2-1 Simplifying Radicals

Friday, October 18, 2019 12:23 PM

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2.1 SIMPLIFYING RADICALS Name: _____ Blk: _____

- Recall: $\sqrt[n]{x}$ — $x =$ radicand; $n =$ index; radical

- Evaluate:
  a. $\sqrt{144} =$
  b. $\sqrt[3]{27} =$
  c. $\sqrt[4]{16} =$

- Complete the table:

Expression	$x = 2$	$x = -2$
x^2		
$\sqrt{x^2}$		
x^3		
$\sqrt[3]{x^3}$		
x^4		
$\sqrt[4]{x^4}$		
x^5		
$\sqrt[5]{x^5}$		

→ How can you predict the sign of a radical expression?

- Recall: $\left(\sqrt[n]{x}\right)\left(\sqrt[n]{y}\right) = \sqrt[n]{xy}$ Eg. $\left(\sqrt[3]{7}\right)\left(\sqrt[3]{3}\right) =$

$$\frac{\sqrt[n]{x}}{\sqrt[n]{y}} = \sqrt[n]{\frac{x}{y}}$$ Eg. $\left(\frac{\sqrt{30}}{\sqrt{6}}\right) =$

- Recall: Whole/Entire Radical ↔ Mixed Radical
  a. $\sqrt{24} =$ b. $4\sqrt[3]{2} =$

1. Change to a mixed radical:

- Option 1: Prime factorize
- Option 2: Factor squares, cubes, fourths, etc

a. $\sqrt[3]{\frac{-16}{135}}$

$= \sqrt[3]{\frac{-8 \cdot 2}{27 \cdot 5}}$

$= \frac{-2}{3}\sqrt[3]{\frac{2}{5}}$

b. $\sqrt[4]{m^7}$ $\quad m^{7/4}$

$m^4 \cdot m^3$

$= \sqrt[4]{m^4 \cdot m^3}$

$= m\sqrt[4]{m^3}$

c. $\sqrt{63n^7p^4}$ $\quad \sqrt{n^6} = n^{6/2} = n^3$

$= \sqrt{9 \cdot 7 \cdot n^6 \cdot n^1 \cdot p^4}$

$= 3n^3p^2\sqrt{7n}$

2. Change to an entire radical

- Move the constant on the outside of the radical into the radical and write it as a power with an exponent equivalent to the index of the radical

a. $-3\sqrt[4]{\frac{2}{27}}$ $\quad (3^4)$ $\quad 3 = \frac{3}{1}$

$= -\sqrt[4]{\frac{3^4 \cdot 2}{27}}$

$= -\sqrt[4]{\frac{162}{27}}$

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

b. $x\sqrt[3]{x}$

$= \sqrt[3]{x^3 \cdot x}$

$= \sqrt[3]{x^4}$

c. $2k^2(\sqrt[3]{4k})$

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

$= \sqrt[3]{8k^6 \cdot 4k}$

$= \sqrt[3]{32k^7}$

3. Arrange from greatest to least:

- Option 1: change all your radicals to decimals and compare
- Option 2: change all radicals into ~~mixed~~ entire radicals with the same index and compare

a. $5, 3\sqrt{3}, 2\sqrt{6}, \sqrt{23}$ → change to entire radicals. → all

$\sqrt{25}, \sqrt{27}, \sqrt{24}, \sqrt{23}$

*Final answer should be in its original form

$3\sqrt{3}, 5, 2\sqrt{6}, \sqrt{23}$

b. $9\sqrt[3]{2}, 11\sqrt[3]{2}, 8\sqrt[3]{2}$

• same radicand AND index
• just look & rearrange.

$11\sqrt[3]{2}, 9\sqrt[3]{2}, 8\sqrt[3]{2}$

c. $3\sqrt[4]{8}, 4\sqrt{2}, 3\sqrt[3]{5}$

• use your calc. → change to a decimal.

$4\sqrt{2}, 3\sqrt[3]{5}, 3\sqrt[4]{8}$

Defining your variable

- When you have to simplify radicals with variables, you must DEFINE your variables or state your RESTRICTIONS
- If the index is EVEN, the radicand must be NON-NEGATIVE (≥ 0), or the radical is undefined (unpossible!)
    - In order to indicate that we won't let this happen, we have to set the restrictions for the expression
- Odd index radicals have no restrictions
- Eg. For which values of the variable is each radical defined? (In other words, what values of x (or whatever the variable is) could we substitute into the following radicals to ensure that we would get an actual answer?) Simplify the radical if possible.

$\sqrt{x^2} = |x|$

*Use absolute value notation if the variable can be any real number but the radicand must be positive (index is even)

a. $\sqrt{27x^2}$ $x \in \mathbb{R}$

$= \sqrt{9 \cdot 3 \cdot x^2}$

$= 3|x|\sqrt{3}$

eg. $\sqrt{27x^4}$ $x \in \mathbb{R}$

$= \sqrt{9 \cdot 3 x^4}$

$= 3x^2\sqrt{3}$

b. $\sqrt[3]{24y^5}$ $y \in \mathbb{R}$

$\sqrt[3]{8 \cdot 3 y^3 \cdot y^2}$

$= 2y\sqrt[3]{3y^2}$

c. $\sqrt[4]{-12x^3}$ $x \leq 0$

cannot simplify

d. $\sqrt{45a^2}$ $a \in \mathbb{R}$

$= \sqrt{9 \cdot 5 \cdot a^2}$

$= 3|a|\sqrt{5}$

Assignment: + WB pg's #5-7, 10-14, 16 9S-101

Finish reflection.

Finish self reflection.