

## Quotient of Powers Property WORKSHEET

Period: \_\_\_\_\_

(Includes: negative exponent property, and zero exponent property)

Simplify. Your answer should contain only positive exponents.

1)  $\frac{4^4}{4}$  using Quotient of Powers Property

$\frac{4^4}{4^1}$  Write the original problem (showing exponents of 1)

$4^{4-1}$  Dividing powers with the same base can SUBTRACT exponents

$4^3$  Subtract exponents

1)  $\frac{4^4}{4}$  using Expanding form and reducing

$\frac{4 \cdot 4 \cdot 4 \cdot 4}{4}$  Write the original problem (in expanded form)

$\frac{4 \cdot 4 \cdot 4 \cdot \cancel{4}}{\cancel{4}}$  Reduce

$4^3$  Re-write in exponent form

3)  $\frac{2p^2}{2p^3}$  using Quotient of Powers Property

$\frac{2^1 p^2}{2^1 p^3}$  Write the original problem (showing exponents of 1)

$2^{1-1} \cdot p^{2-3}$  Dividing powers with the same base can SUBTRACT exponents

$2^0 \cdot p^{-1}$  Subtract exponents

$1 \cdot \frac{1}{p^1}$  negative exponent property, and zero exponent property

$\frac{1}{p}$  Simplify

3)  $\frac{2p^2}{2p^3}$  using Expanding form and reducing

$\frac{2 \cdot p \cdot p}{2 \cdot p \cdot p \cdot p}$  Write the original problem (in expanded form)

$\frac{\cancel{2} \cdot \cancel{p} \cdot \cancel{p}}{\cancel{2} \cdot \cancel{p} \cdot p}$  Reduce

$\frac{1}{p}$  Re-write

$$5) \frac{n^4}{4n}$$

using Quotient of Powers Property

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

Write the original problem (showing exponents of 1)

$$\frac{1}{4} \cdot n^{4-1}$$

Dividing powers with the same base can SUBTRACT exponents

$$\frac{1}{4} \cdot n^3$$

Subtract exponents

$$\frac{n^3}{4}$$

Simplify

$$5) \frac{n^4}{4n}$$

using Expanding form and reducing

$$\frac{n \cdot n \cdot n \cdot n}{4 \cdot n}$$

Write the original problem (in expanded form)

$$\frac{\cancel{n} \cdot n \cdot n \cdot n}{4 \cdot \cancel{n}}$$

Reduce

$$\frac{n^3}{4}$$

Re-write in exponent form

$$7) \frac{3m^4}{3m^3}$$

using Quotient of Powers Property

$$\frac{3^1 m^4}{3^1 m^3}$$

Write the original problem (showing exponents of 1)

$$3^{1-1} \cdot m^{4-3}$$

Dividing powers with the same base can SUBTRACT exponents

$$3^0 \cdot m^1$$

Subtract exponents

$$1 \cdot m^1$$

zero exponent property

$$m$$

Simplify

$$7) \frac{3m^4}{3m^3}$$

using Expanding form and reducing

$$\frac{3 \cdot m \cdot m \cdot m \cdot m}{3 \cdot m \cdot m \cdot m}$$

Write the original problem (in expanded form)

$$\frac{\cancel{3} \cdot \cancel{m} \cdot \cancel{m} \cdot \cancel{m} \cdot m}{\cancel{3} \cdot \cancel{m} \cdot \cancel{m} \cdot \cancel{m}}$$

Reduce

$$m$$

Re-write

$$9) \frac{4x^3}{4xy^3}$$

$$\frac{4 \cdot x \cdot x \cdot x}{4 \cdot x \cdot y \cdot y \cdot y}$$

Write the original problem (in expanded form)

$$\frac{\cancel{4} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x}}{\cancel{4} \cdot \cancel{x} \cdot y \cdot y \cdot y}$$

Reduce

$$m$$

Re-write

$$11) \frac{4y}{xy^3}$$

$$\frac{4 \cdot y}{x \cdot y \cdot y \cdot y}$$

Write the original problem (in expanded form)

$$\frac{\cancel{4} \cdot y}{x \cdot y \cdot y \cdot y}$$

Reduce

$$\frac{4}{xy^2}$$

Re-write

$$13) \frac{2x}{2x^4y^2}$$

$$\frac{2 \cdot x}{2 \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y}$$

Write the original problem (in expanded form)

$$\frac{\cancel{2} \cdot \cancel{x}}{\cancel{2} \cdot x \cdot x \cdot x \cdot x \cdot y \cdot y}$$

Reduce

$$\frac{1}{x^3y^2}$$

Re-write

$$15) \frac{3yz^3}{3xy^2}$$

$$\frac{3 \cdot y \cdot z \cdot z \cdot z}{3 \cdot x \cdot y \cdot y}$$

Write the original problem (in expanded form)

$$\frac{\cancel{3} \cdot y \cdot z \cdot z \cdot z}{\cancel{3} \cdot x \cdot y \cdot y}$$

Reduce

$$\frac{z^3}{xy}$$

Re-write

$$17) \frac{3y^4z^2}{4xy^4}$$

$$\frac{3 \cdot y \cdot y \cdot y \cdot y \cdot z \cdot z}{4 \cdot x \cdot y \cdot y \cdot y \cdot y}$$

Write the original problem (in expanded form)

$$\frac{\cancel{3} \cdot \cancel{y} \cdot \cancel{y} \cdot \cancel{y} \cdot \cancel{y} \cdot z \cdot z}{4 \cdot x \cdot \cancel{y} \cdot \cancel{y} \cdot \cancel{y} \cdot \cancel{y}}$$

Reduce

$$\frac{3z^2}{4x}$$

Re-write

$$19) \frac{4m^2q^3}{2mq}$$

$$\frac{2 \cdot 2 \cdot m \cdot m \cdot q \cdot q \cdot q}{2 \cdot m \cdot q}$$

Write the original problem (in expanded form)

$$\frac{\cancel{2} \cdot \cancel{2} \cdot m \cdot m \cdot q \cdot q \cdot q}{\cancel{2} \cdot m \cdot q}$$

Reduce

$$2mq^2$$

Re-write

$$21) \left( \frac{2^4 \cdot 2^4}{2^2} \right)^2$$

$$\left( \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2} \right) \left( \frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2} \right)$$

Write the original problem (in expanded form)

$$\frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 2 \cdot 2}$$

Re-write as one fraction

$$\frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}}$$

Reduce

$$2^{12}$$

Re-write using exponent

$$23) \frac{(2a)^2}{a \cdot a}$$

$$\frac{2 \cdot a \cdot 2 \cdot a}{a \cdot a}$$

Write the original problem (in expanded form)

$$\frac{\cancel{2} \cdot \cancel{a} \cdot \cancel{2} \cdot \cancel{a}}{\cancel{a} \cdot \cancel{a}}$$

Reduce

$$2^2$$

Re-write

$$25) \frac{(x^2)^3}{2x^3 \cdot 2x^3}$$

$$\frac{x \cdot x \cdot x \cdot x \cdot x \cdot x}{2 \cdot x \cdot x \cdot x \cdot 2 \cdot x \cdot x \cdot x}$$

Write the original problem (in expanded form)

$$\frac{\cancel{x \cdot x \cdot x \cdot x \cdot x \cdot x}}{\cancel{2 \cdot x \cdot x \cdot x \cdot 2 \cdot x \cdot x \cdot x}}$$

Reduce

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

Re-write

$$27) \left( \frac{m^3 n^2 \cdot m}{(m^3 n^3)^2} \right)^3$$

Write the original problem (in expanded form)

$$\frac{m \cdot m \cdot m \cdot n \cdot n \cdot m}{m \cdot m \cdot m \cdot n \cdot n \cdot n} \cdot \frac{m \cdot m \cdot m \cdot n \cdot n \cdot m}{m \cdot m \cdot m \cdot n \cdot n \cdot n} \cdot \frac{m \cdot m \cdot m \cdot n \cdot n \cdot m}{m \cdot m \cdot m \cdot n \cdot n \cdot n}$$

Reduce

$$\frac{\cancel{m \cdot m \cdot m \cdot n \cdot n \cdot m} \cdot \cancel{m \cdot m \cdot m \cdot n \cdot n \cdot m} \cdot \cancel{m \cdot m \cdot m \cdot n \cdot n \cdot m}}{\cancel{m \cdot m \cdot m \cdot n \cdot n \cdot n} \cdot \cancel{m \cdot m \cdot m \cdot n \cdot n \cdot n} \cdot \cancel{m \cdot m \cdot m \cdot n \cdot n \cdot n} \cdot \cancel{m \cdot m \cdot m \cdot n \cdot n \cdot n} \cdot \cancel{m \cdot m \cdot m \cdot n \cdot n \cdot n} \cdot \cancel{m \cdot m \cdot m \cdot n \cdot n \cdot n}}$$

Re-write

$$\frac{1}{m^6 n^{12}}$$

$$29) \frac{(u^4 v^4)^3}{2u^4 v^4 \cdot 2vu^4}$$

$$\frac{u \cdot u \cdot u \cdot u \cdot v \cdot v \cdot v \cdot v \cdot u \cdot u \cdot u \cdot u \cdot v \cdot v \cdot v \cdot v \cdot u \cdot u \cdot u \cdot u \cdot v \cdot v \cdot v \cdot v}{2 \cdot u \cdot u \cdot u \cdot u \cdot v \cdot v \cdot v \cdot v \cdot 2 \cdot v \cdot u \cdot u \cdot u \cdot u}$$

Write the original problem (in expanded form)

$$\frac{\cancel{u \cdot u \cdot u \cdot u \cdot v \cdot v \cdot v \cdot v} \cdot \cancel{u \cdot u \cdot u \cdot u \cdot v \cdot v \cdot v \cdot v} \cdot \cancel{u \cdot u \cdot u \cdot u \cdot v \cdot v \cdot v \cdot v}}{2 \cdot \cancel{u \cdot u \cdot u \cdot u \cdot v \cdot v \cdot v \cdot v} \cdot 2 \cdot \cancel{v \cdot u \cdot u \cdot u \cdot u}}$$

Reduce

$$\frac{u^4 v^7}{2^2}$$

Re-write

$$31) \frac{(2mqp^4)^2}{2m^3 p^3 q^3 \cdot mp^3 q^2}$$

$$\frac{2 \cdot m \cdot q \cdot p \cdot p \cdot p \cdot p \cdot 2 \cdot m \cdot q \cdot p \cdot p \cdot p \cdot p}{2 \cdot m \cdot m \cdot m \cdot p \cdot p \cdot p \cdot q \cdot q \cdot m \cdot p \cdot p \cdot p \cdot q \cdot q}$$

Write the original problem (in expanded form)

$$\frac{\cancel{2 \cdot m \cdot q \cdot p \cdot p \cdot p \cdot p} \cdot \cancel{2 \cdot m \cdot q \cdot p \cdot p \cdot p \cdot p}}{\cancel{2 \cdot m \cdot m \cdot m \cdot p \cdot p \cdot p \cdot q \cdot q \cdot m \cdot p \cdot p \cdot p \cdot q \cdot q}}$$

Reduce

$$\frac{2p^2}{m^2 q^3}$$

Re-write

$$33) \left( \frac{2qm^2p^2 \cdot 2mp^3}{qm^3p^2} \right)^2$$

$$\frac{2 \cdot q \cdot m \cdot m \cdot p \cdot p \cdot 2 \cdot m \cdot p \cdot p \cdot p \cdot 2 \cdot q \cdot m \cdot m \cdot p \cdot p \cdot 2 \cdot m \cdot p \cdot p \cdot p}{q \cdot m \cdot m \cdot m \cdot p \cdot p \cdot q \cdot m \cdot m \cdot m \cdot p \cdot p}$$

Write the original problem (in expanded form)

$$\frac{2 \cdot q \cdot m \cdot m \cdot p \cdot p \cdot 2 \cdot m \cdot p \cdot p \cdot p \cdot 2 \cdot q \cdot m \cdot m \cdot p \cdot p \cdot 2 \cdot m \cdot p \cdot p \cdot p}{q \cdot m \cdot m \cdot m \cdot p \cdot p \cdot q \cdot m \cdot m \cdot m \cdot p \cdot p}$$

Reduce

$$2^4 p^6$$

Re-write