solve equations involving cubes.

EXAMPLE 2 Solving an Equation

Find the surface area of the cube.



Use the formula for the volume of a cube to find the side length s.

$V = s^3$	Write formula for volume.
$125 = s^3$	Substitute 125 for V.
$\sqrt[3]{125} = \sqrt[3]{s^3}$	Take the cube root of each side.
$5 = s$	Simplify.

Remember

The volume V of a cube with side length s is given by $V = s^3$. The surface area S is given by $S = 6s^2$.

The side length is 5 feet. Use a formula to find the surface area of the cube.

$S = 6s^2$	Write formula for surface area.
$= 6(5)^2$	Substitute 5 for s.
$= 150$	Simplify.

∴ The surface area of the cube is 150 square feet.

Practice

Find the cube root of the number.

1. 1 **2.** 64 **3.** −125 **4.** 0

5. 216 **6.** −343 **7.** $\frac{1}{1000}$ **8.** −0.008

9. GEOMETRY The volume of a cube is 512 cubic centimeters. Find the surface area of the cube.

English Spanish

In Lesson 6.3, you estimated square roots to the nearest integer. You can continue that process to obtain better approximations of square roots.

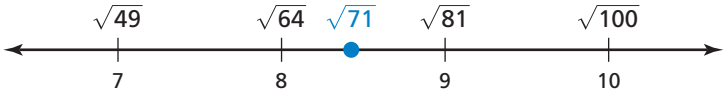
EXAMPLE 3 Estimating a Square Root

Estimate $\sqrt{71}$ to the nearest tenth.

Step 1: Make a table of numbers whose squares are close to the radicand, 71.

Number	7	8	9	10
Square of Number	49	64	81	100

The table shows that 71 is not a perfect square. It is between the perfect squares 64 and 81.

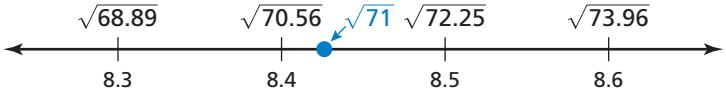


So, $\sqrt{71}$ is between 8 and 9.

Step 2: Make a table of numbers between 8 and 9 whose squares are close to 71.

Number	8.3	8.4	8.5	8.6
Square of Number	68.89	70.56	72.25	73.96

Because 71 is closer to 70.56 than to 72.25, $\sqrt{71}$ is closer to 8.4 than to 8.5.



∴ So, $\sqrt{71} \approx 8.4$.

Study Tip

Use a calculator with a square root key to check your estimations.

Practice

Estimate the square root to the nearest tenth.

10. $\sqrt{5}$ **11.** $-\sqrt{13}$ **12.** $-\sqrt{24}$ **13.** $\sqrt{110}$

14. WRITING Explain how to continue the method in Example 3 to estimate $\sqrt{71}$ to the nearest hundredth.

15. REASONING Describe a method that you can use to estimate a cube root to the nearest tenth. Use your method to estimate $\sqrt[3]{14}$ to the nearest tenth.

Copy and complete the statement using < or >.

16. $\sqrt{39}$ ☐ $-\sqrt{87}$ **17.** $\sqrt{6}$ ☐ $\sqrt{20}$

18. π ☐ $\sqrt{11}$ **19.** $-\sqrt{21}$ ☐ $\sqrt[3]{-81}$