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 $x \cdot x \cdot x \cdot x$

Example 1   **Simplify:**   **a.** $(-2x^3y^2)(-3x^2y)$ **b.** $(p^5q)^4$ **c.** $(-a^2)^3$

Solution   a. $(-2x^3y^2)(-3x^2y) = (-2)(-3)(x^3 \cdot x^2)(y^2 \cdot y^1)$ $(y = y^1)$
                                $= 6 \cdot (x^{3+2}) \cdot (y^{2+1})$ (Law 1)
                                $= 6x^5y^3$

   b. $(p^5q)^4 = (p^5)^4 \cdot q^4$ (Law 2)   c. $(-a^2)^3 = [(-1)a^2]^3$ $[-a^2 = (-1)a^2]$
               $= p^{(5 \cdot 4)} \cdot q^4$ (Law 3) $= (-1)^3(a^2)^3$ (Law 2)
               $= p^{20} \cdot q^4$ $= -1 \cdot a^{(2 \cdot 3)}$ (Law 3)
                                                        $= -a^6$

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. $(4r^4s^2)(-3rs^3)(rs)$

Example 2   **Simplify:**   **a.** $r(r^3)^2r^8$ **b.** $(2x^2yz^4)^3$ **c.** $(3t^2)^3(2t^4)^3$

Solution   a. $r(r^3)^2r^8$ $=$ $r^1 \cdot r^6 \cdot r^8$ (Law 3)
                       $=$ r^{1+6+8} (Law 1)
                       $=$ r^{15}

   b. $(2x^2yz^4)^3$ $=$ $2^3(x^2)^3(y^1)^3(z^4)^3$ (Law 2)
                      $=$ $8x^6y^3z^{12}$ (Law 3)

   c. $(3t^2)^3(2t^4)^3 =$ $3^3(t^2)^3 \cdot 2^2(t^4)^2$ (Law 2)
                      $=$ $27t^6 \cdot 4t^8$ (Law 3)
                      $=$ $108t^{14}$ (Law 1)