



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

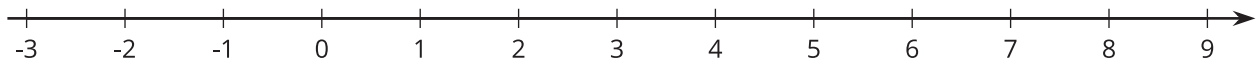
## 15.3 Solutions on a Number Line

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

$$x^3 = 5$$

$$y^3 = 27$$

$$z^3 = 700$$



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 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  $\sqrt[3]{100} \approx 4.6416$ .