LESSON MAKER PRO

Roots and Powers

Use rational exponents to find exact values.

HIGH SCHOOL · A2.N.1.3

A2.N.1.3 "Understand and apply the relationship between rational exponents, integer exponents, and radicals to solve problems."

NAME _____ DATE _____

THE BIG IDEA

For a positive number a, $a^{m/n}$ means take the nth root of a, then raise it to the mth power. A negative exponent means take the reciprocal: $a^{-m/n} = 1/a^{m/n}$.

WORKED EXAMPLE

Evaluate $243^{2/5}$.

1. $243^{2/5}$ = (fifth root of 243)^2
2. The fifth root of 243 is 3.
3. $3^2 = 9$

Answer: 9

PRACTICE 6 problems

1 Evaluate $64^{1/3}$.

ANSWER _____

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

ANSWER _____

3 Evaluate $125^{-1/3}$.

ANSWER _____

4 Evaluate $32^{3/5}$.

ANSWER _____

5 Rewrite $\sqrt{(x^7)}$ as a single power of x. Assume $x > 0$.

ANSWER _____

6 Evaluate $18^{1/2} \cdot 2^{1/2}$.

ANSWER _____

APPLY IT Show your work

1 A game designer uses a square tile with an area of 72 cm^2. The side length is $A^{1/2}$ cm, where A is the area in square centimeters. Find the exact side length in simplest radical form.

WORK SPACE

ANSWER _____

2 A 3D printer makes a cube-shaped game piece with a volume of 250 cm^3. Its edge length is $V^{1/3}$ cm, where V is the volume in cubic centimeters. Find the exact edge length in simplest radical form.

WORK SPACE

ANSWER _____

CHALLENGE One step up

Simplify $98^{-1/2}$ to a fraction with no radical in the denominator. Show how you used both parts of the exponent.

WORK SPACE AND ANSWER

Roots and Powers

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Evaluate $64^{1/3}$.	**4**
2	Evaluate $49^{3/2}$.	**343**
3	Evaluate $125^{-1/3}$.	**1/5**
4	Evaluate $32^{3/5}$.	**8**
5	Rewrite $\sqrt{(x^7)}$ as a single power of x. Assume $x > 0$.	**$x^{7/2}$**
6	Evaluate $18^{1/2} \cdot 2^{1/2}$.	**6**

PART 2 · APPLY IT

1. **$6\sqrt{(2)}$ cm** The side length is $72^{1/2} = \sqrt{(72)}$. Since $72 = 36 \cdot 2$, $\sqrt{(72)} = 6\sqrt{(2)}$ cm.
2. **$5\sqrt[3]{(2)}$ cm** The edge length is $250^{1/3} = \sqrt[3]{(250)}$. Since $250 = 125 \cdot 2$, $\sqrt[3]{(250)} = 5\sqrt[3]{(2)}$ cm.

CHALLENGE

$98^{-1/2} = 1/\sqrt{(98)} = 1/(7\sqrt{(2)}) = \sqrt{(2)}/14$.

Accept equivalent exact expressions unless the prompt requires simplest radical form or no radical in the denominator. For the challenge, look for a reciprocal and a square root in the student's steps.