

3.3.20 Homework (Due 3.6.20) Name: _____ Period: ____

Write the actual value of each power shown below. A couple are already done for you.

10^0	10^1	10^2	10^3	10^4	10^5	10^6
1			1,000			

Write the actual value of each power shown below. A couple are already done for you.

10^0	10^{-1}	10^{-2}	10^{-3}	10^{-4}	10^{-5}	10^{-6}
1			$\frac{1}{1000}$		$\frac{1}{100000}$	

POWERS of 10				POWERS of 2	
Words	Number (as decimals)	Number (as Fractions)	Number (with Powers)	Number	Number (with Powers)
a.	1,000,000			64	
b.	100,000	$\frac{100,000}{1}$		32	
c.				16	
d.		$\frac{1,000}{1}$		8	
e. One hundred	100		10^2		2^2
f.	10	$\frac{10}{1}$	10^1		
g.	1			1	
h.	.1	$\frac{1}{10}$	$\frac{1}{10^1}$ or 10^{-1}		
i.		$\frac{1}{100}$			
j.	.001				
k. One ten thousandth					
l.		$\frac{1}{100,000}$			
m.					

Zero Exponent Property

Quotient	Expanded Form	Simplified	Thus...
$\frac{x^5}{x^5}$	$\frac{x \cdot x \cdot x \cdot x \cdot x}{x \cdot x \cdot x \cdot x \cdot x}$	$\frac{1}{1} = 1$	$\frac{x^5}{x^5} = 1$
$\frac{4^3}{4^3}$			
$\frac{(ab)^2}{(ab)^2}$			

Quotient	Simplify using the Quotient Rule	Thus...	Zero Exponent Property
$\frac{x^5}{x^5}$	$x^{5-5} = x^0$	$\frac{x^5}{x^5} = x^0$	Since $\frac{x^5}{x^5} = x^0$ and $\frac{x^5}{x^5} = 1$, then $x^0 = 1$
$\frac{4^3}{4^3}$			
$\frac{(ab)^2}{(ab)^2}$			

$$\rightarrow 2^{-3} = \frac{1}{2^3} = \frac{1}{8} \qquad 10^{-4} = \frac{1}{10^4} = \frac{1}{10,000} \qquad 5^{-2} = \frac{1}{5^2} = \frac{1}{25}$$

Negative Exponent Rule

Quotient	Column 1 rewritten in expanded form or as repeated multiplication.	Column 1 simplified using the Quotient Rule.	Compare your answers; one written as a fraction and the other in exponent form.
$\frac{3^3}{3^5}$	$\frac{3 \cdot 3 \cdot 3}{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3} = \frac{1}{3^2} = \frac{1}{9}$	$3^{3-5} = 3^{-2}$	$\frac{1}{3^2} = 3^{-2}$
$\frac{a^4}{a^7}$			
$\frac{a^3 b^6}{a^6 b^{10}}$			
$\frac{4^{15} a^{30}}{4^{20} a^{50}}$	<i>This is too long to expand, find a short cut.</i>		

Product of Powers

Column 1	Column 1 rewritten in expanded form or as repeated multiplication.	Column 2 rewritten in exponential form.
$5^3 \cdot 5^2$		
$b^6 \cdot b^2$		
$y^2 y^{10} y^4$		

Quotient of Powers

	Column 1 rewritten in expanded form or as repeated multiplication.	Column 2 rewritten in exponential form.
$\frac{3^5}{3^2}$		
$\frac{a^4}{a^3}$		
$\frac{b^3}{b^5}$		
$\frac{4^5 \cdot x^7}{4^2 \cdot x^4}$		

Power of a Product

	Column 1 rewritten in expanded form or as repeated multiplication.	Column 2 rewritten in exponential form.
$(ab)^4$		
$(abc)^3$		
$(a^2b)^3$		
$(4xy^2)^4$		

Example 1 Simplify $(3x^6)(5x^2)$.

$$(3x^6)(5x^2) = (3)(5)(x^6 \cdot x^2)$$

$$= (3 \cdot 5)(x^{6+2})$$

$$= 15x^8$$

The product is $15x^8$.

Group the coefficients
and the variables

Product of Powers

Simplify.

Example 2 Simplify $(-4a^3b)(3a^2b^5)$.

$$(-4a^3b)(3a^2b^5) = (-4)(3)(a^3 \cdot a^2)(b \cdot b^5)$$

$$= -12(a^{3+2})(b^{1+5})$$

$$= -12a^5b^6$$

The product is $-12a^5b^6$.

Example 3

Subtract the exponents $8-2=6$

$$\frac{12x^8y^3}{3x^2y}$$

$$= 4x^6y^2$$

Subtract the exponents $3-1=2$

Divide the coefficients $12/3=4$

1. $x^3 \cdot x^5$

2. $a^{15} \cdot a^{11}$

3. $3y^8 \cdot 2y^2$

4. $5j^4(-9j^5)$

5. $(x^5)^2$

6. $(a^3)^6$

7. $(h^4)^3$

8. $[(k^5)^2]^3$

9. $(xy)^7$

10. $(4gz)^2$

11. $(-2awy)^3$

12. $-3(km)^4$

13. $\frac{d^8}{d^4}$

14. $\frac{t^9}{t^3}$

15. $\frac{a^5b^3}{a^2d}$

16. $\frac{x^3y^2z}{x^2y^2}$