

**Lesson 7.2 Notes (Division Properties of Exponents)****Objectives:**

- Divide monomials using the properties of exponents.
- Simplify expressions containing negative and zero exponents.

**Dividing Monomials:**

KeyConcept Quotient of Powers	
Words	To divide two powers with the same base, subtract the exponents.
Symbols	For any nonzero number $a$ , and any integers $m$ and $p$ , $\frac{a^m}{a^p} = a^{m-p}$ .
Examples	$\frac{c^{11}}{c^8} = c^{11-8}$ or $c^3$ $\frac{r^5}{r^2} = r^{5-2} = r^3$

  

KeyConcept Power of a Quotient	
Words	To find the power of a quotient, find the power of the numerator and the power of the denominator.
Symbols	For any real numbers $a$ and $b \neq 0$ , and any integer $m$ , $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$ .
Examples	$\left(\frac{3}{5}\right)^4 = \frac{3^4}{5^4}$ $\left(\frac{r}{t}\right)^5 = \frac{r^5}{t^5}$

**Examples:** Simplify each expression. Assume that no denominator equals zero.

$$1. \frac{5^5}{5^2} \quad 5^3 = \boxed{125}$$

$$2. \frac{m^6}{m^4} \quad m^2$$

$$3. \frac{a^2}{a} \quad a$$

$$4. \frac{x^5 y^3}{x^5 y^2} \quad y$$

$$5. \frac{xy^6}{y^4 x} \quad y^2$$

$$6. \left(\frac{2a^2 b}{a}\right)^3 \quad \frac{8a^4 b^3}{a^3} = \boxed{8a^3 b^3}$$

$$7. \left(\frac{2r^5 w^3}{r^4 w^3}\right)^4 \quad \frac{16r^{20} w^{12}}{r^{16} w^{12}} = \boxed{16r^4}$$

$$8. \left(\frac{3r^6 n^3}{2r^5 n}\right)^4 \quad \frac{81r^{24} n^{12}}{16}$$

**Negative and Zero Exponents:**

<b>KeyConcept Zero Exponent Property</b>	
Words	Any nonzero number raised to the zero power is equal to 1.
Symbols	For any nonzero number $a$ , $a^0 = 1$ .
Examples	$15^0 = 1$ $\left(\frac{b}{c}\right)^0 = 1$ $\left(\frac{2}{7}\right)^0 = 1$

  

<b>KeyConcept Negative Exponent Property</b>	
Words	For any nonzero number $a$ and any integer $n$ , $a^{-n}$ is the reciprocal of $a^n$ . Also, the reciprocal of $a^{-n}$ is $a^n$ .
Symbols	For any nonzero number $a$ and any integer $n$ , $a^{-n} = \frac{1}{a^n}$ .
Examples	$2^{-4} = \frac{1}{2^4} = \frac{1}{16}$ $\frac{1}{f^{-4}} = f^4$

**When is an expression simplified?**

- Only Positive Exponents
- Each Base Appears Exactly Once
- No Powers of Powers
- All Fractions are in Simplest Form

**Examples:** Simplify each expression. Assume that no denominator equals zero.

$$1. \frac{2^2}{2^{-3}} \quad 2^5 = \boxed{32}$$

$$2. \frac{m}{m^{-4}} \quad m^5$$

$$3. \frac{b^{-4}}{b^{-5}} \quad b$$

$$4. \frac{(-x^{-1}y)^0}{4w^{-1}y^2} \quad \frac{w}{4y^2}$$

$$5. \frac{x^4y^0}{x^{-2}} \quad x^6$$

$$6. \frac{(6a^{-1}b)^2}{(b^2)^4} \quad \frac{36a^{-2}b^2}{b^8} = \boxed{\frac{36}{a^2b^6}}$$

$$7. \frac{m^{-3}t^{-5}}{(m^2t^3)^{-1}} \quad \frac{m^{-3}t^{-5}}{m^{-2}t^{-3}} = m^{-1}t^{-2} = \boxed{\frac{1}{mt^2}}$$

$$8. \left(\frac{4m^2n^2}{8m^{-1}l}\right)^0 \quad \boxed{1}$$