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Unit 8, Lesson 12: Edge Lengths and Volumes

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

12.1: Ordering Squares and Cubes

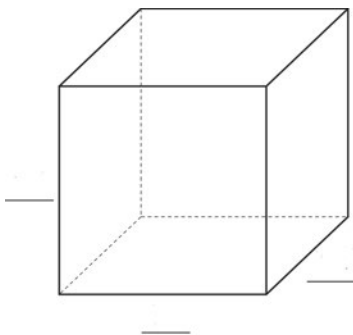
Let $a, b, c, d, e,$ and f be positive numbers.

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	
$\sqrt[3]{5}$		
		$(\sqrt[3]{16})^3 = 16$

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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.

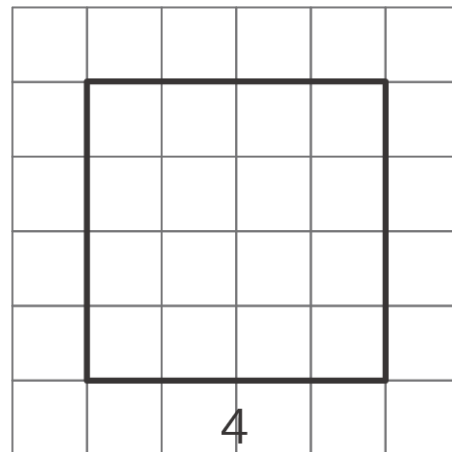
Lesson 12 Summary

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:

$$4^2 = 16$$

$$\sqrt{16} = 4$$

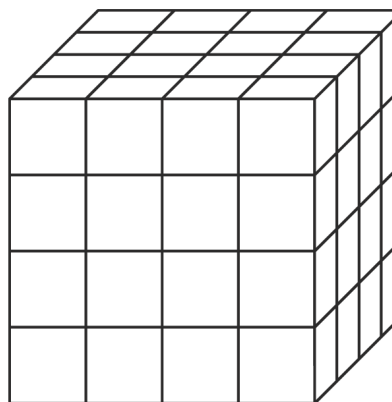


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Now think about a solid cube. The cube has a volume, and the edge length of the cube is called the **cube root** of its volume. In this diagram, the cube has a volume of 64 units and an edge length of 4 units:



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:

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

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

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

Lesson 12 Glossary Terms

- cube root

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Unit 8, Lesson 12: Edge Lengths and Volumes

1. a. What is the volume of a cube with a side length of
i. 4 centimeters?

ii. $\sqrt[3]{11}$ feet?

iii. s units?

- b. What is the side length of a cube with a volume of
i. 1,000 cubic centimeters?

ii. 23 cubic inches?

iii. v cubic units?

2. Write an equivalent expression that doesn't use a cube root symbol.

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

b. $\sqrt[3]{216}$

c. $\sqrt[3]{8000}$

d. $\sqrt[3]{\frac{1}{64}}$

e. $\sqrt[3]{\frac{27}{125}}$

f. $\sqrt[3]{0.027}$

g. $\sqrt[3]{0.000125}$

3. Find the distance between each pair of points. If you get stuck, try plotting the points on graph paper.

a. $X = (5, 0)$ and $Y = (-4, 0)$

b. $K = (-21, -29)$ and $L = (0, 0)$

(from Unit 8, Lesson 11)

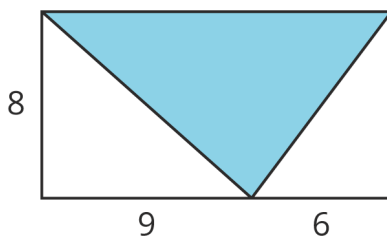
4. Here is a 15-by-8 rectangle divided into triangles. Is the shaded triangle a right triangle? Explain or

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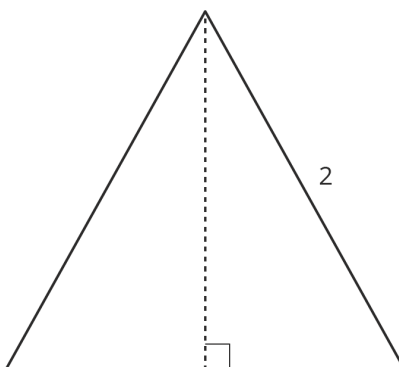
show your reasoning.



(from Unit 8, Lesson 9)

5. Here is an equilateral triangle. The length of each side is 2 units. A height is drawn. In an equilateral triangle, the height divides the opposite side into two pieces of equal length.

- Find the exact height.
- Find the area of the equilateral triangle.
- (Challenge) Using x for the length of each side in an equilateral triangle, express its area in terms of x .



(from Unit 8, Lesson 10)