Algebra 1 7.3

Evaluate and rewrite expressions involving rational exponents

Solve equations with rational exponents

rational – fraction form

inverse operation $(\ )^2$

radical sign $\sqrt{25}=5$

square root (8th grade standard) $\sqrt{49}=7$

cube root $\sqrt[3]{\ }$

nth root $\sqrt[4]{\ }$

exponential equation $\sqrt{30}$ $(\ )^2=30$

whiteboards $5^2=25$ $6^2=36$

Square root $\sqrt{(\ )}$

$\sqrt{25} = 5$

$\sqrt{49} = 7$

$\sqrt{36} = 6$

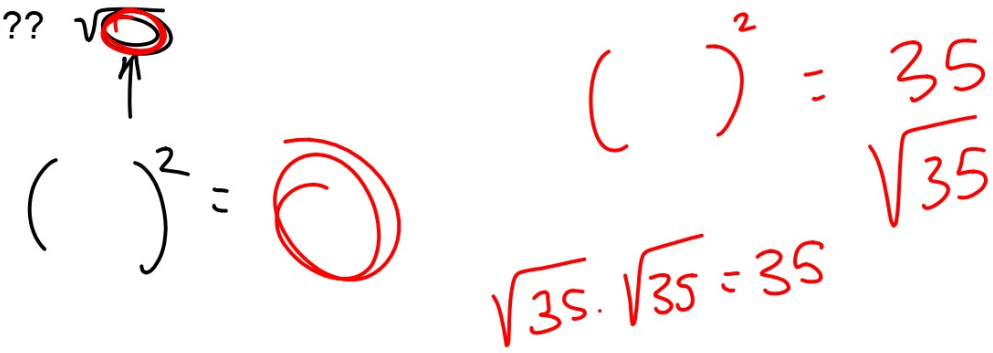
8th grade standard
perfect square
irrational

$b^1 = b$

$b^2 = b*b$

$b^3 = b*b*b$

$b^{(1/2)} = ????$



It takes two of them (one pair) to make b

You have to know the code:

rational form radical form

KeyConcept $b^{\frac{1}{2}} = \sqrt{b}$

Words	For any nonnegative real number b, $b^{\frac{1}{2}} = \sqrt{b}$.
Examples	$16^{\frac{1}{2}} = \sqrt{16}$ or 4 $\quad$ $38^{\frac{1}{2}} = \sqrt{38}$

$16^{\frac{1}{2}} = \sqrt{16} = 4$ $\quad$ $38^{\frac{1}{2}} = \sqrt{38}$

$6 < x < 7$ $\quad$ $16^{\frac{1}{2}}$ $\quad$ $16\frac{1}{2}$

Example 1 Radical and Exponential Forms

Write each expression in radical form, or write each radical in exponential form.

a. $25^{\frac{1}{2}}$ $\sqrt{25}$

b. $\sqrt{18}$ $18^{\frac{1}{2}}$

$125^{\frac{1}{3}}$

c. $5x^{\frac{1}{2}}$ $5\sqrt{x}$

d. $\sqrt{(8p)}$ $(8p)^{\frac{1}{2}}$

$8p^{\frac{1}{2}}$

Reminder: radical $\sqrt[3]{\ }$ $\sqrt{\ }$ is also a grouping symbol

index

$\sqrt[3]{(\ )}$ $(\ )^{\frac{1}{3}}$

$\sqrt[4]{(\ )}$ $(\ )^{\frac{1}{4}}$

GuidedPractice

1A. $a^{\frac{1}{2}}$ **1B.** $\sqrt{22}$ **1C.** $(7w)^{\frac{1}{2}}$ **1D.** $2\sqrt{x}$

$\sqrt{a}$ $(22)^{\frac{1}{2}}$ $\sqrt{7w}$ $(2x)^{\frac{1}{2}}$

$2(x)^{\frac{1}{2}}$

Grouping symbol

KeyConcept *n*th Root

Words	For any real numbers a and b and any positive integer n, if $a^n = b$, then a is an nth root of b.
Example	Because $2^4 = 16$, 2 is a fourth root of 16; $\sqrt[4]{16} = 2$.

index

index

Example 2 *n*th roots

Simplify.

a. $\sqrt[3]{27}$

$(27)^{\frac{1}{3}} = 3$

$3^3 = 27$

b. $\sqrt[5]{32}$

$(32)^{\frac{1}{5}} = 2$

$2^5 = 3^5 \quad 4^5$

guess & check
(for now)

GuidedPractice

2A. $\sqrt[3]{64} = 4$

$(\ )^3 = 64$

$(0.1)(0.1)(0.1)$

$(0.1)^3 = \left(\frac{1}{10}\right)^3 \quad 1 \cdot 10^{-3}$

$\sqrt[3]{(0.001)}$

2B. $\sqrt[4]{10{,}000} = 10$

$(\ )^4 = 10{,}000$

$(\ )^3 = 0.001$

if 1/2 means square root...

KeyConcept $b^{\frac{1}{n}}$

Words	For any positive real number b and any integer $n > 1$, $b^{\frac{1}{n}} = \sqrt[n]{b}$.
Example	$8^{\frac{1}{3}} = \sqrt[3]{8} = \sqrt[3]{2 \cdot 2 \cdot 2}$ or 2

$b^{\frac{1}{2}}$

$b^{\frac{1}{3}}$

$b^{\frac{1}{x}}$

Might be easier to see if written in radical form first...

Simplify.

a. $125^{\frac{1}{3}} = \sqrt[3]{125} = 5$

$= (\ )^3 = 125$

$\sqrt[3]{3375}$

Groups of 3...
(triplets)

b. $1296^{\frac{1}{4}}$ $\sqrt[4]{1296} = 6$

$(\ )^4 = 1296$

Groups of 4
(quads)

GuidedPractice

3A. $27^{\frac{1}{3}} = 3$

3B. $256^{\frac{1}{4}} = 4$

*2 different ways...

Example 4 Evaluate $b^{\frac{m}{n}}$ Expressions

Simplify.

a. $64^{\frac{2}{3}}$

$$\left(64^{\frac{1}{3}}\right)^2$$

$$(4)^2 = 16$$

b. $36^{\frac{3}{2}}$

$$\left(36^{\frac{1}{2}}\right)^3$$

$$6^3$$

$$216$$

*root first

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4A. $27^{\frac{2}{3}}$

4B. $256^{\frac{5}{4}}$

$(\quad)^4$

$(256^{\frac{1}{4}})^5$

$(4)^5$

7.3 17-77 eou

(skip 45, 49, 53)