Algebra 1 7.3

Evaluate and rewrite expressions involving rational exponents

Solve equations with rational exponents

(irrational) fraction form $\frac{1}{3}$ 0.25 $\frac{1}{4}$ 50% $\frac{1}{2}$

can't ← rational → $\frac{5}{1}$

inverse operation

radical sign

→ square root (8th grade standard) $(\quad)^2$ $\sqrt{\quad}$

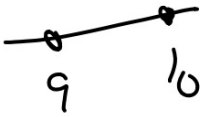
cube root

nth root

exponential equation $\sqrt{25} = 5$ $\sqrt{100} = 10$

whiteboards

$\sqrt{90}$



$\sqrt{50}$

Square root $\sqrt{}$

$\sqrt{25} = \frac{5}{1}$

$\sqrt{49} = \frac{7}{1}$

$\sqrt{36} = \frac{6}{1}$

$\sqrt{67}$

8th grade standard

perfect square

irrational

$b^1 = b$

$b^2 = b*b$

$b^3 = b*b*b$

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

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

$\sqrt{25} \cdot \sqrt{25} = 25$

$\sqrt{9} \cdot \sqrt{9} = 9$

$\sqrt{b} \cdot \sqrt{b} = b$

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

You have to know the code:

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

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

$\sqrt{16} = 4$ $\quad$ $\sqrt{38}$

Example 1 Radical and Exponential Forms

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

a. $25^{\frac{1}{2}}$ $\sqrt{25} = 5$

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

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

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

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

$\sqrt{\ }$ $(\ )^2$ $\sqrt[3]{8}$ $(\ )^3$ $\sqrt[4]{625}$ $(\ )^4$

Guided Practice

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

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

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. $\sqrt[3]{27}$ $= (\ ?\ )^3$

$= 3$

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

$(\ ?\ )^5$

$= 2$

guess & check

GuidedPractice

2A. $\sqrt[3]{64}$ $(\ ?\ )^3$

$= 4$

2B. $\sqrt[4]{10{,}000}$ $(\ ?\ )^4$

$= 10$

if 1/2 means square root...

$(\quad)^{\frac{1}{2}} = \sqrt{3}$

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

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

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

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

Simplify.

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

$\sqrt[3]{125} = 5$

$(?)^3 = 125$

Groups of 3...
(triplets)

b. $1296^{\frac{1}{4}}$

$\sqrt[4]{1296} = 6$

$(?)^4 = 1296$

Groups of 4
(quads)

GuidedPractice

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

$\sqrt[3]{27}$

$(\ )^3$

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

$\sqrt[4]{256}$

*2 different ways...

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

$81^{\frac{3}{2}}$

Simplify.

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

$\sqrt[3]{64} = (4)^2$

$= 16$

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

$\sqrt{36} = (6)^3$

$= 216$

*root first

GuidedPractice

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

$\sqrt[3]{27}\ (3)^2$

9

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

$\sqrt[4]{256}\ (4)^5$

1024

$\sqrt{x^2 y^4}$

p. 410
17-65 odd