Lesson 4: Simplifying Expressions with Exponents

Summary of Exponent Laws:

Rule	Numeric Example	Algebraic Example
Product	$2^3 \times 2^4 = 2^7$	$a^m \times a^n = a^{m+n}$
Quotient	$5^6 \div 5^2 = 5^4$	$a^m \div a^n = a^{m-n}$
Power of a power	$(3^3)^2 = 3^6$	$(a^m)^n = a^{mn}$
Power of a product	$(2 \times 3)^4 = 2^4 \times 3^4$	$(xy)^m = x^m y^m$
Power of a quotient	$\left(\frac{3}{5}\right)^2 = \frac{3^2}{5^2}$	$\left(\frac{x}{y}\right)^m = \frac{x^m}{y^m}, y \neq 0$
Zero exponent	40 = 1	$a^0 = 1, a \neq 0$
Negative exponents	$6^{-2} = \frac{1}{6^2}$	$a^{-n} = \frac{1}{a^n}, a \neq 0$
Rational exponents	$8^{\frac{2}{3}} = \left(\sqrt[3]{8}\right)^2$	$x^{\frac{m}{n}} = \sqrt[n]{x^m} = \left(\sqrt[n]{8}\right)^m$

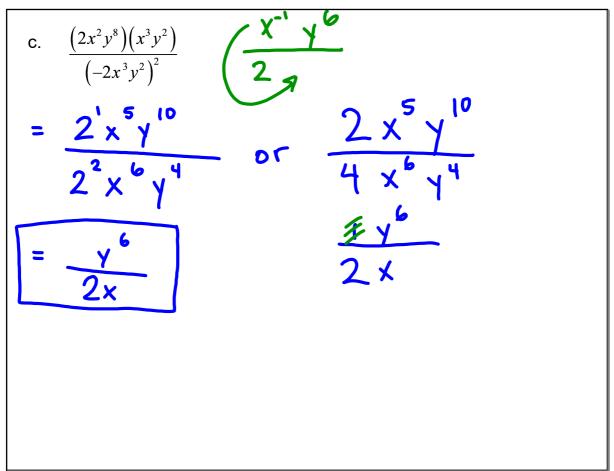
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- When simplifying expressions involving exponents follow the laws and rules for exponents and the order of operations.
 - o Power of a power rule must be done BEFORE product rule (exponents before multiplication).
 - o Simplify all expressions in the numerator and denominator FIRST, before using quotient rule to divide (large fraction bar is a grouping symbol)
 - o When you have nested grouping symbols, simplify the innermost first.
- Rewrite any decimal exponents as fractions.
- Rewrite numbers as powers with the same bases, if possible.
- Express all final answers using **positive exponents**.

• Express all answers in **rational form** (no decimals!)
Ex 1) Simplify, then evaluate. Express answers in rational form with positive

a)
$$\frac{(2x^3)^4(-x^2)}{8x^4}$$

 $=(2^4x^{12})(-x^2)$
 $=(2^3x^{-4})$
 $=(2^4x^{12})(-x^2)$
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Ex 2) Simplify. Express answers with positive exponents

a)
$$\left(\frac{x^5(y^2)^3}{x^3y^8}\right)^{-2}$$

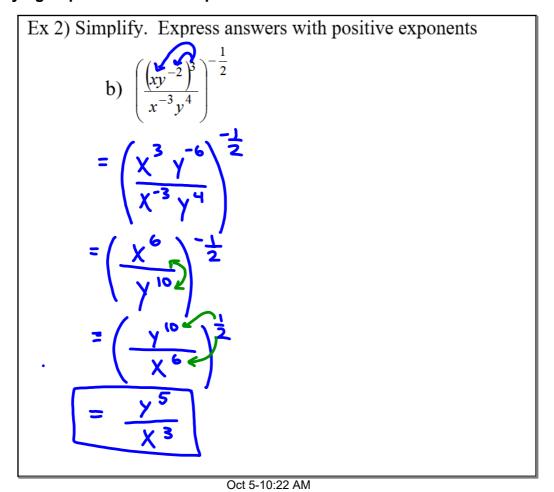
$$= \left(\frac{x^5}{x^3}\right)^{-2}$$

$$= \left(\frac{x^2}{y^2}\right)^{-2}$$

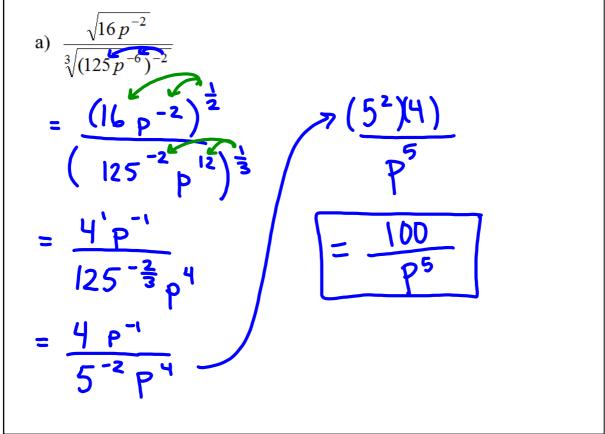
$$= \left(\frac{y^2}{x^2}\right)^2$$

$$= \frac{y^4}{x^4}$$

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Ex 3) Simplify, then evaluate. Express answers in rational form with positive exponents



Ex 3) Simplify then evaluate. Express answers in rational form with positive exponents

b)
$$\frac{\left(16x^3\right)^2 \left(8y^2\right)}{32\left(xy^2\right)^4} = 1.5$$

$$= \left(\frac{2^4x^3}{32}\right)^2 \left(\frac{2^3y^2}{2^3}\right) = 1.5$$

$$= \left(\frac{2^8x^6}{2^3}\right)^2 \left(\frac{2^3y^2}{2^3}\right) = 1.5$$

$$= \left(\frac{2^8x^6}{2^3}\right)^2 \left(\frac{2^3y^2}{2^3}\right) = 1.5$$

$$= \left(\frac{2^3x^3}{2^3}\right)^2 = \frac{3}{2}$$

$$= \left(\frac{y^3}{2^3x^3}\right)^2 = \frac{18}{2} = 9$$

$$= \left(\frac{y^3}{2^3x^3}\right)$$

$$= \frac{y^3}{512x^3}$$
Do ALL homework questions without a calculator, unless specified otherwise.

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HW U2L4:

p.235 #1-2ace, 3, 4-9ace, 11
 (calculator permitted for 11b)