

Learning Goals: *I will learn to*

- apply exponent rules to simplify expressions with powers

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Multiply Powers with the Same Base

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

EXPONENT LAW - Product of Powers

- When multiplying powers with the same base, ADD the exponents to write the product as a single power.

$$30^{21} \times 30^{52} = 30^{73} \leftarrow 21+52$$

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Divide Powers with the Same Base

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

EXPONENT LAW - Quotient of Powers

- When dividing powers with the same base, SUBTRACT the exponents to write the quotient as a single power.

$$(-9)^{52} \div (-9)^{22} = (-9)^{30} \leftarrow 52-22$$

Raise Powers to an Exponent

$$(a^m)^n = a^{mn}$$

EXPONENT LAW - Power of a Power

- When a power is raised to an exponent, MULTIPLY the exponents to write the expression with a single ~~exponent~~ ~~power~~ ~~exponent~~.

$$(3^9)^5 = 3^{45} \leftarrow 9 \times 5$$

$$[(-5)^{11}]^4 = (-5)^{44} \leftarrow 11 \times 4$$

Raise Products to an Exponent

$$(ab)^m = a^m \times b^m$$

EXPONENT LAW - Power of a Product

- When a product is raised to an exponent, you can rewrite each factor in the product with the same exponent.

$$\begin{aligned}(5 \times 3)^3 &= \underline{5 \times 3} \times \underline{5 \times 3} \times \underline{5 \times 3} \\ &= 5 \times 5 \times 5 \times 3 \times 3 \times 3 \\ &= 5^3 \times 3^3\end{aligned}$$

$$[(-2) \times 9]^{10} = (-2)^{10} \times 9^{10}$$

* We don't always need to, but it can be useful at times.

Raise Quotients to an Exponent

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

EXPONENT LAW - Power of a Quotient

- When a quotient is raised to an exponent, you can rewrite each number in the quotient with the same exponent.

$$\begin{aligned}\left(\frac{-3}{4}\right)^3 &= \frac{-3}{4} \times \frac{-3}{4} \times \frac{-3}{4} \\ &= \frac{-3 \times -3 \times -3}{4 \times 4 \times 4} \\ &= \frac{(-3)^3}{4^3}\end{aligned}$$