Tests will be handed back at the end of the period.

- Your term grade is written at the bottom of the third page of the test.

- A retake will be available next Monday and Tuesday. You must go over the test yourself, then with me before you can take the retake.

- Any IXL that needs to be completed for this term must be done by 5pm Thursday.

Warm Up

1/20

Simplify the following:

$$3x^4y^2 \cdot 5x^2y^1z^3$$

$$3 \cdot 5 \cdot x^4 \cdot x^2 \cdot y^2 \cdot y \cdot z^3$$

$$15x^6y^3z^3$$


Questions from last week?

Let's review what we learned!

1. Work with your group to compare the bases and exponents of the original form to the base and exponent of the simplified exponent form. **Write a statement to describe the relationship you see.**

$$x^5 \cdot x^4 = x^{5+4} = x^9$$

telling us how many x's we are multiplying

2. Visualize how you would expand $20^{12} \cdot 20^8$ in your mind. What would this expression be in simplified exponent form? Describe your reasoning.

$$20^{12} \cdot 20^8 = 20^{20}$$

20, 12 times

20, 8 times

We are multiplying 20, twenty times

3. A group of students rewrote the expression $10^3 \cdot 5^4$ as 50^7. Is their simplification correct? Explain your reasoning.

$$10^3 \cdot 5^4 \stackrel{?}{=} 50^7$$

$$10 \cdot 10 \cdot 10 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \stackrel{?}{=} 50 \cdot 50 \cdot 50 \cdot 50 \cdot 50 \cdot 50 \cdot 50$$

$$(10 \cdot 5)(10 \cdot 5)(10 \cdot 5) \cdot 5$$

$$50 \cdot 50 \cdot 50 \cdot 5 \stackrel{?}{=} 50^7$$

$$50^3 \cdot 5 \stackrel{?}{\neq} 50^7$$

How to simplify the following ...

$x^5 \cdot x^3 = x^8$

$x^3y^7 =$ already simplified

$3x^2 \cdot xy^2 = 3x^3y^2$

Homework Questions?

NAME ______________________ DATE ____________ PERIOD _____

8-1 Study Guide and Intervention

Multiplying Monomials

Multiply Monomials A **monomial** is a number, a variable, or a product of a number and one or more variables. An expression of the form x^n is called a **power** and represents the product you obtain when x is used as a factor n times. To multiply two powers that have the same base, add the exponents.

Product of Powers	For any number a and all integers m and n, $a^m \cdot a^n = a^{m+n}$.

Example 1 **Simplify $(3x^6)(5x^2)$.**

$(3x^6)(5x^2) = (3)(5)(x^6 \cdot x^2)$ Associative Property

$= (3 \cdot 5)(x^{6+2})$ Product of Powers

$= 15x^8$ Simplify.

The product is $15x^8$.

Example 2 **Simplify $(-4a^3b)(3a^2b^5)$.**

$(-4a^3b)(3a^2b^5) = (-4)(3)(a^3 \cdot a^2)(b \cdot b^5)$

$= -12(a^{3+2})(b^{1+5})$

$= -12a^5b^6$

The product is $-12a^5b^6$.

Exercises

Simplify.

1. $y(y^5)$

y^6

2. $n^2 \cdot n^7$

n^9

3. $(-7x^2)(x^4)$

$-7x^6$

4. $x(x^2)(x^4)$

x^7

5. $m \cdot m^5$

m^6

6. $(-x^3)(-x^4) = (-1)(-1)x^3x^4$

x^7

7. $(2a^2)(8a)$

$16a^3$

8. $(rs)(rs^3)(s^2)$

r^2s^6

9. $(x^2y)(4xy^3)$

$4x^3y^4$

10. $\frac{1}{3}(2a^3b)(6b^3)$

$4a^3b^4$

11. $(-4x^3)(-5x^7) = (-4)(-5)x^3x^7$

$20x^{10}$

12. $(-3j^2k^4)(2jk^6)$

$-6j^3k^{10}$

13. $(5a^2bc^3)\left(\frac{1}{5}abc^4\right)$

$a^3b^2c^7$

14. $(-5xy)(4x^2)(y^4)$

$-20x^3y^5$

15. $(10x^3yz^2)(-2xy^5z)$

$-20x^4y^6z^3$

8-1 ## Skills Practice
Multiplying Monomials

Simplify.

7. $a^2(a^3)(a^6) = a^{11}$

8. $x(x^2)(x^7) = x^{10}$

9. $(y^2z)(yz^2) = y^3z^3$

10. $(\ell^2k^2)(\ell^3k) = \ell^5k^3$

11. $(e^2f^4)(e^2f^2) = e^4f^6$

12. $(cd^2)(c^3d^2) = c^4d^4$

13. $(2x^2)(3x^5) = 6x^7$

14. $(5a^7)(4a^2) = 20a^9$

15. $(4xy^3)(3x^3y^5) = 12x^4y^8$

16. $(7a^5b^2)(a^2b^3) = 7a^7b^5$

17. $(-5m^3)(3m^8) = -15m^{11}$

18. $(-2c^4d)(-4cd) = 8c^5d^2$

When in doubt, expand it out!

$(-2c^4d)(-4cd)$

$(-2)(-4)\cdot c\cdot c\cdot c\cdot c\cdot d\cdot c\cdot d$

$8c^5d^2$

Part B

When a number is raised to a power and then raised to a power again, the result follows a consistent pattern. Copy and complete the table below in your notebook. Expand each expression into factored form and then rewrite it with new exponents as shown in the example.

Original Form	Factored Form	Simplified Exponent Form
$(5^2)^5$	$(5\cdot5)(5\cdot5)(5\cdot5)(5\cdot5)(5\cdot5)$	5^{10}
$(2^2)^4$	$2^2\cdot2^2\cdot2^2\cdot2^2 = 2\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2\cdot2$	2^8
$(3^7)^2$		3^{14}
$(x^3)^5$		x^{15}
$(x^3y^2)^2$		x^6y^4

1. Work with your group to describe the pattern between the exponents in the original form and the exponent(s) in the simplified exponent form. **Write a statement to describe the relationship you see.**

We multiply the exponent on the outside of the parentheses with the exponent inside.

$(x^3)^5$

3 x's   5 times $x^{3\cdot5} = x^{15}$

2. Visualize $(20^{12})^8$ written in factored form.

   a. What is multiplied (what is the base)? 20

   b. How many times is it multiplied? $12 \cdot 8 = 96$ times!

   c. Use the expression you visualized to help you rewrite the expression in simplified exponent form.

   d. Describe in detail how you figured out what exponent to use in the simplified exponent form.

   e. In Part A, #2 you visualized the factored form of the expression $20^{12} \cdot 20^8$. Compare the **factored** form of that expression to the **factored** form of $(20^{12})^8$ from above. How are the two expressions different?

$$20^{12} \cdot 20^{8} \stackrel{?}{=} (20^{12})^{8}$$

$$20^{20} \stackrel{?}{\cancel{=}} 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot 20^{12} \cdot \ldots$$

$$(x^2)^3 = x^2 \cdot x^2 \cdot x^2 = x^6$$
$$= x^{2\cdot 3} = x^6$$

$$(xy^2)^4 = x^4 \cdot y^8 = x^4 y^8$$

$$(2x^3y)^3 = 2^3 x^9 y^3 = 8x^9y^3$$

$$(x^2)^5 \cdot (x^3) = x^{2\cdot 5} \cdot x^3 = x^{10} \cdot x^3 = x^{13}$$

$$(4x^2b)^2 = 4^2 \cdot (x^2)^2 \cdot b^2$$
$$= 16x^4b^2$$

$$(-3ab^4)^3 = -27a^3b^{12}$$

$$(-4xy)^3(-2x^2)^3 = 512x^7y^3$$

8-1 Study Guide and Intervention *(continued)*

Multiplying Monomials

Powers of Monomials An expression of the form $(x^m)^n$ is called a **power of a power** and represents the product you obtain when x^m is used as a factor n times. To find the power of a power, multiply exponents.

Power of a Power	For any number a and all integers m and n, $(a^m)^n = a^{mn}$.
Power of a Product	For any number a and all integers m and n, $(ab)^m = a^m b^m$.

Example **Simplify $(-2ab^2)^3(a^2)^4$.**

$(-2ab^2)^3(a^2)^4 = (-2ab^2)^3(a^8)$	Power of a Power
$= (-2)^3(a^3)(b^2)^3(a^8)$	Power of a Product
$= (-2)^3(a^3)(a^8)(b^2)^3$	Commutative Property
$= (-2)^3(a^{11})(b^2)^3$	Product of Powers
$= -8a^{11}b^6$	Power of a Power

The product is $-8a^{11}b^6$.

Exercises

Simplify.

1. $(y^5)^2$

2. $(n^7)^4$

3. $(x^2)^5(x^3)$

4. $-3(ab^4)^3$

5. $(-3ab^4)^3$

6. $(4x^2b)^3$

7. $(4a^2)^2(b^3)$

8. $(4x)^2(b^3)$

9. $(x^2y^4)^5$

10. $(2a^3b^2)(b^3)^2$

11. $(-4xy)^3(-2x^2)^3$

12. $(-3j^2k^3)^2(2j^2k)^3$

13. $(25a^2b)^3\left(\frac{1}{5}abc\right)^2$

14. $(2xy)^2(-3x^2)(4y^4)$

15. $(2x^3y^2z^2)^3(x^2z)^4$

16. $(-2n^6y^5)(-6n^3y^2)(ny)^3$

17. $(-3a^3n^4)(-3a^3n)^4$

18. $-3(2x)^4(4x^5y)^2$

Homework

Finish Classwork