

Algebra 2
 1.5 part 2
 Zero and Negative Exponents
Definition of Zero and Negative Exponents

$= \frac{1}{(4x)^2} (4x)^2$ $4x^2 = \frac{4}{x^2}$	<p>Algebra</p> $a^0 = 1, a \neq 0$ $\frac{a^{-n}}{1} = \frac{1}{a^n}, a \neq 0$ $\frac{a^n}{1} = \frac{1}{a^{-n}}, a \neq 0$	<p>Example</p> $5^0 = 1$ $(\frac{x^3 \cdot y^4}{2x^2})^0$ $2^{-1} = \frac{1}{2}$ $\frac{2^1}{1} = \frac{1}{2^{-1}}$
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EXAMPLE 1 Use definition of zero and negative exponents

<p>a. 3^{-2}</p> $\frac{1}{3^2}$ $\frac{1}{9}$	<p>b. $(-7)^0$</p> 1	<p>c. $(\frac{1}{5})^{-2}$</p> $\frac{5^2}{1^2}$ $\frac{25}{1}$ 25	<p>d. 0^{-3}</p> $\frac{1}{0^3}$ $\frac{1}{0}$ undefined
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GUIDED PRACTICE for Example 1

Evaluate the expression.

1. $(\frac{2}{3})^0$

$$1$$

2. $(-8)^{-2}$

$$\frac{1}{(-8)^2}$$

$$\frac{1}{64}$$

3. $\frac{1}{2^{-3}}$

$$2^3$$

$$8$$

4. $(-1)^0$

$$1$$

Review Properties of ExponentsLet a and b be real numbers, and let m and n be integers.

$$a^m \cdot a^n = a^{m+n} \quad \text{Product of powers property}$$

$$(a^m)^n = a^{mn} \quad \text{Power of a power property}$$

$$(ab)^m = a^m b^m \quad \text{Power of a product property}$$

$$\frac{a^m}{a^n} = a^{m-n}, a \neq 0 \quad \text{Quotient of powers property}$$

$$\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0 \quad \text{Power of a quotient property}$$

EXAMPLE 2 Evaluate exponential expressions

a. $6^{-4} \cdot 6^4$

$$6^0$$

$$1$$

$$\frac{6^4}{6^4}$$

$$1$$

b. $(4^{-2})^2$

$$4^{-4}$$

$$\frac{1}{4^4}$$

$$\frac{1}{256}$$

c. $\frac{1}{3^{-4}}$

$$3^4$$

$$81$$

d. $\frac{5^{-1}}{5^2}$

$$\frac{1}{5^2 \cdot 5^1}$$

$$\frac{1}{5^3}$$

$$\frac{1}{125}$$

GUIDED PRACTICE for Example 2

Evaluate the expression.

5. $\frac{1}{4^{-3}}$

$$4^3$$

$$64$$

6. $(5^{-3})^{-1}$

$$5^3$$

$$125$$

7. $(-3)^5 \cdot (-3)^{-5}$

$$(-3)^0$$

$$1$$

8. $\frac{6^{-2}}{6^2}$

$$\frac{1}{6^2 \cdot 6^2}$$

$$\frac{1}{6^4}$$

$$\frac{1}{1296}$$

EXAMPLE 3 Use properties of exponents

Simplify the expression. Write your answer using only positive exponents.

a. $(2xy^{-5})^3$

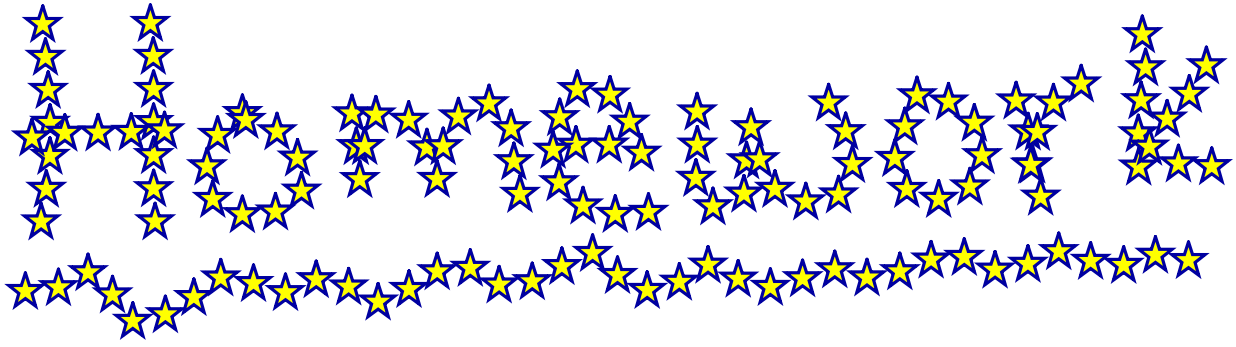
$$\begin{array}{l} 2^3 x^3 (y^{-5})^3 \\ 8x^3 y^{-15} \\ \hline \boxed{\frac{8x^3}{y^{15}}} \end{array}$$

b. $\frac{(2x)^{-2}y^5}{-4x^2y^2}$

$$\begin{array}{l} \frac{2^{-2}x^{-2}y^5}{-4x^2y^2} \\ \frac{y^5}{-4x^2y^2} \cdot \frac{2^2x^2}{2^2x^2} \\ \frac{y^3}{-16x^4} \end{array}$$

GUIDED PRACTICE

$$\frac{3xy^{-3}}{9x^3y} = \frac{1}{3} \frac{x^1}{x^3} \frac{y^1}{y^3} = \boxed{\frac{1}{3x^2y^4}}$$



Worksheet