Cube Roots

Let’s compare cube roots.

15.1 Math Talk: Cubed

Decide mentally whether each statement is true.

- $\left(\sqrt[3]{5}\right)^3 = 5$
- $\left(\sqrt[3]{27}\right)^3 = 3$
- $7 = \left(\sqrt[3]{7}\right)^3$
- $\left(\sqrt[3]{64}\right) = 2^3$

15.2 Cube Root Values

The value of a cube root of a number lies between two integers. Which are those consecutive whole numbers for the following? Be prepared to explain your reasoning.

1. $\sqrt[3]{5}$

2. $\sqrt[3]{23}$

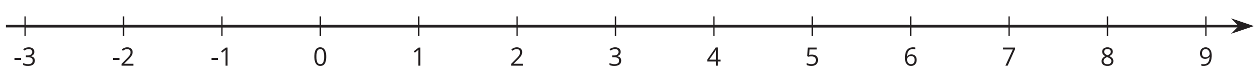
3. $\sqrt[3]{81}$

4. $\sqrt[3]{999}$

15.3 Solutions on a Number Line

The numbers x, y, and z are positive, and:

$x^3 = 5$ $\qquad$ $y^3 = 27$ $\qquad$ $z^3 = 700$



1. Plot x, y, and z on the number line. Be prepared to share your reasoning with the class.
2. Plot $-\sqrt[3]{2}$ on the number line.

Are you ready for more?

Diego knows that $8^2 = 64$ and that $4^3 = 64$. He says that this means the following are all true:

- $\sqrt{64} = 8$
- $\sqrt[3]{64} = 4$
- $\sqrt{-64} = -8$
- $\sqrt[3]{-64} = -4$

Is he correct? Explain how you know.

Lesson 15 Summary

Like square roots, most cube roots of whole numbers are irrational. The only time the cube root of a number is a rational number is when the number we are taking the cube root of is a perfect cube. For example, 8 is a perfect cube, and $\sqrt[3]{8} = 2$.

We can approximate the values of the cube root of a number by observing the integers around it and remembering the relationship between cubes and cube roots. For example, $\sqrt[3]{20}$ is between 2 and 3 since $2^3 = 8$ and $3^3 = 27$, and 20 is between 8 and 27. Similarly, since 100 is between 4^3 and 5^3, we know $\sqrt[3]{100}$ is between 4 and 5.

Many calculators have a cube root function which can be used to approximate the value of a cube root more precisely. Using our numbers from before, a calculator will show that $\sqrt[3]{20} \approx 2.7144$ and that $\sqrt[3]{100} \approx 4.6416$.

