

SC Algebra 1

8.1 Multiplication Properties of Exponents

Warm Up

Evaluate.

- 3^5 **243**
- $2^3 * 2^4$ **128**
- $(-3)^2 * 3^5$ **2187**
- $3^2 * 2^4 * (-1)^3$ **-144**

- Alisa posted a meme on social media and tagged 10 of her friends. Each of those friends tagged 10 friends, and each of those friends tagged 10 friends. Use exponents to write an expression for this situation. How many people were tagged altogether?

$$10^3 = \underline{1000}$$

$$10^8 = 10,000,000$$

Powers Quick Review:

b^n
 n ← exponent
 b ← base

$$n^5 = n \cdot n \cdot n \cdot n \cdot n$$

$$3^3 = 3 \cdot 3 \cdot 3$$

Product Rule:

"When you multiply powers and the base is the same, add the exponents, keep the base. That's the game."

$$b^{\textcircled{3}} \cdot b^{\textcircled{4}} = b \cdot b \cdot b \cdot b \cdot b \cdot b \cdot b = b^{\textcircled{7}}$$

Example 1:

Simplify each expression.

$$(p^{13})(p^5)$$

$$p^{18}$$

$$(3n^4)(4n^7)$$

$$12n^{11}$$

$$(2n^3)(-3n^5)$$

$$-6n^8$$

$$(7n^7)(-7n)$$

$$-49n^8$$

$$(11x^6y^6)(xy^9)$$

$$11x^7y^{15}$$

$$(7xy^2)(2x^4y^3)$$

$$\cancel{7}x^{\cancel{1}+4}y^{\cancel{2}+3} = 14x^5y^5$$

Power of a Power Rule:

"When you have a power with a power inside, a power to a power, the exponents multiply."

$$b^n$$

$$(a^3)^5$$

$$a^3 \cdot a^3 \cdot a^3 \cdot a^3 \cdot a^3$$

$$a^{15}$$

How can I meet today's standards?

I can evaluate the **product of powers**, the **power of a power**, and the **power of a product**.

Example 2:

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Simplify each expression.

$$(n^5)^3$$

$$n^{15}$$

$$(x^4)^2$$

$$x^8$$

$$(n^7)^4$$

$$n^{28}$$

$$(x^3)^{10}$$
~~$$x^{13}$$~~

$$x^{30}$$

$$(n^4)^{11}$$
~~$$n^{15}$$~~

$$n^{44}$$

$$(x^7)^3$$
~~$$x^{10}$$~~

$$x^{21}$$

Power of a Product Rule:

"When bases unite, the exponents take flight. Distribute the exponent to get this right!"

$$(2x^2y)^5 = 2^5 (x^2)^5 y^5 = 32x^{10}y^5$$

$$(abc^3)^{10} = a^{10} (b^2)^{10} (c^3)^{10} = a^{10} b^{20} c^{30}$$

Example 3:

Simplify each expression.

$$(9x^4y^8)^3$$

$$729x^{12}y^{24}$$

$$(-2a^{10}b^4)^5$$

$$(-2)^5 (a^{10})^5 (b^4)^5$$

$$-32a^{50}b^{20}$$

$$(4x^3y^2)^3$$

$$64x^9y^6$$

$$(3xy^2)^3$$
~~$$9x^3y^6$$~~

$$27x^3y^6$$

$$(-3a^5b^9)^4$$
~~$$81a^{20}b^{36}$$~~

$$81a^{20}b^{36}$$

$$(-3)^4 = 81$$

$$\sqrt[4]{-3^4} = -81$$

$$(4q^3r^{12}s)^2$$
~~$$16q^6r^{24}s^2$$~~

$$16q^6r^{24}s^2$$