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Unit 8, 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. $\sqrt[3]{81}$

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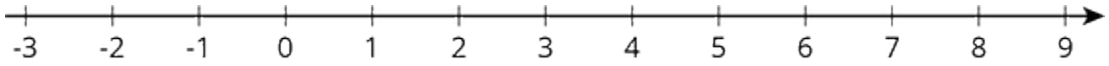
4. $\sqrt[3]{999}$

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.

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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 $\sqrt[3]{20} \approx 2.7144$ and that $\sqrt[3]{100} \approx 4.6416$.

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.