10.3 Quotient of Powers Property

Learning Target:

Simplify Expressions with Powers using Multiplication and Division

$$\frac{x^5}{x^3} \bullet \frac{x^9}{x^4}$$

$$\frac{8^5 m^3 n^2}{8^3 m^2}$$

First, Quick Review of 10.2

1. **Product of Powers:** when you multiply powers with the same base, ADD the exponents.

$$5^3 * 5^6 = 5^{3+6} = 5^9$$

2. **Power of Powers:** to find a power of a power, multiply the exponents.

$$(8^3)^4 = 8^{3*4} = 8^{12}$$

3. **Power of a Product:** to find the power of a product, you can find the power of each factor and multiply.

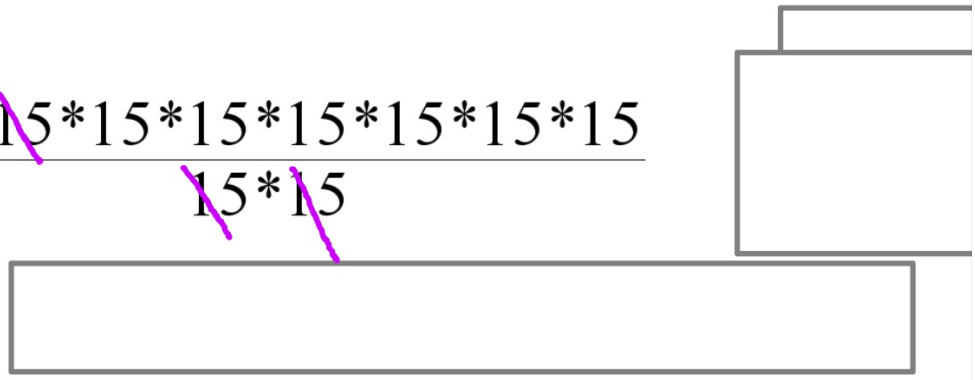
$$(6 * w)^2 = 6^2 * w^2 = 36w^2$$

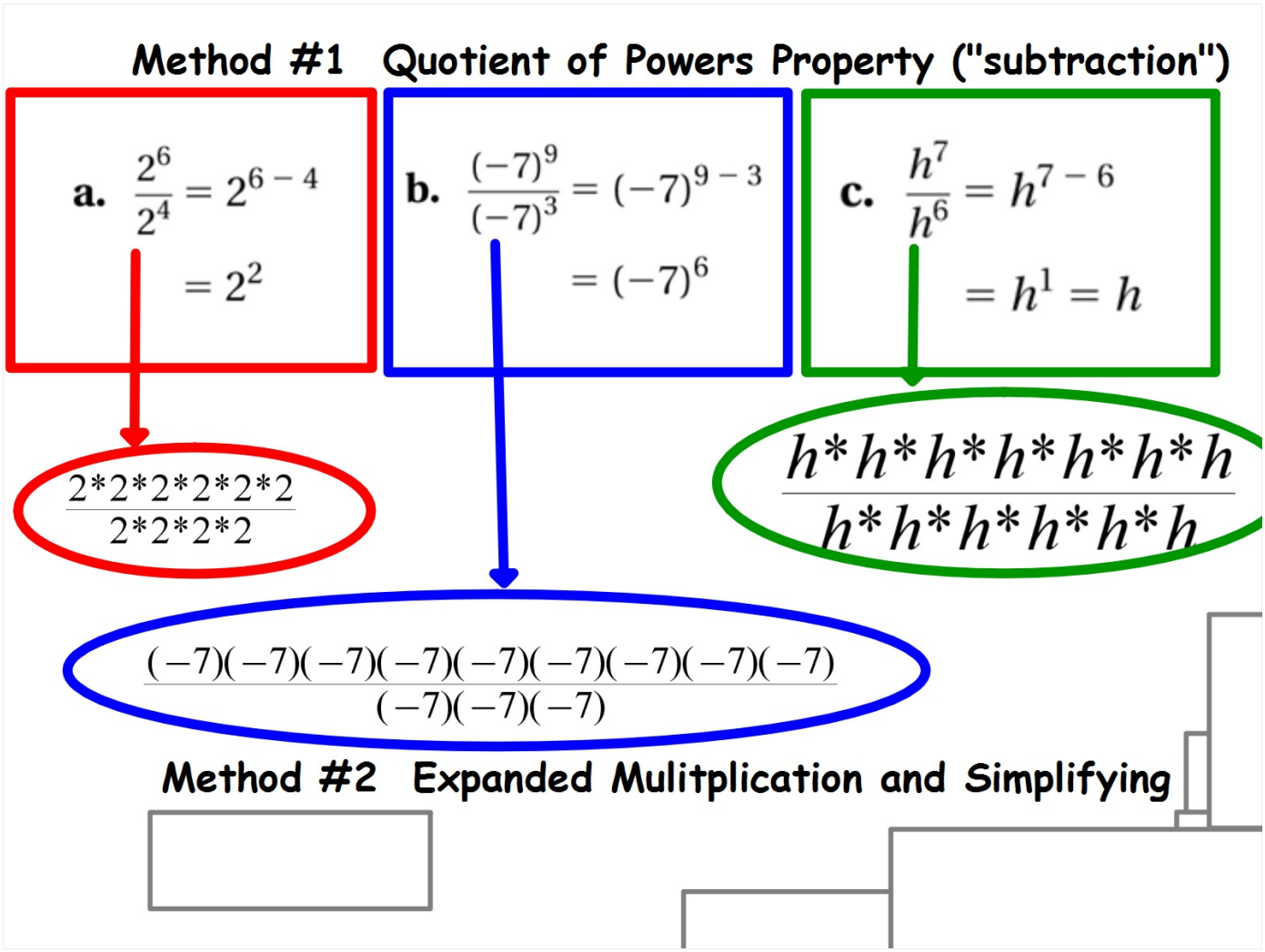
Quotient of Powers Property

To Divide powers with the same base, Subtract their exponents.

$$\frac{15^8}{15^2} = 15^{8-2} = 15^6$$

$$\frac{15*15*15*15*15*15*15*15}{15*15}$$




Method #1 Quotient of Powers Property ("subtraction")
a. $\frac{2^6}{2^4} = 2^{6-4}$
$= 2^2$
b. $\frac{(-7)^9}{(-7)^3} = (-7)^{9-3}$
$= (-7)^6$
c. $\frac{h^7}{h^6} = h^{7-6}$
$= h^1 = h$
$\frac{2*2*2*2*2*2}{2*2*2*2}$
$\frac{h*h*h*h*h*h*h}{h*h*h*h*h*h}$
$\frac{(-7)(-7)(-7)(-7)(-7)(-7)(-7)(-7)(-7)(-7)}{(-7)(-7)(-7)}$
Method #2 Expanded Mulitplication and Simplifying

$$\frac{2^4}{2^6} = \frac{2*2*2*2}{2*2*2*2*2*2} = \frac{1}{2^2}$$

$$2^{4-6} = 2^{-2}$$

$$\frac{h^3}{h^3} = 1$$

$$\frac{x^2}{x^5} = \frac{1}{x^3} = x^{-3}$$

Simplifying an Expression

Simplify $\frac{3^4 \cdot 3^2}{3^3}$. Write your answer as a power.

Method #1

Simplify the numerator then divide

$$\frac{3^4 \cdot 3^2}{3^3} = \frac{3^{4+2}}{3^3}$$

$$= \frac{3^6}{3^3}$$

$$= 3^{6-3}$$

$$= 3^3$$

Simplifying an Expression

Simplify $\frac{3^4 \cdot 3^2}{3^3}$. Write your answer as a power.

Method #2

$$\frac{3^4 \cdot 3^2}{3^3}$$

Use expanded multiplication and cancel to simplify

$$\frac{3*3*3*3 \quad *3*3}{3*3*3}$$

$$= 3^3$$

Simplifying an Expression

Simplify $\frac{a^{10}}{a^6} \cdot \frac{a^7}{a^4}$. Write your answer as a power.

$$\frac{a^{10}}{a^6} \cdot \frac{a^7}{a^4} = a^{10-6} \cdot a^{7-4}$$

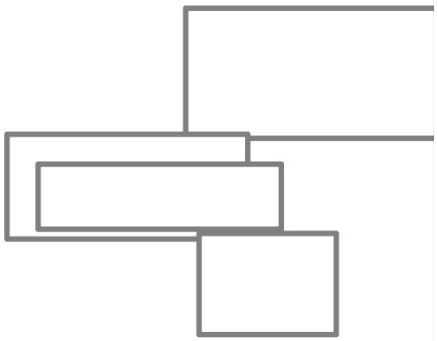
$$= a^4 \cdot a^3$$

$$= a^{4+3}$$

$$= a^7$$

$$\frac{a^{17}}{a^{10}}$$

$$= a^7$$



Simplifying an Expression

$$\frac{8^5 * m^3 * n^2}{8^3 * m^2} = 8^{5-3} * m^{3-2} * n^2$$

$$= 8^2 mn^2$$

$$\frac{8^5}{8^3} \cdot \frac{m^3}{m^2} \cdot n^2$$

$$\frac{8*8*8*8*8*m*m*m*n*n}{8*8*8*m*m} = 8^2 mn^2$$

Homework

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