LESSON MAKER PRO

Roots in Disguise

Connect radicals and fractional exponents.

HIGH SCHOOL · A3.N.6

A3.N.6 "Simplify expressions with fractional exponents to include converting from radicals."

NAME _____ DATE _____

ROOT FIRST

For a positive base a, $a^{m/n}$ means take the nth root of a, then raise the result to the mth power. You can also write a radical as a fractional exponent before simplifying.

WORKED EXAMPLE

Simplify $243^{4/5}$.

1. Take the fifth root first: the fifth root of 243 is 3.
2. Raise the result to the fourth power: $3^4 = 81$.

Answer: 81

PRACTICE 6 problems

1 Simplify $121^{1/2}$.

ANSWER _____

2 Simplify $16^{3/4}$.

ANSWER _____

3 Rewrite $\sqrt{49}$ using a fractional exponent, then simplify.

ANSWER _____

4 Rewrite $\sqrt[3]{216}$ using a fractional exponent, then simplify.

ANSWER _____

5 Simplify $x^{1/2} \cdot x^{5/2}$. Assume $x > 0$.

ANSWER _____

6 Rewrite $\sqrt[3]{(x^6)}$ using a fractional exponent, then simplify.

ANSWER _____

APPLY IT Show your work

1 A cube-shaped shipping box has a volume of 8000 cm^3. Write its edge length using a fractional exponent, then find the length.

WORK SPACE

ANSWER _____

2 An artist builds a cube-shaped display. One face has an area of 225 cm^2. Write the display's volume using a fractional exponent, then find its volume.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Assume $x > 0$. Rewrite (fourth root of x^{12}) / $\sqrt{x}$ using fractional exponents, then simplify to one power of x.

WORK SPACE AND ANSWER

Roots in Disguise

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Simplify $121^{1/2}$.	**11**
2	Simplify $16^{3/4}$.	**8**
3	Rewrite $\sqrt{49}$ using a fractional exponent, then simplify.	**$49^{1/2} = 7$**
4	Rewrite $\sqrt[3]{216}$ using a fractional exponent, then simplify.	**$216^{1/3} = 6$**
5	Simplify $x^{1/2} \cdot x^{5/2}$. Assume $x > 0$.	**x^3**
6	Rewrite $\sqrt[3]{(x^6)}$ using a fractional exponent, then simplify.	**$(x^6)^{1/3} = x^2$**

PART 2 · APPLY IT

1. **$8000^{1/3} = 20$ cm** The edge length is the cube root of the volume. Since $20^3 = 8000$, the edge is 20 cm long.
2. **$225^{3/2} = 3375$ cm^3** The edge length is $\sqrt{225} = 15$ cm. Cube the edge length to get $15^3 = 3375$ cm^3.

CHALLENGE

$x^{12/4} / x^{1/2} = x^{5/2}$

Accept equivalent fractional-exponent forms in intermediate steps. For the challenge, $x > 0$ allows the fourth root of x^{12} to simplify to x^3.