

Name: \_\_\_\_\_  
 Period: \_\_\_\_\_  
 Date: \_\_\_\_\_

### Laws of Exponents Worksheet

The laws of exponents: (let a and b be real numbers and m and n be positive integers.)

Then:

1.  $a^m \times a^n = a^{m+n}$       Example:  $a^3 \times a^4 = a^{3+4} = a^7$
2.  $(ab)^m = a^m b^m$       Example:  $(ab)^2 = a^2 b^2$
3.  $(a^m)^n = a^{mn}$       Example:  $(a^4)^3 = a^{4 \times 3} = a^{12}$

Symbol       $x^4$  means  $x \cdot x \cdot x \cdot x$

<b>Example 1</b>	<b>Simplify:</b>	a. $(-2x^3y^2)(-3x^2y)$	b. $(p^5q)^4$	c. $(-a^2)^3$
<b>Solution</b>		$\begin{aligned} a. (-2x^3y^2)(-3x^2y) &= (-2)(-3)(x^3 \cdot x^2)(y^2 \cdot y^1) \quad (y = y^1) \\ &= 6 \cdot (x^{3+2}) \cdot (y^{2+1}) \quad (\text{Law 1}) \\ &= 6x^5y^3 \end{aligned}$	$\begin{aligned} b. (p^5q)^4 &= (p^5)^4 \cdot q^4 \quad (\text{Law 2}) \\ &= p^{(5 \cdot 4)} \cdot q^4 \quad (\text{Law 3}) \\ &= p^{20} \cdot q^4 \end{aligned}$	$\begin{aligned} c. (-a^2)^3 &= [(-1)a^2]^3 \quad [ -a^2 = (-1)a^2 ] \\ &= (-1)^3(a^2)^3 \quad (\text{Law 2}) \\ &= -1 \cdot a^{(2 \cdot 3)} \quad (\text{Law 3}) \\ &= -a^6 \end{aligned}$

Simplify.

- |                    |                           |                             |                       |
|--------------------|---------------------------|-----------------------------|-----------------------|
| 1. $a^3 \cdot a^3$ | 2. $c^4 \cdot c^2$        | 3. $(a^3)^3$                | 4. $(c^4)^2$          |
| 5. $(mn^2)^4$      | 6. $(x^2y^3)^5$           | 7. $5x^3 \cdot 2x^2$        | 8. $-2r^5 \cdot 6r^8$ |
| 9. $(-x^5)^2$      | 10. $(-x^2)^5$            | 11. $(4bd^2)(b^3d^2)$       | 12. $(-6m^4n^3)(2mn)$ |
|                    | 13. $(-p^3)(pq^3)(-p^2q)$ | 14. $(4r^4s^2)(-3rs^3)(rs)$ |                       |

<b>Example 2</b>	<b>Simplify:</b>	a. $r(r^3)^2r^8$	b. $(2x^2yz^4)^3$	c. $(3t^2)^3(2t^4)^3$
<b>Solution</b>		$\begin{aligned} a. r(r^3)^2r^8 &= r^1 \cdot r^{6} \cdot r^8 \quad (\text{Law 3}) \\ &= r^{1+6+8} \quad (\text{Law 1}) \\ &= r^{15} \end{aligned}$	$\begin{aligned} b. (2x^2yz^4)^3 &= 2^3(x^2)^3(y^1)^3(z^4)^3 \quad (\text{Law 2}) \\ &= 8x^6y^3z^{12} \quad (\text{Law 3}) \end{aligned}$	$\begin{aligned} c. (3t^2)^3(2t^4)^3 &= 3^3(t^2)^3 \cdot 2^3(t^4)^3 \quad (\text{Law 2}) \\ &= 27t^6 \cdot 4t^{12} \quad (\text{Law 3}) \\ &= 108t^{14} \quad (\text{Law 1}) \end{aligned}$