## Lesson 12: Edge Lengths and Volumes

Let’s explore the relationship between volume and edge lengths of cubes.

### 12.1: Ordering Squares and Cubes

Let $a$, $b$, $c$, $d$, $e$, and $f$ be positive numbers.

Given these equations, arrange $a$, $b$, $c$, $d$, $e$, and $f$ from least to greatest. Explain your reasoning.

* $a^{2}=9$
* $b^{3}=8$
* $c^{2}=10$
* $d^{3}=9$
* $e^{2}=8$
* $f^{3}=7$

### 12.2: Name That Edge Length!

Fill in the missing values using the information provided:



| sides | volume | volume equation |
| --- | --- | --- |
|   | $27 in^{3}$ |   |
| $\sqrt[3]{5}$ |   |   |
|   |   | $\left(\sqrt[3]{16}\right)^{3}=16$ |

#### Are you ready for more?

A cube has a volume of 8 cubic centimeters. A square has the same value for its area as the value for the surface area of the cube. How long is each side of the square?

### 12.3: Card Sort: Rooted in the Number Line

Your teacher will give your group a set of cards. For each card with a letter and value, find the two other cards that match. One shows the location on a number line where the value exists, and the other shows an equation that the value satisfies. Be prepared to explain your reasoning.

### Lesson 12 Summary

To review, the side length of the square is the square root of its area. In this diagram, the square has an area of 16 units and a side length of 4 units.

These equations are both true: $4^{2}=16$ $\sqrt{16}=4$



Now think about a solid cube. The cube has a volume, and the edge length of the cube is called the **cube root** of its volume. In this diagram, the cube has a volume of 64 units and an edge length of 4 units:

These equations are both true:

$4^{3}=64$

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



$\sqrt[3]{64}$ is pronounced “The cube root of 64.” Here are some other values of cube roots:

$\sqrt[3]{8}=2$, because $2^{3}=8$

$\sqrt[3]{27}=3$, because $3^{3}=27$

$\sqrt[3]{125}=5$, because $5^{3}=125$



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