

Algebra 1 7.2 $\frac{5}{5}=1$ $\frac{3}{3}$ $\frac{6}{6}$

Use the properties of exponents to divide
monomials

Simplify expressions containing negative
exponents

Simplify expressions containing zero exponent

Compare measurements using order of magnitude
exponent

base

quotient

factors

negative exponent

order of magnitude

$$\frac{2^7}{2^4} = \frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 2 \cdot 2 \cdot 2}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}} = \frac{128}{16}$$

$$2^3 = 8$$

$$\frac{t^4}{t^3} = \frac{\cancel{t} \cdot \cancel{t} \cdot \cancel{t} \cdot t}{\cancel{t} \cdot \cancel{t} \cdot \cancel{t}} = t$$

Triangle puzzle (if time)

$$\frac{\cancel{g}gg\cancel{h}\cancel{h}h h h}{\cancel{g}\cancel{h}\cancel{h}}$$

$$1 \cdot g^2 h^3$$



Example 1 Quotient of Powers

Simplify $\frac{g^3 h^5}{g h^2}$. Assume that no denominator equals zero.

why?

1B. $\frac{k^7m^{10}p}{k^5m^3p}$

$k \ k \ k \ k \ k \ k \ k \ m \ m \ m \ m \ m \ m \ m \ m \ m \ m \ m \ m \ p$
 $k \ k \ k \ k \ k \ m \ m \ m \ p$
 $k^2 m^7$

"Power rule"

Key Concept 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 $\left(\frac{3}{5}\right)^4 = \frac{3^4}{5^4}$ $\left(\frac{r}{t}\right)^5 = \frac{r^5}{t^5}$

$$\left[\left(\frac{3}{5}\right)^4\right]^2 = \left(\frac{3}{5} \times \frac{3}{5} \times \frac{3}{5} \times \frac{3}{5}\right)^2 = \frac{3^4}{5^4} = \frac{81}{625}$$

$\left[\left(\times \right) \left(\times \right) \right] \left[\left(\right) \left(\right) \left(\right) \left(\right) \right]$

numerator/denominator

Example 2 Power of a Quotient

Simplify $\left(\frac{3p^3}{7}\right)^2$.

$$\left(\frac{3ppp}{7}\right)\left(\frac{3ppp}{7}\right) = \frac{9p^6}{49}$$

whiteboards

Guided Practice

Simplify each expression.

$$\textcircled{2A.} \left(\frac{3x^4}{4} \right)^3$$

$$\textcircled{2B.} \left(\frac{5x^5y}{6} \right)^2$$

$$\textcircled{2C.} \left(\frac{2y^2}{3z^3} \right)^2$$

$$\textcircled{2D.} \left(\frac{4x^3}{5y^4} \right)^3$$

$$\left(\frac{3xxxx}{4} \right) \left(\frac{3xxxx}{4} \right) \left(\frac{3xxxx}{4} \right)$$

$$\frac{27x^{12}}{64}$$

$$\frac{25x^{10}y^2}{36}$$

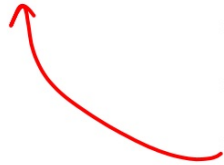
$$\frac{4y^4}{9z^6}$$

$$\frac{64x^9}{125y^{12}}$$

$$(xxxx)(xxxx)$$

$$\frac{z}{z^2} (z^2) (z^2)$$

$$\frac{10 \cdot 10 \cdot 10}{10 \cdot 10 \cdot 10}$$



Patterns:

10^6	1,000,000
10^5	100,000
10^4	10,000
10^3	1000
10^2	100
10^1	10
10^0	1

KeyConcept Zero Exponent Property

Words Any nonzero number raised to the zero power is equal to 1. why?

Symbols For any nonzero number a , $a^0 = 1$.

Examples $15^0 = 1$ $\left(\frac{b}{c}\right)^0 = 1$ $\left(\frac{2}{7}\right)^0 = 1$

Guided Practice

3A. $\frac{b^4 c^2 d^0}{b^2 c}$

$$\frac{b b b b c c \cdot 1}{b b c}$$

$$b b c$$

$$b^2 c \cdot 1$$

$$\cancel{b b c}$$

3B. $\left(\frac{2f^4 g^7 h^3}{15f^3 g^9 h^6} \right)^0 = 1$

replace zero powers with something =
what would that be?

Example 3 Zero Exponent

Simplify each expression. Assume that no denominator equals zero.

a. $\left(-\frac{4n^2q^5r^2}{9n^3q^2r}\right)^0 = 1$

b. $\frac{x^5y^0}{x^3} = x^2 = 1x^2$

Method 1

$$\frac{c^2}{c^5} =$$

Method 2

$$\frac{c^2}{c^5} =$$

An expression can only have one answer...

$$2^3$$

$$2^{-3}$$

What do you think - might stand for (in this context)?

KeyConcept Negative Exponent Property

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 $2^{-4} = \frac{1}{2^4} = \frac{1}{16}$ $\frac{1}{j^{-4}} = j^4$

negative exponent = code for reciprocal

Example 4 Negative Exponents

Simplify each expression. Assume that no denominator equals zero.

a. $\frac{n^{-5}p^4}{r^{-2}}$

final answer: exponents positive,
no zero exponents

b. $\frac{5r^{-3}t^4}{-20r^2t^7u^{-5}}$

final answer: exponents positive
no zero exponents

Guided Practice

final answer: exponents positive
no zero exponents

Simplify each expression. Assume that no denominator equals zero.

4A. $\frac{v^{-3}wx^2}{wy^{-6}}$

4B. $\frac{32a^{-8}b^3c^{-4}}{4a^3b^5c^{-2}}$

4C. $\frac{5j^{-3}k^2m^{-6}}{25k^{-4}m^{-2}}$