Unit 3 Day 2

Simplifying Radicals

Basic Radical Operations

Day 2 Warm Up

Warm-up in the Notes

$a^m \cdot a^n = \_\_\_\_\_$ $\frac{a^m}{a^n} = \_\_\_\_\_$ $\frac{1}{a^n} = \_\_\_\_\_$

$(a^m)^n = \_\_\_\_\_$ $(a \cdot b)^n = \_\_\_\_\_$

1. $\sqrt{98} =$
2. $\sqrt{108} =$
3. $3\sqrt{2} \cdot 4\sqrt{3} =$
4. $-\sqrt{8} \cdot 3\sqrt{2} =$
5. $4\sqrt{6} + 3\sqrt{6} =$
6. $\sqrt{8} + \sqrt{18} =$
7. $3\sqrt{2} - 2\sqrt{2} =$
8. $\sqrt{48} - \sqrt{27} =$

A	$7\sqrt{2}$
B	$4\sqrt{2}$
C	$5\sqrt{2}$
D	-12
E	$\sqrt{2}$
F	$12\sqrt{6}$
G	$6\sqrt{3}$
H	$\sqrt{3}$
I	$7\sqrt{6}$

Done early?
Complete Top of Notes pg. 3
&
Bottom of Notes pg. 2
(if not done yet)

Day 2 Warm Up ANSWERS

Warm-up in the Notes
(Properties of Exponents…today we'll do them with FRACTIONS!)
Even though they seem more complicated, fractions are numbers too. You can use all the same properties with fraction (rational) exponents as you can with integer exponents. Write down those properties first.

$a^m \cdot a^n =$ a^{m+n} $\quad \frac{a^m}{a^n} =$ a^{m-n} $\quad \frac{1}{a^n} =$ a^{-n}

$(a^m)^n =$ a^{mn} $\quad (a \cdot b)^n =$ $a^n b^n$

Day 2 Warm Up ANSWERS

A G F D I C E H

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Homework Answers

1) $2m^2 \cdot 2m^3$

$4m^5$

2) $m^4 \cdot 2m^{-3}$

$2m$

3) $4r^{-3} \cdot 2r^2$

$\frac{8}{r}$

4) $4n^4 \cdot 2n^{-3}$

$8n$

5) $2k^4 \cdot 4k$

$8k^5$

6) $2x^3y^{-3} \cdot 2x^{-1}y^3$

$4x^2$

7) $2y^2 \cdot 3x$

$6xy^2$

8) $4v^3 \cdot vu^2$

$4u^2v^4$

Homework Answers

9) $4a^3b^2 \cdot 3a^{-4}b^{-3}$

$\frac{12}{ab}$

10) $x^2y^{-4} \cdot x^3y^2$

$\frac{x^5}{y^2}$

11) $(x^2)^0$

1

12) $(2x^2)^{-4}$

$\frac{1}{16x^8}$

13) $(4r^0)^4$

256

14) $(4a^3)^2$

$16a^6$

15) $(3k^4)^4$

$81k^{16}$

16) $(4xy)^{-1}$

$\frac{1}{4xy}$

Packet pg. 2

Homework Answers

1) $(x^{-2}x^{-3})^4$

$$\frac{1}{x^{20}}$$

2) $(x^4)^{-3} \cdot 2x^4$

$$\frac{2}{x^8}$$

3) $(n^3)^3 \cdot 2n^{-1}$

$2n^8$

4) $(2v)^2 \cdot 2v^2$

$8v^4$

5) $\dfrac{2x^2y^4 \cdot 4x^2y^4 \cdot 3x}{3x^{-3}y^2}$

$$8x^8y^6$$

6) $\dfrac{2y^3 \cdot 3xy^3}{3x^2y^4}$

$$\frac{2y^2}{x}$$

Homework Answers

7) $\dfrac{x^3y^3 \cdot x^3}{4x^2}$

$\dfrac{x^4y^3}{4}$

8) $\dfrac{3x^2y^2}{2x^{-1} \cdot 4yx^2}$

$\dfrac{3xy}{8}$

9) $\dfrac{x}{(2x^0)^2}$

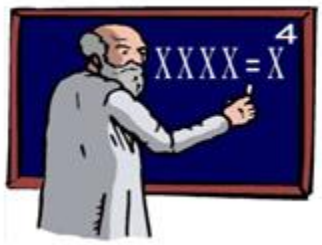
$\dfrac{x}{4}$

10) $\dfrac{2m^{-4}}{(2m^{-4})^3}$

$\dfrac{m^8}{4}$

Tonight's Homework:
Packet p. 3 and 4

Elements of a Radical



index → $\sqrt[n]{x} = r$ ← root

radicand

$\sqrt[3]{64} = ?$

Radicand = 64

Index= 3

Root is 4

because 4 · 4 · 4 = $4^3 = 64$

$\sqrt[5]{32x^5} = ?$

Radicand= $32x^5$

Index= 5

Root is 2x

because 2x · 2x · 2x · 2x · 2x = $(2x)^5 = 32x^5$

On the Calculator

Reminder: To use your calculator:

Step 1: Type in the index.

Step 2: Press MATH

Step 3: Choose 5: $\sqrt[x]{\square}$

Step 4: Type in the radicand.

$$\sqrt[3]{343} = 7$$

You Try!

$\sqrt[5]{243y^5}$

$\sqrt[4]{1296m^4n^8}$

$\sqrt{144v^8}$

$3y$

$6mn^2$

$12v^4$

Simplifying Radicals

But not every problem will work out that nicely!
Try using your calculator to find an exact answer for $\sqrt[3]{24}$

$\sqrt{12} = 2\sqrt{3}$ $\quad$ $\sqrt[3]{24} = 2\sqrt[3]{3}$ $\quad$ $\sqrt[4]{48} = 2\sqrt[4]{3}$

$2\sqrt{3}$ $\quad$ $2\sqrt[3]{3}$ $\quad$ $2\sqrt[4]{3}$

Simplifying Radicals: 1) Breakdown the radicand using a factor tree

2) Find a group of #s (same group size as index) to pull out

3) Always check that radicand is fully simplified!

Negative Inside of the radical?

If you have an even root → The negative means an imaginary number

If you have an odd root → The negative CAN stay FROM the radicand TO the coefficient… Does not mean an imaginary number

Let's look at some examples!

★ = you try

Examples:

$\sqrt{16x^2}$	$\sqrt{8x}$ ★	$\sqrt{15x^3}$ ★
$\sqrt[3]{-8}$	$\sqrt[3]{80n^5}$ ★	$\sqrt[4]{96}$ ★
$\sqrt[4]{81}$	$\sqrt[5]{486}$ ★	$\sqrt[3]{-40}$ ★
$\sqrt[3]{18x^4}$	$\sqrt[4]{64x^3}$ ★	$\sqrt[5]{-32x^3y^6}$ ★
$\sqrt[3]{81x^3y^2z^4}$	$\sqrt[3]{192x^5y^7z^2}$ ★	$\sqrt[4]{1875x^4z^2}$ ★

★ = you try

Examples:

$\sqrt{16x^2}$ $4x$	$\sqrt{8x}$ ★ $2\sqrt{2x}$	$\sqrt{15x^3}$ ★ $x\sqrt{15x}$
$\sqrt[3]{-8}$ -2	$\sqrt[3]{80n^5}$ ★ $2n\sqrt[3]{10n^2}$	$\sqrt[4]{96}$ ★ $2\sqrt[4]{6}$
$\sqrt[4]{81}$ 3	$\sqrt[5]{486}$ ★ $3\sqrt[5]{2}$	$\sqrt[3]{-40}$ ★ $-2\sqrt[3]{5}$
$\sqrt[3]{18x^4}$ $x\sqrt[3]{18x}$	$\sqrt[4]{64x^3}$ ★ $2\sqrt[4]{4x^3}$	$\sqrt[5]{-32x^3y^6}$ ★ $-2y\sqrt[5]{x^3y}$
$\sqrt[3]{81x^3y^2z^4}$ $3xz\sqrt[3]{3y^2z}$	$\sqrt[3]{192x^5y^7z^2}$ ★ $4xy^2\sqrt[3]{3x^2yz^2}$	$\sqrt[4]{1875x^4z^2}$ ★ $5x\sqrt[4]{3z^2}$

Multiplying Radicals

Make sure the index is the same!!

1. Multiply the coefficients.
2. Multiply the radicands.
3. Simplify!!

★ = you try ☺

$2\sqrt{3}\cdot 5\sqrt{2}$	$-3\sqrt{8}\cdot\sqrt{2}$ ★	$4\sqrt{5}\cdot 3\sqrt{10}$ ★
$\sqrt{3x^2y}\cdot\sqrt{5xy}$	$6\sqrt{8x^3y^2}\cdot\sqrt{10xy^3}$ ★	$-\sqrt{5x^4y^3}\cdot\sqrt{15x^2y^5}$ ★
$\sqrt[3]{4x^2}\cdot 5\sqrt[3]{8xy}$	$\sqrt[4]{2x^5}\cdot\sqrt[4]{40x^3y^3}$ ★	$4\sqrt[5]{27x^3}\cdot\sqrt[5]{9x^3y^5}$ ★
$3\sqrt[3]{5x^3}\cdot 2\sqrt[3]{50y}$	$\sqrt[3]{9}\cdot\sqrt[3]{-24}$ ★	$\sqrt[4]{8}\cdot\sqrt[4]{32}$ ★

★ = you try ☺

$2\sqrt{3}\cdot 5\sqrt{2}$ $10\sqrt{6}$	$-3\sqrt{8}\cdot\sqrt{2}$ ★ -12	$4\sqrt{5}\cdot 3\sqrt{10}$ ★ $60\sqrt{2}$
$\sqrt{3x^2y}\cdot\sqrt{5xy}$ $xy\sqrt{15x}$	$6\sqrt{8x^3y^2}\cdot\sqrt{10xy^3}$ ★ $24x^2y^2\sqrt{5y}$	$-\sqrt{5x^4y^3}\cdot\sqrt{15x^2y^5}$ ★ $-5x^3y^4\sqrt{3}$
$\sqrt[3]{4x^2}\cdot 5\sqrt[3]{8xy}$ $10x\sqrt[3]{4y}$	$\sqrt[4]{2x^5}\cdot\sqrt[4]{40x^3y^3}$ ★ $2x^2\sqrt[4]{5y^3}$	$4\sqrt[5]{27x^3}\cdot\sqrt[5]{9x^3y^5}$ ★ $12xy\sqrt[5]{x}$
$3\sqrt[3]{5x^3}\cdot 2\sqrt[3]{50y}$ $30x\sqrt[3]{2y}$	$\sqrt[3]{9}\cdot\sqrt[3]{-24}$ ★ -6	$\sqrt[4]{8}\cdot\sqrt[4]{32}$ ★ 4

Adding and Subtracting Radicals

Just like Combining "like" Terms.

$2x - x + 4x =$ _____

$3y - 2x + y - 6y =$ _____

Some tips:

-You are now combining "like" radical expressions instead.

-Add/Subtract only when the radicals have the same **index** and **radicand**.

-When you add/subtract, you add the **coefficients**. The radicands do not change.

-Always **SIMPLIFY** FIRST.

Examples:

★ = you try ☺

$3\sqrt{3} + 4\sqrt{3}$	$\sqrt{5} + 2\sqrt{5} + 3\sqrt{5}$ ★	$4\sqrt{12} - \sqrt{75}$ ★
$\sqrt{45x^3} - \sqrt{20x^3}$	$5\sqrt[3]{32} - 2\sqrt[3]{108}$ ★	$3\sqrt[3]{16} + \sqrt[3]{54}$ ★
$2\sqrt[3]{125a^4} - 5\sqrt[3]{8a}$	$9\sqrt[3]{40a} - 7\sqrt[3]{135a}$ ★	$5\sqrt[3]{16y^4} + 7\sqrt[3]{2y}$ ★
$6\sqrt{18} + 3\sqrt{50}$	$\sqrt[3]{54} + \sqrt[3]{16}$ ★	$\sqrt[4]{32} + \sqrt[4]{48}$ ★

★ = you try

$3\sqrt{3} + 4\sqrt{3}$ $7\sqrt{3}$	$\sqrt{5} + 2\sqrt{5} + 3\sqrt{5}$ ★ $6\sqrt{5}$	$4\sqrt{12} - \sqrt{75}$ ★ $3\sqrt{3}$
$\sqrt{45x^3} - \sqrt{20x^3}$ $x\sqrt{5x}$	$5\sqrt[3]{32} - 2\sqrt[3]{108}$ ★ $4\sqrt[3]{4}$	$3\sqrt[3]{16} + \sqrt[3]{54}$ ★ $9\sqrt[3]{2}$
$2\sqrt[3]{125a^4} - 5\sqrt[3]{8a}$ $10a\sqrt[3]{a} - 10\sqrt[3]{a}$	$9\sqrt[3]{40a} - 7\sqrt[3]{135a}$ ★ $-3\sqrt[3]{5a}$	$5\sqrt[3]{16y^4} + 7\sqrt[3]{2y}$ ★ $10y\sqrt[3]{2y} + 7\sqrt[3]{2y}$
$6\sqrt{18} + 3\sqrt{50}$ $33\sqrt{2}$	$\sqrt[3]{54} + \sqrt[3]{16}$ ★ $5\sqrt[3]{2}$	$\sqrt[4]{32} + \sqrt[4]{48}$ ★ $2\sqrt[4]{2} + 2\sqrt[4]{3}$

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Packet p. 3 and 4