TOPIC: SIMPLIFYING RADICAL EXPRESSIONS

Simplifying Radicals by Expanding

- When $\sqrt{\ }$'s aren't perfect powers, you can simplify by re-writing it as a ________ where 1 term **IS** a perfect power**!**
  - An expression is <u>fully simplified</u> when you can't break up $\sqrt{\ }$'s any further.

If a number in a radical has factors $\boldsymbol{a}$ & $\boldsymbol{b}$, $\sqrt[n]{\#}$ = ______ = ____________

EXAMPLE: Simplify the expression.

(A) $\sqrt{20}$

(B) $\sqrt{18x^2}$

(C) $\sqrt[3]{54x^4}$

PERFECT POWERS	
Squares	**Cubes**
$2^2 = 4$	$2^3 = 8$
$3^2 = 9$	$3^3 = 27$
$4^2 = 16$	$4^3 = 64$
$5^2 = 25$	$5^3 = 125$
$6^2 = 36$	
$7^2 = 49$	
$8^2 = 64$	
$9^2 = 81$	
$10^2 = 100$	

PRACTICE: Simplify the radical.

$\sqrt{75}$

PRACTICE: Simplify the radical.

$\sqrt{180}$

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Simplifying Radicals with Variables

● We can apply everything we've seen for Square & n^{th} Roots with Variables in $\sqrt{\ }$'s!

Radicals WITHOUT Variables		Radicals WITH Variables	
$(3)^2 =$	$(2)^3 =$	$(\quad)^2 =$	$(\quad)^3 =$
$\sqrt{9} =$	$\sqrt[3]{8} =$	$\sqrt{x^2} =$	$\sqrt[3]{x^6} =$

Power Rule
$(a^m)^n = a^{m \cdot n}$

● Remember: When $\sqrt{\ }$'s aren't perfect powers, split them where 1 factor (# or variable) ***IS*** a perfect power.

- For $\sqrt{\ }$'s with numbers AND variables, simplify them ________________.

$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$

EXAMPLE: Simplify the expression.

(A) $\sqrt{x^3}$

(B) $\sqrt{x^7}$

(C) $\sqrt{8x^5}$

PERFECT POWERS	
Squares	Cubes
$2^2 = 4$	$2^3 = 8$
$3^2 = 9$	$3^3 = 27$
$4^2 = 16$	$4^3 = 64$
$5^2 = 25$	$5^3 = 125$
$6^2 = 36$	
$7^2 = 49$	
$8^2 = 64$	
$9^2 = 81$	
$10^2 = 100$	

PRACTICE: Simplify the radical.

$\sqrt{63x^2}$

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Simplifying Radicals with Fractions

$$\sqrt[n]{ab} = \sqrt[n]{a} \cdot \sqrt[n]{b}$$

$$\sqrt[n]{\frac{a}{b}} = \underline{\qquad}$$

- Split up OR combine radical expressions with fractions using these rules:
  - Sometimes it's better to split & simplify, sometimes it's better to divide & simplify.

$\sqrt{\frac{49}{64}} =$

$\frac{\sqrt{32}}{\sqrt{2}} =$

EXAMPLE: Simplify the expression.

(A) $\sqrt{\frac{64x^4}{9x^2}}$

(B) $\frac{\sqrt{72x^3}}{\sqrt{9x}}$

PERFECT POWERS	
Squares	Cubes
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$4^2 = 16$	$4^3 = 64$
$5^2 = 25$	$5^3 = 125$
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$7^2 = 49$	
$8^2 = 64$	
$9^2 = 81$	
$10^2 = 100$	

Adding & Subtracting LIKE Radicals

- Just how we combined ***like terms***, combine _______________ (same ***radicand***, same ***index***).

Algebraic Expressions	Radical Expressions
$2x + 3 + 4x + 8$	$(2\sqrt{x} + 3) + (4\sqrt{x} + 8)$
$(2x + 4x) + (3 + 8)$	
$6x + 11$	

EXAMPLE: Perform the indicated operation and simplify. Assume all variables are positive.

(A) $3\sqrt{7} + 2\sqrt{7} - \sqrt[3]{7}$

(B) $9\sqrt[3]{x} - \sqrt{x} - 5\sqrt[3]{x} + 3$

Warning!

$\sqrt[m]{a} + \sqrt[m]{b} \neq \sqrt[m]{a+b}$

<u>TOPIC: SIMPLIFYING RADICAL EXPRESSIONS</u>

<u>PRACTICE</u>: True or False: $\sqrt{9+16}$ and $\sqrt{9}+\sqrt{16}$ are equal.

<u>Adding & Subtracting UNLIKE Radicals</u>

● When adding/subtracting radicands that are NOT alike, you'll have to ____________ them *first* before combining!

Combining LIKE Radicals	**Combining UNLIKE Radicals**
$3\sqrt{5}+4\sqrt{5}$	$\sqrt{5}+\sqrt{20}$

$\sqrt[n]{ab}=\sqrt[n]{a}\cdot\sqrt[n]{b}$

<u>EXAMPLE</u>: Add or subtract the expressions and simplify.

$(\boldsymbol{A})$ $5\sqrt{2}-\sqrt{18}$

$(\boldsymbol{B})$ $\sqrt{18}+\sqrt{50}$

PERFECT POWERS	
Squares	**Cubes**
$2^2 = 4$	$2^3 = 8$
$3^2 = 9$	$3^3 = 27$
$4^2 = 16$	$4^3 = 64$
$5^2 = 25$	$5^3 = 125$
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