

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

ANSWER _____

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

ANSWER _____

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

ANSWER _____

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

ANSWER _____

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

ANSWER _____

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

ANSWER _____

APPLY IT Show your work

- 1** APPLY 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** APPLY 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

CHALLENGE

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

PART 1 • PRACTICE

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

PART 2 • APPLY IT

- 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.
- $625^{1/2} * 2/5 = 10$ 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 $1/9$.