

6.1 PROPERTIES OF EXPONENTS

KEY CONCEPT		For Your Notebook
Properties of Exponents		
Let a and b be real numbers and let m and n be integers.		
Property Name	Definition	Example
Product of Powers	$a^m \cdot a^n = a^{m+n}$ <i>Keep base/add exp.</i>	$5^3 \cdot 5^{-1} = 5^{3+(-1)} = 5^2 = 25$
Power of a Power	$(a^m)^n = a^{mn}$ <i>mult. exp.</i>	$(3^3)^2 = 3^{3 \cdot 2} = 3^6 = 729$
Power of a Product	$(ab)^m = a^m b^m$	$(2 \cdot 3)^4 = 2^4 \cdot 3^4 = 1296$
Negative Exponent	$a^{-m} = \frac{1}{a^m}, a \neq 0$	$7^{-2} = \frac{1}{7^2} = \frac{1}{49}$
Zero Exponent	$a^0 = 1, a \neq 0$	$(-89)^0 = 1$
Quotient of Powers	$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$ <i>Keep base/subtract exp.</i>	$\frac{6^{-3}}{6^{-6}} = 6^{-3 - (-6)} = 6^3 = 216$
Power of a Quotient	$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$	$\left(\frac{4}{7}\right)^2 = \frac{4^2}{7^2} = \frac{16}{49}$

SIMPLIFY.

- $(a^2 b^2 c^3)(a^2 bc)$
 $a^4 b^3 c^4$
- $(6x^2 y^3)(4xyz)$
 $6x^3 y^4 z$
- $(2ab^2)(-4a^3 b^3 c)$
 $-8a^4 b^5 c$

SIMPLIFY.

$$4. (2^2)^4 = 2^{2 \cdot 4} = 2^8 = 256$$

$$5. (3xy^2)^2 = 3^2 x^2 (y^2)^2 = 9x^2 y^4$$

product

$$6. (-2r^2s)^3 = (-2)^3 (r^2)^3 s^3 = -8r^6 s^3$$

$$7. (-2xy^3)^4 = (-2)^4 x^4 (y^3)^4 = 16x^4 y^{12}$$

SIMPLIFY.

$$8. (2a^2b)(4ab^2)$$

$$(2^2)(a^2)^1 b^1 (4ab^2)$$

$$\underline{4} a^4 b^2 \cdot \underline{4} ab^2$$

$$16a^5 b^4$$

$$9. 3x^2(-2xy)^2$$

$$3x^2 \cdot (-2)^2 (x)^2 (y)^2$$

$$\underline{3} x^2 \cdot \underline{4} x^2 y^2$$

$$10. (-xy^2)(-2x^2y)(-4xy)$$

$$(-1)^3 (x)^3 (y^2)^3 (-2)^2 (x^2)^2 (y)^2 \cdot -4xy$$

$$\underline{-1} x^3 y^6 \cdot \underline{4} x^4 y^2 \cdot \underline{-4} xy$$

$$16x^8 y^9$$

SIMPLIFY.

$$11. \frac{-24x^2y^2}{6xy^4}$$

$$\downarrow$$

$$-4x^{2-1}y^{2-4}$$

$$\frac{-4xy^{-2}}{1}$$

$$\frac{-4x}{y^2}$$

$$12. \frac{5ab^3c^4}{15b^5c^3}$$

$$\downarrow$$

$$\frac{1}{3}a^1b^{3-5}c^{4-3}$$

$$\frac{1}{3}ab^{-2}c$$

$$\frac{1ac}{3b^2}$$

$$13. \frac{8x^3y^5}{36x^7y^2}$$

$$\downarrow$$

$$\frac{2}{9}x^{3-7}y^{5-2}$$

$$\frac{2}{9}x^{-4}y^3$$

$$\frac{2y^3}{9x^4}$$

SIMPLIFY.

$$14. \left(\frac{xy^2}{4x^2} \right)^2$$

$$\frac{x^2(y^2)^2}{4^2(x^2)^2}$$

$$\frac{x^2y^4}{16x^4}$$

$$\frac{y^4}{16x^2}$$

$$15. \left(\frac{a^2bc^3}{2^4} \right)^4$$

$$\frac{(a^2)^4(b)^4(c^3)^4}{2^{16}}$$

$$\frac{16}{a^8b^4c^{12}}$$

$$16. \left(\frac{-6y^5}{3y^2} \right)^2$$

$$\left(-2y^3 \right)^2$$

$$(-2)^2(y^3)^2$$

$$4y^6$$