Name: Key Date: Period:

Algebra 1
Properties of Exponents -Day 3

Write in expanded form and then simplify if possible. Then identify a rule you could use for the quotient of powers.

1. $\frac{8^4}{8^6}$ $\frac{8\cdot8\cdot8\cdot8}{8\cdot8\cdot8\cdot8\cdot8\cdot8}$ $\frac{1}{8^2} = \boxed{\frac{1}{64}}$

2. $\frac{(-3)^3}{(-3)^2}$ $\frac{(-3)(-3)(-3)}{(-3)(-3)}$ $\frac{(-3)}{1} = \boxed{-3}$

3. $\frac{4x^5}{2x^3}$ $\frac{2\cdot2\cdot x\cdot x\cdot x\cdot x\cdot x}{1\cdot2\cdot x\cdot x\cdot x}$ $\frac{2x^2}{1} = \boxed{2x^2}$

4. $\frac{a^3b}{a^2b^4}$ $\frac{a\cdot a\cdot a\cdot b}{a\cdot a\cdot b\cdot b\cdot b\cdot b}$ $\boxed{\frac{a}{b^3}}$

Rule # 6 : Quotient of Powers Property $\frac{a^m}{a^n} = a^{m-n}$

When you divide powers that have the same base:

subtract the exponents, put the base and new exponent where the larger exponent was.

Practice Problems:

5. $\frac{a^9}{a^5}$ a^{9-5} top exponent is larger $\frac{a^4}{1} = \boxed{a^4}$

6. $\frac{y^3}{y^5}$ y^{5-3} bottom larger $\boxed{\frac{1}{y^2}}$

7. $\frac{-8x^3}{16x}$ x^{3-1} $\frac{-1x^2}{2} = \boxed{-\frac{x^2}{2}}$

8. $\frac{-x^3y^8}{x^5y^4}$ $\boxed{-\frac{y^4}{x^2}}$

Write in expanded form and then simplify if possible. Then identify a rule you could use for the power of a quotient.

9. $\left(\frac{2}{3}\right)^2$ $\left(\frac{2}{3}\right)\left(\frac{2}{3}\right)$ $\frac{2^2}{3^2} = \boxed{\frac{4}{9}}$

10. $\left(\frac{-3}{y}\right)^3$ $\frac{-3}{y}\cdot\frac{-3}{y}\cdot\frac{-3}{y}$ $\frac{(-3)^3}{y^3} = \boxed{\frac{-27}{y^3}}$

11. $\left(\frac{1}{x}\right)^5$ $\frac{1}{x}\cdot\frac{1}{x}\cdot\frac{1}{x}\cdot\frac{1}{x}\cdot\frac{1}{x}$ $\frac{1^5}{x^5} = \boxed{\frac{1}{x^5}}$

Rule # 7 : Power of a Quotient Property $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$

When you find the power of a quotient:

distribute the power to the numerator and denominator

Practice Problems:

12. $\left(\frac{1}{4}\right)^{-3}$

$\frac{(1)^{-3}}{(4)^{-3}} = \frac{(4)^3}{(1)^3}$

$= \boxed{64}$

13. $\left(\frac{4}{a}\right)^{0}$

$\frac{4^0}{a^0} = \frac{1}{1} = \boxed{1}$

14. $\left(\frac{2}{5}\right)^{-1}$ *flip the whole fraction

$\frac{2^{-1}}{5^{-1}} = \boxed{\frac{5}{2}}$

15. $\left(\frac{8}{b^2}\right)^{3}$

$\frac{8^3}{(b^2)^3} = \boxed{\frac{512}{b^6}}$

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

$\frac{(-3x)^2}{(y^6)^2} = \frac{(-3)^2 x^2}{y^{12}}$

$= \boxed{\frac{9x^2}{y^{12}}}$

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

$\frac{x^{-6}}{y^3} = \boxed{\frac{1}{x^6 y^3}}$

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

$\frac{(-2)^3 x^{-6}}{y^3} = \boxed{\frac{-8}{x^6 y^3}}$

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

$\frac{(-2)^{-3} x^6}{y^{-3}}$

$\frac{x^6 y^3}{(-2)^3} = \boxed{-\frac{x^6 y^3}{8}}$

Mixed Practice: Simplify Completely.

1.) $\frac{3^9}{3^5}$

$3^4 = \boxed{81}$

2.) $\frac{d^6}{5d^3}$

$\boxed{\frac{d^3}{5}}$

3.) $\frac{-9a^2}{18a^3}$

$\boxed{\frac{-1}{2a}}$

4.) $\frac{24a^3b^5c}{8a^5b^2c}$

$\boxed{\frac{3b^3}{a^2}}$

5.) $\left(\frac{2}{7}\right)^{-2}$

$\frac{2^{-2}}{7^{-2}} = \frac{7^2}{2^2} = \boxed{\frac{49}{4}}$

6.) $\left(\frac{a}{5}\right)^{3}$

$\frac{a^3}{5^3} = \boxed{\frac{a^3}{125}}$

7.) $\left(\frac{3x}{y}\right)^{4}$

$\frac{3^4 x^4}{y^4} = \boxed{\frac{81x^4}{y^4}}$

8.) $\left(\frac{-2w^2}{t^{-1}}\right)^{2}$

$\frac{(-2)^2 w^4}{t^{-2}} = 4w^4t^2$

$= \boxed{4t^2w^4}$

9.) $\frac{x^3 \cdot x^5}{x^2}$

$\frac{x^8}{x^2} = \boxed{x^6}$