



Reviewing Squares, Cubes, and Exponent Expressions

Grade 8

Rationale

- ✚ The intent of this lesson is to review squares and cubes, and exponent expressions.

Goals

- ✚ To understand that squaring a number and extracting the square root are inverse.
- ✚ To understand that cubing a number and extracting the cube root are inverse.
- ✚ To simplify exponent expressions.
- ✚ To have students use previously learned skills in a game format.

Standards

- ✚ **8.EE.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.*
- ✚ **8.EE.2** Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
- ✚ **MP.2** Reason abstractly and quantitatively.
- ✚ **MP.7** Look for and make use of structure.

Objectives

- ✚ Students will be able to simplify exponent expressions.
- ✚ Students will be able to find the value of square roots and cube roots.
- ✚ Students will be able to match expressions in Match Game format.

Materials

- ✚ Computer with internet access
- ✚ Expression Boards 1 and 2 (one of each for a student pair)
- ✚ Answer cards (one set per student pair)
- ✚ Baggies or envelopes for cards.
- ✚ Scrap paper/pencils

Procedure

- ✚ BEFORE the lesson: Print the two game boards. Print the answer cards and cut apart. Place one set of cards in a baggie or envelope.
- ✚ Today students will play the Match Game
- ✚ Review exponent rules: <http://www.coolmath.com/algebra/01-exponents>
- ✚ Review square and cube roots.
- ✚ The students need to play in pairs.
- ✚ Each student pair needs Board 1 and Board 2 and a set of cards.
- ✚ Each student needs paper and pencil.
- ✚ Here are the rules for the *Match Game*: Place the cards in a deck upside down.
- ✚ Please note: There will be extra cards that do not fit on either board. If a player draws one of these cards, the card should be placed to the side.
- ✚ Player 1 draws the top card and matches it to its equivalent expression on one of the boards. After the card is placed on the board, the player may not move the card.
- ✚ Next, the opponent will verbally agree or disagree with the placement of the card. If the opponent disagrees, the opponent must prove the correct equivalence and move the card to the correct equivalence, or if the card does not match any expression on the board, the card is placed aside.
- ✚ Now it is Player 2's turn. Player 2 draws a card to match an equivalent on one of the boards. Players continue the process, taking turns and placing cards.
- ✚ Keeping score: A player will earn a point when:
 1. On his/her turn, the card is placed on the correct equivalence.
 2. On his/her turn, the card is correctly identified as not fitting on one of the boards and is set aside.
 3. As the opponent, a correction is made in matching a card to its equivalence and/or placing the card aside.
- ✚ When the deck of cards is empty, the scores will be totaled.
- ✚ Now, extend the game: there will be several cards that did not fit on the boards and have been set aside. Each student will design equivalent radical or exponent expressions that will match each card. Each student will earn an additional point for each correct equivalent created. NOTE: Each student can create many expressions to match to a single card. Every equivalent expression earns an additional point.

Teacher & Teachers' Aide Observations

- ✚ Teachers should identify students who are struggling with equivalent expressions.
- ✚ Teachers should notice whether the students are successful in critiquing each other's matching equivalents.

Assessment

- ✚ Students will apply exponent rules correctly.
- ✚ Students will successfully simplify radical expressions.

Game Board 1

$\sqrt{16}$	$\sqrt{25}$	9^2
5^{-2}	$\sqrt{36}$	$6^{-3} \cdot 6$
$\sqrt[3]{8}$	$\sqrt[3]{64}$	$5^2 \div 5^{-1}$
$\sqrt[3]{125}$	$11^2 \cdot 11^{-3}$	15^2

Game Board 2

7^2	$4^2 \cdot 4^{-4}$	2^3
3^{-2}	$8^3 \div 8$	3^{-3}
3^4	$5^{-4} \cdot 5^2$	6^3
$\sqrt[3]{27}$	$9^3 \cdot 3^{-2}$	$1^3 \cdot 16^{-1}$

✂
Answer Cards –cut apart

4	5	81	$\frac{1}{25}$
$\frac{6}{}$	$\frac{1}{36}$	2	4
125	5	11	225
49	$\frac{1}{16}$	8	$\frac{1}{9}$
64	$\frac{1}{27}$	81	$\frac{1}{25}$

$\frac{1}{16}$	216	81	3
$\frac{1}{11}$	$\frac{1}{81}$	27	25
$\frac{1}{9}$	36	$\frac{1}{4}$	$\frac{1}{2}$