

$$2^3 = 8 \div 2$$

$$2^2 = 4 \div 2$$

$$2^1 = 2 \div 2$$

$$2^0 = 1 \div 2$$

$$2^{-1} = \frac{1}{2}$$

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

$$2^{-3} = \frac{1}{8}$$

$$(17x^4y^{37}\odot)^0 = 1$$

$$\frac{a^3}{a^3} = \frac{\cancel{a} \cdot \cancel{a} \cdot \cancel{a}}{\cancel{a} \cdot \cancel{a} \cdot \cancel{a}} = 1$$

$$a^{3-3} = a^0 = \frac{1}{1} = 1$$

KEY CONCEPT		For Your Notebook
Definition of Zero and Negative Exponents		
Words	Algebra	Example
a to the zero power is 1.	$a^0 = 1, a \neq 0$	$5^0 = 1$
a^{-n} is the reciprocal of a^n .	$a^{-n} = \frac{1}{a^n}, a \neq 0$	$2^{-1} = \frac{1}{2}$
a^n is the reciprocal of a^{-n} .	$a^n = \frac{1}{a^{-n}}, a \neq 0$	$2 = \frac{1}{2^{-1}}$

Part 1 – Evaluate the expression

1) $4^{-3} = \frac{1}{4^3}$ 2) $(-3)^{-8} = \frac{1}{(-3)^8}$ 3) $(-5/12)^0 = 1$

KEY CONCEPT		For Your Notebook
Properties of Exponents		
Let a and b be real numbers, and let m and n be integers.		
$a^m \cdot a^n = a^{m+n}$	Product of powers property	Remember our Rules up to this point!
$(a^m)^n = a^{mn}$	Power of a power property	
$(ab)^m = a^m b^m$	Power of a product property	
$\frac{a^m}{a^n} = a^{m-n}, a \neq 0$	Quotient of powers property	
$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$	Power of a quotient property	

4) $(-2/7)^{-2} = \frac{7^2}{(-2)^2} = \frac{49}{4}$

5) $3^{-3} = \frac{1}{3^3} = \frac{1}{27}$

6) $4(2^{-4}/2^{-3}) = 4\left(\frac{2^{-4}}{2^{-3}}\right) = 4(2^{-4-(-3)}) = 4(2^{-1}) = 4\left(\frac{1}{2}\right) = 2$

Part 3 – Simplify.

7) $0^{-8} = \frac{1}{0^8} = \frac{1}{0}$ (Undefined)

8) $\frac{5m^7n^4}{m^2n^4}$

9) $(4x^{-3}y^5)^{-2} = 4^2 x^6 y^{-10} = \frac{16x^6}{y^{10}}$

10) $(-16x^{-3}y^5)^0 = 1$

Part 3 continued – Simplify.

11) $\frac{12x^8y^{-7}}{(4x^{-2}y^{-6})^2} = \frac{12x^8y^{-7}}{4^2x^{-4}y^{-12}} = \frac{12x^8y^{-7}}{16x^{-4}y^{-12}} = \frac{12x^{8-(-4)}y^{-7-(-12)}}{16} = \frac{12x^{12}y^5}{16} = \frac{3x^{12}y^5}{4}$

Part 3 continued – Simplify.

12) $\frac{12x^8y^{-7}}{(4x^{-2}y^{-12})^2} = \frac{12x^8y^{-7}}{4^2x^{-4}y^{-12}} = \frac{12x^{8-(-4)}y^{-7-(-12)}}{16} = \frac{12x^{12}y^5}{16} = \frac{3x^{12}y^5}{4}$