8^{th} Grade Math; Unit 2 Lesson 1 Part 2 EE.2
Key Standards addressed in this Lesson: CC8.EE.2
Time allotted for this Lesson: 3 days

Key Concepts in Standards:

MCC8.EE.2 Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

Evidence of Learning:

By the conclusion of this unit, students should be able to demonstrate the following competencies:

- find square roots and cube roots of perfect squares and perfect cubes;

Essential Question(s):

- Why is it useful for me to know the square root of a number?

Vocabulary: (Tier)

- **Cube Root:** If the cube root of a number b is a (i.e., $\sqrt[3]{b} = a$), then $a^3 = b$.
- **Perfect Square:** A number that has a rational number as its square root.
- **Exponent:** The number of times a base is used as a factor of repeated multiplication.
- **Radical:** A symbol $\sqrt{\ }$ that is used to indicate square roots.
- **Square Root:** One of two equal factors of a nonnegative number. For example, 5 is a square root of 25 because 5 • 5 = 25. Another square root of 25 is -5 because (-5) • (-5) = 25. The +5 is called the principle square root of 25 and is always assumed when the radical symbol is used.

Concepts/Skills to Maintain:

- computation with whole numbers and decimals, including application of order of operations

Opening: Task

- Number line Opener - attached

Work Session:

- Use this slide show on Square Roots and Irrational Numbers by Ms. Dewey Hoffman to teach square roots, cube roots, and irrational numbers and their relationships. http://www.slideshare.net/Ms.DH/111-square-root-irrational

- **Or** open the file that says Square Root Graphic Organizer and use this GO (won't attach right, sorry!)

- Teaching example attached – optional

<u>Other Possible Mathematics Resources:</u>
Correlated activities in Holt Course 3 Text:
- Section 4-5 Squares & Square Roots
- Section 4-6 Estimating Square Roots

Glencoe Algebra Study Guide and Practice Workbook
- Section 8-5 Square Roots
- Section 8-6 Estimating Square Roots
- Worksheet attached for square/cube roots

The Outstanding Mathematics Guide: 8th Grade Supplement
- Perfect Squares and Cubes page 43

Common Core Coach
- Lesson 4

Coach Grade 8 (GPS Version)
- Lesson 3

On Core Mathematics
- Lesson 1-4

Or related sections in your school's textbook resources

Cumulative Practice on squares, cubes, and roots

Closing:

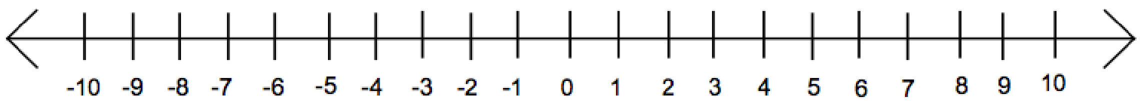
- TOD: Give 5 problems to work and turn in
- GA Dept. of Education Task: Exponential Exponents located on the GA Frameworks at www.georgiastandards.org

Corresponding Task
- **GA Dept. of Education Task: Nesting Dolls located on the GA Frameworks at www.georgiastandards.org**

Highlight the Mathematical Practices that this lesson incorporates:

Make sense of problems and persevere in solving them	Reason abstractly and quantitatively	Construct viable arguments and critique the reasoning of others	Model with mathematics	Use appropriate tools strategically	Attend to precision	Look for and make sure of structure	Look for and express regularity in repeated reasoning

Think About This:



Without using your calculator, order the following numbers from least to greatest:

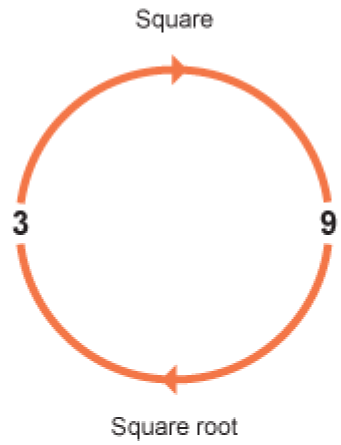
$$-\left(\tfrac{1}{2}\pi\right),\quad \sqrt[3]{30},\quad \sqrt{17},\quad -2\sqrt{2}$$

Explain your answer.

Adapted from Illustrative Mathematics – 8.EE.2 & 8.NS.2 Irrational Numbers on the Number Line

Square root

The opposite of squaring a number is called finding the **square root**.



Example

The square root of 16 is 4 (because $4^2 = 4 \times 4 = 16$)

The square root of 25 is 5 (because $5^2 = 5 \times 5 = 25$)

The square root of 100 is 10 (because $10^2 = 10 \times 10 = 100$)

What is the square root of 4?

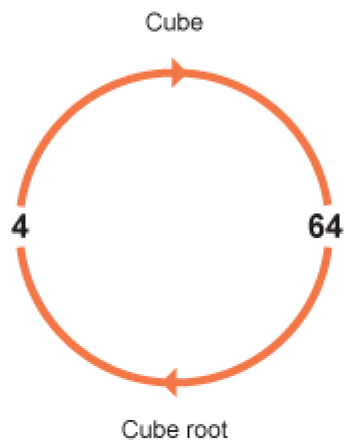
$2 \times 2 = 4$, so 2 is the square root of 4.

The symbol '√ ' means square root, so
√ 36 means 'the square root of 36', and
√ 81 means 'the square root of 81'

You will also find a square root key on your calculator.

Cube root

The opposite of cubing a number is called finding the cube root.



Example

The cube root of 27 is 3 (because $3 \times 3 \times 3 = 27$)

The cube root of 1000 is 10 (because $10 \times 10 \times 10 = 1000$)

What is the cube root of 8?

$2 \times 2 \times 2 = 8$, so 2 is the cube root of 8.

Name:______________________________ Date:_________________

The **square** of a number is the number times itself.

$$5^2 = 5 \times 5 = 25$$

The **cube** of a number is the number multiplied twice by itself.

$$5^3 = 5 \times 5 \times 5 = 125$$

Write the **square** or **cube** of each number.

A.	$4^2 =$ 4 x 4 = 16	$9^2 =$ ______	$3^3 =$ ______
B.	$6^3 =$ ______	$7^2 =$ ______	$15^3 =$ ______
C.	$10^3 =$ ______	$5^3 =$ ______	$14^2 =$ ______
D.	$20^2 =$ ______	$24^3 =$ ______	$19^3 =$ ______
E.	$8^3 =$ ______	$13^2 =$ ______	$48^2 =$ ______
F.	$17^2 =$ ______	$25^3 =$ ______	$37^2 =$ ______

Write the **square** root.

G.	36 = 6^2	64 = ____	81 = ____	25 = ____	324 = ____	529 = ____
H.	100 = ____	49 = ____	4 = ____	16 = ____	121 = ____	1,600 = ____
I.	400 = ____	225 = ____	625 = ____	144 = ____	900 = ____	2,500 = ____

Write the **cube** root.

J.	125 = 5^3	1,000 = ____	64 = ____	27 = ____	8 = ____	216 = ____
K.	512 = ____	1,728 = ____	2,744 = ____	343 = ____	8,000 = ____	6,859 = ____

Simplify the following:

1. $\sqrt{49}$ 2. $\sqrt[3]{27}$

3. $\sqrt{81}$ 4. $\sqrt[3]{8}$

5. $\sqrt{25}$ 6. $\sqrt{121}$

7. $\sqrt[3]{64}$ 8. $\sqrt{16}$

9. $\sqrt{169}$ 10. $\sqrt[3]{125}$

11. $\sqrt{36}$ 12. $\sqrt{64}$

13. $\sqrt{100}$ 14. $\sqrt{144}$

15. $\sqrt[3]{216}$ 16. $\sqrt[3]{343}$

17. $\sqrt[3]{1000}$ 18. $\sqrt[3]{512}$