

# Rules of Exponents (4-5)

## Review

Label the power, base, and exponent.

$$\text{base} \rightarrow 3^7 \leftarrow \text{exponent}$$

Σ power

Evaluate.

$$2^4 = \underbrace{2 \cdot 2 \cdot 2 \cdot 2}_4 = 16$$

<i>product of powers</i>	Decode
Definition when multiplying powers w/ the same base, ADD the exponents	Example $3^2 \cdot 3^4 = 3^6$ $3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 3 = 3^6$

Let's break it down!

$$x^4 \cdot x^2 = x \cdot x \cdot x \cdot x \cdot x \cdot x = x^6$$

so.....

$$a^m \cdot a^n = a^{m+n}$$

**Example 1.** Find the product.

I Do	We Do
$2^4 \cdot 2^7 = 2^{4+7} = 2^{11}$	$y^{11} \cdot y^{14} = y^{25}$

I Do	You Do
$3x^4 \cdot 9x^7$ $3 \cdot 9 \cdot x^4 \cdot x^7$ $27x^{11}$	$7y^{11} \cdot 6y^5$ $42y^{16}$

<i>quotient of powers</i>	Decode
Definition When dividing powers w/ the same bases SUBTRACT the exponents	Example $\frac{2^4}{2^2} = 2^{4-2}$ $= 2^2 = 4$

Let's break it down!

$$\frac{x^6}{x^4} = \frac{\cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot x \cdot x}{\cancel{x} \cdot \cancel{x} \cdot \cancel{x} \cdot \cancel{x}} = x^2$$

so.....

$$\frac{a^m}{a^n} = a^{m-n}$$

$$\frac{5}{5} = 1$$

$$\frac{2}{2} = 1$$

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

$$\frac{x}{x} = 1$$

**Example 3.** Find the quotient.

I Do	We Do
$\frac{6^9}{6^5} = 6^{9-5} = 6^4$	$\frac{s^{15}}{s^4} = s^{11}$

I Do	You Do
$\frac{12x^7}{18x^5} \div 6 = \frac{2x^7}{3x^5}$ $= \frac{2x^{7-5}}{3}$ $= \frac{2x^2}{3}$	$\frac{15z^2}{18z} \div 3 = \frac{5z^{2-1}}{6} = \frac{5z}{6}$

**Example 4.** Find the quotient.

I Do	You Do
$\frac{3x^7 \cdot x^3}{15x^5} = \frac{3x^{7+3}}{15x^5} = \frac{3x^{10}}{15x^5}$ $\frac{3x^{10}}{15x^5} \div 3 = \frac{x^{10}}{5x^5} = \frac{x^{10-5}}{5}$ $= \frac{x^5}{5}$	$\frac{12p^6}{9 \cdot 3p^2} = \frac{12p^6}{27p^2} \div 3 =$ $\frac{4p^6}{9p^2} = \frac{4p^{6-2}}{9}$ $= \frac{4p^4}{9}$