

Foundations of Algebra

Unit 3: Arithmetic to Algebra

Notes

## Unit 3: Arithmetic to Algebra

### Learning Goal 3.2 – Radical Expressions

After completion of this unit, you will be able to...

#### Learning Target #2: RadiCal Expressions

- Simplify Radical Expressions
- Multiply Radical Expressions
- Add & Subtract Radical Expressions

#### Timeline for Unit 3

Monday	Tuesday	Wednesday	Thursday	Friday
<b>11<sup>th</sup></b>	<b>12<sup>th</sup></b>	<b>11<sup>th</sup></b>	<b>12<sup>th</sup></b> Day 1 – Interpreting Expressions, Terms, Factors, & Coefficients and Simplifying Expressions	<b>13<sup>th</sup></b> Day 2 – Evaluating Numerical and Algebraic Expressions
<b>16<sup>th</sup></b> Day 3 – Creating Algebraic Expressions from a Context	<b>17<sup>th</sup></b> Day4/5 – Interpreting Algebraic Expressions	<b>18<sup>th</sup></b> Exponents and Radicals with Variables	<b>19<sup>th</sup></b> Multiply and Adding Radicals with Variables	<b>20<sup>th</sup></b> <b>3.1 Assessment &amp; 3.2 Assessment</b>

	Monday	Tuesday	Wednesday	Thursday	Friday
<b>AM</b>	NONE	NONE	Mr. Webb 7:45 – 8:15 Room 1205	Mr. Watson 7:45 – 8:15 Room 1208	Mr. Watson 7:45 – 8:15 Room 1208
<b>PM</b>	Mrs. Petersen 3:30 – 4:30 Room 1210	Mr. Webb 3:30 – 4:30 Room 1205	Mrs. Jackson 3:30 – 4:30 Room 1210	Mrs. Jackson 3:30 – 4:30 Room 1210	NONE

**Review of Exponents**

In 8<sup>th</sup> grade, you learned how to simplify exponential expressions. We are going to review several of those properties in preparation for the rest of our unit.

**Definition of a Power**

$$Ax^b = A \cdot \underbrace{x \cdot x \cdot \dots \cdot x}_{b \text{ times}}$$

A is the Coefficient of the power  
 x is the Variable of the power  
 b is the exponent of the power

ex:  $7x^3$

**Exploring Multiplying Powers**

Original	Expanded Form	Simplified Form	Rule
$x^4 \cdot x^3$	$x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$	$x^7$	Multiplying Powers $x^m \cdot x^n = x^{m+n}$
$x^2 \cdot x^4$	$x \cdot x \cdot x \cdot x \cdot x \cdot x$	$x^6$	
$5x^4 \cdot -2x^4$	$5 \cdot -2 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x$	$-10x^8$	
$-2x^4 \cdot 3y^3 \cdot x^5 \cdot 4y^4$	$-2 \cdot 3 \cdot 1 \cdot 4 \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y \cdot y$	$-24x^9y^7$	

★ Multiply coefficients, add exponents.

Multiplying & Simplifying Radical Expressions

Complete the table below.

1	2	3	4	5	6	7	8	9	10	$x$	$x^2 = x \cdot x$
1	4	9	16	25	36	49	64	81	100	$x^2$	
$\sqrt{1}$	$\sqrt{4}$	$\sqrt{9}$	$\sqrt{16}$	$\sqrt{25}$	$\sqrt{36}$	$\sqrt{49}$	$\sqrt{64}$	$\sqrt{81}$	$\sqrt{100}$	$\sqrt{x^2}$	$\sqrt{x \cdot x}$
1	2	3	4	5	6	7	8	9	10	$x$	

Simplifying Radicals

Review:

a.  $\sqrt{25}$       b.  $\sqrt{24}$

$\sqrt{25} = 5$        $\sqrt{24} = 2\sqrt{6}$

Handwritten work for a:  $\sqrt{25} = \sqrt{5 \cdot 5} = 5$

c.  $5\sqrt{32}$       d.  $-2\sqrt{63}$

Handwritten work for c:  $5\sqrt{32} = 5\sqrt{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2} = 5 \cdot 2 \cdot 2 \sqrt{2} = 20\sqrt{2}$

Handwritten work for d:  $-2\sqrt{63} = -2\sqrt{3 \cdot 3 \cdot 7} = -2 \cdot 3 \sqrt{7} = -6\sqrt{7}$

Simplifying Radicals with Variables

When simplifying radical expressions, you simplify the variables using the same method as you did previously (Remember  $\sqrt{x^2} = x$ ; square and square roots undo each other).

a.  $\sqrt{x^8}$

Handwritten work:  $\sqrt{x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x} = x \cdot x \cdot x \cdot x = x^4$

b.  $\sqrt{x^5}$

Handwritten work:  $\sqrt{x \cdot x \cdot x \cdot x \cdot x} = x \cdot x \sqrt{x} = x^2 \sqrt{x}$

Handwritten work for  $\sqrt{x^5}$ :  $\sqrt{x^5} = \sqrt{x^4 \cdot x^1} = x^2 \sqrt{x}$

c.  $\sqrt{y^4 z^3}$

Handwritten work:  $\sqrt{y \cdot y \cdot y \cdot y \cdot z \cdot z \cdot z} = y \cdot y \cdot z \sqrt{z} = y^2 z \sqrt{z}$

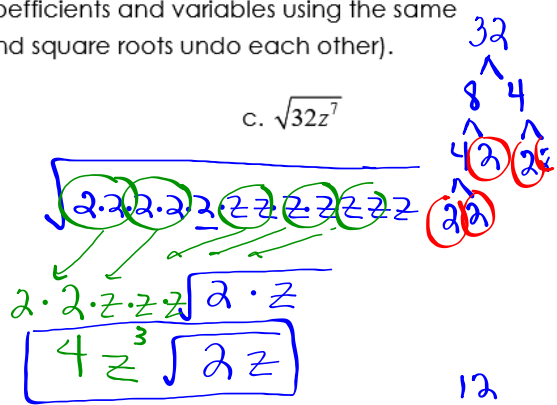
Simplifying Radical Expressions with Square Roots

When simplifying radical expressions, you simplify both the coefficients and variables using the same method as you did previously (Remember  $\sqrt{x^2} = x$ ; square and square roots undo each other). Remember, anything that is left over stays under the radical!

a.  $\sqrt{9x^6}$

b.  $\sqrt{4x^4}$

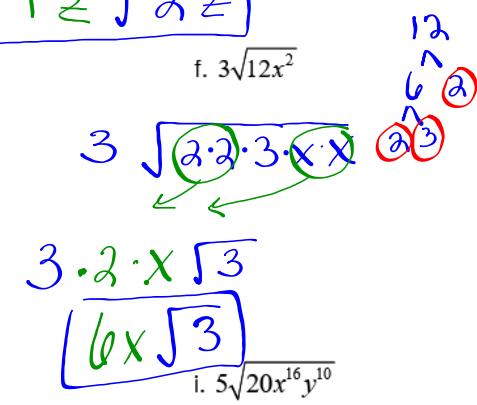
c.  $\sqrt{32z^7}$



d.  $\sqrt{45y^2}$

e.  $\sqrt{108x^5y^9}$

f.  $3\sqrt{12x^2}$



g.  $3\sqrt{18a^4}$

h.  $-2\sqrt{36f^3g^4}$

i.  $5\sqrt{20x^{16}y^{10}}$

j.  $2\sqrt{27a^4b}$

k.  $-\sqrt{54m^4n^2}$

l.  $-8\sqrt{48g^4h^7}$