LESSON MAKER PRO

Power Root Remix

Rewrite, evaluate, and apply rational exponents.

HIGH SCHOOL · MA.912.NSO.1.1

MA.912.NSO.1.1 "Extend previous understanding of the Laws of Exponents to include rational exponents. Apply the Laws of Exponents to evaluate numerical expressions and generate equivalent numerical expressions involving rational exponents."

NAME _____ DATE _____

PRACTICE: RATIONAL POWERS

In a rational exponent $a^{m/n}$, the denominator n tells you to take the n-th root, and the numerator m tells you to raise the result to a power. You can write $a^{m/n}$ as $(a^{1/n})^m$. A negative rational exponent means take the reciprocal after evaluating the positive exponent.

WORKED EXAMPLE

Evaluate $32^{3/5}$.

1. $32^{3/5} = (32^{1/5})^3$
2. $32^{1/5} = 2$
3. $2^3 = 8$

Answer: 8

PRACTICE 6 problems

1 Evaluate $81^{1/2}$.

ANSWER _____

2 Rewrite $64^{2/3}$ as a root expression, then evaluate.

ANSWER _____

3 Evaluate $27^{-2/3}$.

ANSWER _____

4 Evaluate $(1/16)^{-3/4}$.

ANSWER _____

5 Evaluate $49^{3/2} / 7^2$.

ANSWER _____

6 Evaluate $125^{4/3}$.

ANSWER _____

APPLY IT Show your work

1 An esports arena is shaped like a cube. A prototype has a volume of 27 cubic meters, and a new version has a volume of 216 cubic meters. If every edge is scaled by the same factor, find the scale factor using $(216/27)^{1/3}$.

WORK SPACE

ANSWER _____

2 An animation team has a square image tile with an area of 625 square pixels. Its side length is $625^{1/2}$ pixels. The team scales the side length by 2/5. What is the new side length?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Evaluate. Show one equivalent expression before giving your answer: $(256^{3/4} * 27^{2/3}) / 16^{1/2}$.

WORK SPACE AND ANSWER

ANSWER KEY # Power Root Remix

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Evaluate $81^{1/2}$.	**9**
2	Rewrite $64^{2/3}$ as a root expression, then evaluate.	**$(64^{1/3})^2 = 16$**
3	Evaluate $27^{-2/3}$.	**1/9**
4	Evaluate $(1/16)^{-3/4}$.	**8**
5	Evaluate $49^{3/2} / 7^2$.	**7**
6	Evaluate $125^{4/3}$.	**625**

PART 2 · APPLY IT

1. **2, so each edge length is doubled.** 216/27 = 8, and $8^{1/3} = 2$. The new arena has edge lengths that are 2 times the prototype's edge lengths.
2. **$625^{1/2} * 2/5 = 10$ pixels** The original side length is $625^{1/2} = 25$ pixels. Multiplying 25 by 2/5 gives 10 pixels.

CHALLENGE

$((256^{1/4})^3 * (27^{1/3})^2) / 16^{1/2} = (4^3 * 3^2) / 4 = 144$

Accept equivalent root-and-power forms when they are mathematically correct. For problem 3, accept 9^{-1} as equivalent to 1/9.