

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	$a^m \cdot a^n = a^{m+n}$	$5^3 \cdot 5^{-1} = 5^{3+(-1)} = 5^2 = 25$
Power of a Power	$(a^m)^n = a^{mn}$	$(3^3)^2 = 3^{3 \cdot 2} = 3^6 = 729$
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	$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$	$\frac{6^{-3}}{6^{-6}} = 6^{-3-(-6)} = 6^3 = 216$
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.

1. $(a^2 b^2 c^3)(a^2 b^2 c)$

$$a^4 b^4 c^4$$

2. $(6x^2 y^3)(xyz)$

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

3. $(2ab^2)(-4a^3 b^3 c)$

$$-8a^4 b^5 c$$

SIMPLIFY.

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

$$5. (3xy^2)^2 \quad 3^2 x^2 y^{2 \cdot 2} = \boxed{9x^2y^4}$$

$$6. (-2r^2s)^3 = (-2)^3 r^{2 \cdot 3} s^3 = \boxed{-8r^6s^3}$$

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

SIMPLIFY.

$$8. (2a^2b)^2(4ab^2) \quad (4a^4b^2)(4ab^2) = \boxed{16a^5b^4}$$

$$9. 3x^2(-2xy)^2 \quad (3x^2)(4x^2y^2) = \boxed{12x^4y^2}$$

$$10. (-xy^2)^3(-2x^2y)^2(-4xy)$$

$$(-1x^3y^6)(4x^4y^2)(-4xy) = \boxed{16x^8y^9}$$

SIMPLIFY.

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

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

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

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

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

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

$$13. \frac{4 \cdot 8x^3y^5}{4 \cdot 36x^7y^2}$$

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

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

SIMPLIFY.

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

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

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

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

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

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

$$\frac{36y^{10}}{9y^4}$$

$$4y^6$$

SIMPLIFY.

17. $\frac{x^2 y}{x^2 y^4}$

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

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

18. $\frac{(a^2 b^3)^0}{4}$

$$\frac{1}{4}$$

19. $\left(\frac{xy^3 z^5}{yz^3}\right)^0$

$$1$$

SIMPLIFY.

20. $\frac{x^{-3}}{y^{-1} z^4}$

21. $\frac{x^{-2} y^2}{3x^5 y^{-3}}$

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

ALL PROPERTIES TOGETHER

24.
$$\frac{(3x^{-2}y^3)(5xy^{-8})}{(x^{-3})^4y^{-2}}$$

25.
$$(a^{-3}b^2)^4(-2a^3b^7)^{-3}$$

ALL PROPERTIES TOGETHER

26.
$$\left(\frac{p^{-3}}{4r}\right)^{-3}\left(\frac{5r}{p^{-7}}\right)^{-2}$$

27.
$$\left[\frac{(2xy^{-2})^{-2}}{(xy^{-4})^{-1}}\right]^{-2}$$