Lesson 1 - Square Roots and Cube Roots

Algebra and Number

1. Determining the square root of a perfect square and explaining the process
2. Determining the cube root of a perfect cube and explaining the process
3. Solving problems involving square roots or cube roots

Feb 22-7:07 PM

Lesson 4.1 Square Roots and Cube Roots

Key Terms- With your partner, determine the meaning of the following

Power-

Base-

Exponent-

power

6 ← exponent

↑ base

Product-

answer when multiplying

Quotient-

answer when dividing

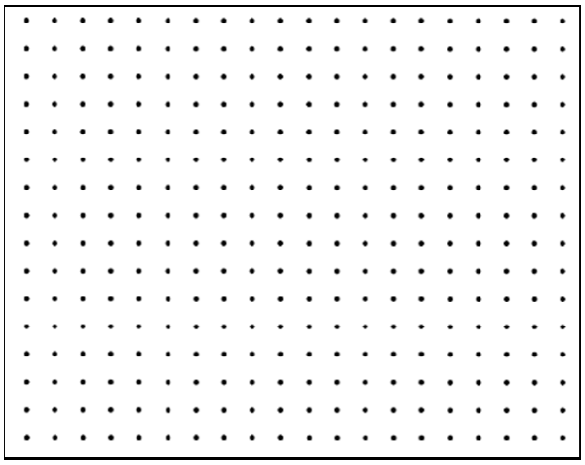
Oct 2-2:54 PM

Investigating Square Roots and Cube Roots

Determine the area of each square shown. Record the information in a table.

Side Length	Area in Exponential Form	Area
1	1^2	1
2	2^2	4
3	3^2	9
4	4^2	16
5	5^2	25
6	6^2	36

Extend the pattern for squares with dimensions of 4, 5 and 6 units.



What is the relationship between the side length of a square and the area of the square?

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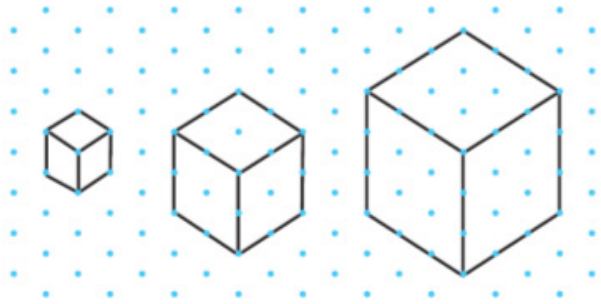
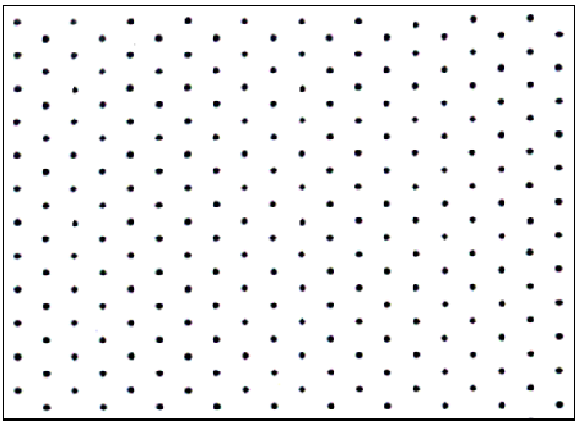
Determine the volume of each cube shown. Record the information in a table



Edge Length	Volume in Exponential Form	Volume
1	1^3	1
2	2^3	8
3	3^3	27
4	4^3	64
5	5^3	125
6	6^3	216

Extend the pattern with cubes with 4, 5 or 6 units.



What is the relationship between the edge length of a cube and the volume of a cube?

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Link the Ideas *(Erase to Reveal)*

Perfect square and Square root are related to each other. The number 25 is a perfect square. It is formed by multiplying two factors of 5 together.

$(5)(5)$ or $5^2 = 25$ The symbol for square root is $\sqrt{\ }$.

The square root of 25 is 5, or $\sqrt{25}$

Perfect cube and cube root are related to each other. The number 27 is a perfect cube. It is formed by multiplying three factors of 3 together.

$(3)(3)(3)$ or $3^3 = 27$ The symbol for cube root is $\sqrt[3]{\ }$.

The cube root of 27 is 3, or $\sqrt[3]{27}$

Some numbers are both perfect squares and perfect cubes.

$64 = (8)(8)$ and $64 = (4)(4)(4)$

$= 8^2$ $= 4^3$

Therefore, 64 is a perfect square and a perfect cube.

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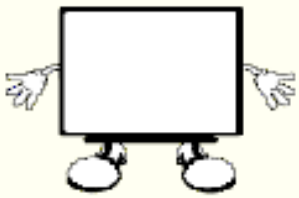
Chapter 4

Square Roots and Cube Roots

Drag the numbers into the appropriate vortex.



Jun 4-11:59 AM

Example 1 Identify Perfect Squares and Perfect Cubes

State whether each of the following numbers is a perfect square, a perfect cube, both, or neither.

a) 121 *(Diagram)* **b)** 729 *(Prime Factorization)* **c)** 356 *(Calculator)*

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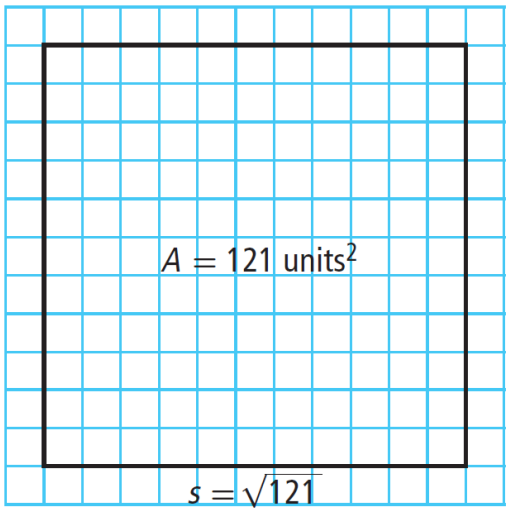
Example 1 Identify Perfect Squares and Perfect Cubes

State whether each of the following numbers is a perfect square, a perfect cube, both, or neither.

a) 121 **b)** 729 **c)** 356

Solution

a) To decide whether 121 is a perfect square you might use a diagram.



$10^2 = 100$ Too low
$12^2 = 144$ Too high
$11^2 = 121$ Correct!

ME

A square with side lengths of 11 units has an area of 121 units^2.

$(11)(11) = 121$.

Therefore, 121 is a perfect square.

To decide whether 121 is a perfect cube, you could use guess and check.

No whole number cubed results in a product of 121.

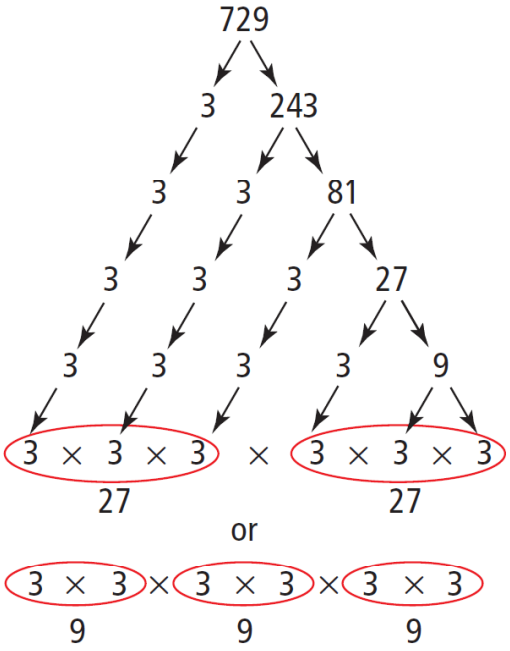
$4^3 = 64$ Too low
$5^3 = 125$ Too high

ME

Therefore, 121 is not a perfect cube.

b) For 729, you might use **prime factorization**. Prime factorization involves writing a number as the product of its prime factors. A factor tree helps organize the prime factors.

Record the prime factorization for 729. Then, identify the factors that can be squared or cubed to form the product 729.



These two groups indicate the square root of 729.

These three groups indicate the cube root of 729.

You can write 729 as the product of $(27)(27) = 27^2$. Therefore, 729 is a perfect square.

You can write 729 as the product of $(9)(9)(9) = 9^3$. Therefore, 729 is a perfect cube.

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c) For 356, you might use a calculator.

C 356 $\sqrt{x}$ 18.867962

C 356 2nd $\sqrt[x]{y}$ 3 = 7.08734

Since the square root is not a whole number, 356 is not a perfect square.
Since the cube root is not an integer, 356 is not a perfect cube.
The number 356 is neither a perfect square nor a perfect cube.

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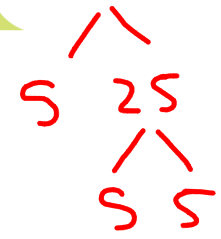
Your Turn

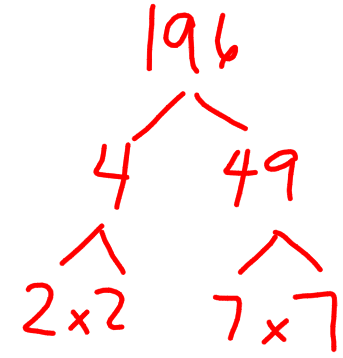
State whether each number is a perfect square, a perfect cube, both, or neither. Use a variety of methods.

a) 125 *(Diagram)* **b)** 196 *(Prime Factorization)* **c)** 4096 *(Calculator)*



5^3

perfect cube



$2 \times 7 = 14$

14^2

Perfect square

$\sqrt{4096} = 64$

$\sqrt[3]{4096} = 16$

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Example 2 Solve Problems Involving Square Roots and Cube Roots

The uranium that Saskatchewan produces in a year has a volume of about 512 m^3. If this volume were made into a single cube, what would be the dimensions of the cube?

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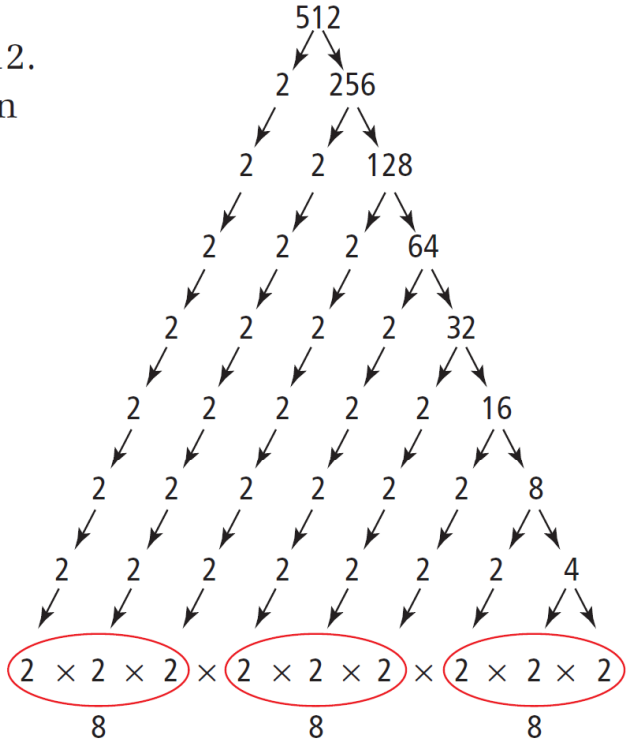
Example 2 Solve Problems Involving Square Roots and Cube Roots

The uranium that Saskatchewan produces in a year has a volume of about 512 m^3. If this volume were made into a single cube, what would be the dimensions of the cube?

Method 1: Use Prime Factorization

Determine the cube root of 512. Record the prime factorization for 512. Then, identify the factors that can be cubed to form 512.



Since there are three equal groups, you know that 512 is a perfect cube.

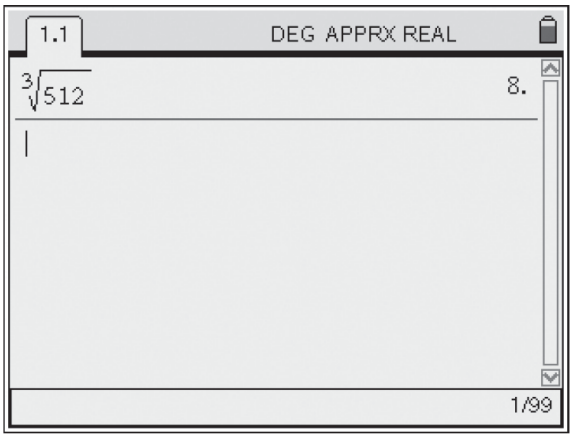
How do you know that 512 is not a perfect square?

The cube root of 512 is 8.
The cube would be 8 m in length, height, and width.

Method 2: Use a Calculator

C 512 2nd $\sqrt[x]{y}$ 3 = 8.

The cube would be 8 m in length, height, and width.



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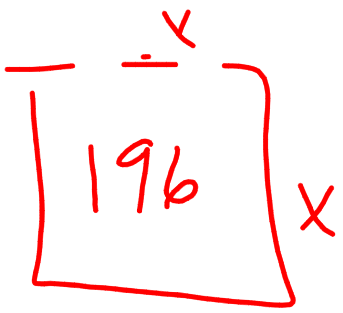
Your Turn

a) A floor mat for gymnastics is a square with an area of 196 m^2. What is its side length?

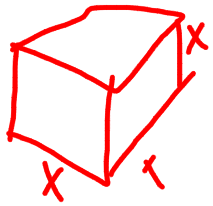


$x^2 = 196$

$\sqrt{x^2} = \sqrt{196}$

$x = 14$

b) The volume of a cubic box is 27 000 $in.^3$ Use two methods to determine its dimensions.



$x^3 = 27000$

$\sqrt[3]{x^3} = \sqrt[3]{27000}$

$x = 30$

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End of Lesson

Assignment: Page 158 #1-12, 14, 16, 17, 20
Challenge: Page 158 #18,19

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