LESSON MAKER PRO

# Exponent Power Moves

*Rewrite and simplify radicals and rational exponents.*

**HIGH SCHOOL · MA.912.NSO.1.3**

**MA.912.NSO.1.3** "Generate equivalent algebraic expressions involving radicals or rational exponents using the properties of exponents."

NAME _____ DATE _____

### TWO WAYS TO WRITE A POWER

For a positive base, $a^{(m/n)}$ means take the nth root, then raise the result to the mth power. You can write $a^{(m/n)}$ as the nth root of $a^m$, or as (the nth root of a)$^m$. Use exponent rules to simplify after rewriting.

### WORKED EXAMPLE

Simplify $625^{(3/4)}$.

1. $625 = 5^4$
2. $(5^4)^{(3/4)} = 5^3$
3. $5^3 = 125$

**Answer: 125**

## PRACTICE 6 problems

**1** For x >= 0, rewrite the 4th root of $x^7$ using a rational exponent.

**ANSWER** _____

**2** For y >= 0, rewrite $y^{(5/6)}$ using a radical.

**ANSWER** _____

**3** Simplify $64^{(5/6)}$.

**ANSWER** _____

**4** Simplify the 3rd root of $216a^6$.

**ANSWER** _____

**5** Rewrite (the 5th root of b)$^3$ using a rational exponent.

**ANSWER** _____

**6** For c >= 0, simplify $(16c^{12})^{(1/4)}$.

**ANSWER** _____

## APPLY IT Show your work

**1** A game designer makes a cube-shaped 3-D map tile with a volume of 2744 cubic meters. Its side length s satisfies $s^3 = 2744$. Write s using a rational exponent, then find the side length.

WORK SPACE

**ANSWER** _____

**2** A student-made music app models an intensity setting with $I = p^4$. For one preset, I = 1296. Write the positive value of p using a radical, then find p.

WORK SPACE

**ANSWER** _____

## CHALLENGE One step up

For $x >= 0$, simplify $(81x^{12})^{(3/4)}$. Show how the exponent 3/4 affects both factors.

WORK SPACE AND ANSWER

**ANSWER KEY**

# Exponent Power Moves

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## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | For x >= 0, rewrite the 4th root of $x^7$ using a rational exponent. | **$x^{(7/4)}$** |
| 2 | For y >= 0, rewrite $y^{(5/6)}$ using a radical. | **6th root of $y^5$** |
| 3 | Simplify $64^{(5/6)}$. | **32** |
| 4 | Simplify the 3rd root of $216a^6$. | **$6a^2$** |
| 5 | Rewrite (the 5th root of b)$^3$ using a rational exponent. | **$b^{(3/5)}$** |
| 6 | For c >= 0, simplify $(16c^{12})^{(1/4)}$. | **$2c^3$** |

## PART 2 · APPLY IT

1. **s = $2744^{(1/3)}$ = 14 meters** Use the exponent 1/3 to represent a cube root. Since $14^3$ = 2744, the side length is 14 meters.
2. **p = 4th root of 1296 = 6** Take the 4th root of both sides because p is raised to the 4th power. Since $6^4$ = 1296, p = 6.

## CHALLENGE

**$27x^9$**

Accept equivalent radical forms, such as (6th root of y)$^5$ for $y^{(5/6)}$. In the challenge, $81^{(3/4)}$ = 27 and $(x^{12})^{(3/4)}$ = $x^9$ under the stated condition.