## Lesson 13: Cube Roots

Let’s compare cube roots.

### 13.1: True or False: Cubed

Decide if each statement is true or false.

$\left(\sqrt[3]{5}\right)^{3}=5$

$\left(\sqrt[3]{27}\right)^{3}=3$

$7=\left(\sqrt[3]{7}\right)^{3}$

$\left(\sqrt[3]{10}\right)^{3}=1,​000$

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

### 13.2: Cube Root Values

What two whole numbers does each cube root lie between? Be prepared to explain your reasoning.

1. $\sqrt[3]{5}$
2. $\sqrt[3]{23}$
3. $\sqrt[3]{81}$
4. $\sqrt[3]{999}$

### 13.3: Solutions on a Number Line

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

$x^{3}=5$

$y^{3}=27$

$z^{3}=700$



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 13 Summary

Remember that square roots of whole numbers are defined as side lengths of squares. For example, $\sqrt{17}$ is the side length of a square whose area is 17. We define cube roots similarly, but using cubes instead of squares. The number $\sqrt[3]{17}$, pronounced “the cube root of 17,” is the edge length of a cube which has a volume of 17.

We can approximate the values of cube roots by observing the whole numbers around it and remembering the relationship between cube roots and cubes. 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 $\sqrt[3]{20}≈2.7144$ and that $\sqrt[3]{100}≈4.6416$.

Also like square roots, most cube roots of whole numbers are irrational. The only time the cube root of a number is a whole number is when the original number is a perfect cube.



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