





10.2 Product of Powers Property

Learning Targets

-  Multiply Powers with the Same Base
-  Finding a Power of a Power
-  Finding a Power of a Product
-  Rewrite a Number as a base and Exponent

$$8x^2$$

$$8 \cdot x^2$$

First Review Punctuation Rules

$$\begin{array}{ll} (-5)^3 & -5^3 \\ (-5)(-5)(-5) & -(5 \cdot 5 \cdot 5) \end{array}$$

$$\begin{array}{ll} \left(\frac{1}{2}\right)^4 & \frac{1^4}{2} \\ \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} & \frac{1 \cdot 1 \cdot 1 \cdot 1}{2} \end{array}$$

Product of Powers Property



Multiply Powers with the Same Base

To multiply powers with the
Same Base,
ADD their Exponents.

$$x^5 * x^3 = x^{5+3} = x^8$$

$$x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x \cdot x = x^8$$

Product of Powers Property

Multiply Powers with the Same Base

a. $2^4 \cdot 2^5 = 2^9$

$2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

b. $-5 \cdot (-5)^6 = (-5)^7$

c. $x^3 \cdot x^7 = x^{10}$

Express

Your answer
as a power

Power of a Power Property



Finding a Power of a Power

To find a power of a power,
MULTIPLY the Exponents.

$$(x^4)^7 = x^{4*7} = x^{28}$$



$$(x^4)(x^4)(x^4)(x^4)(x^4)(x^4)(x^4)$$

x x



Power of a Power Property

Finding a Power of a Power

a. $(3^4)^3$

$$3^4 \cdot 3^4 \cdot 3^4 = 3^{12}$$

b. $(w^2)^4$

$$w^2 \cdot w^2 \cdot w^2 \cdot w^2 = w^8$$

Power of a Product Property



Finding a Power of a Product

To find a power of a product,
Find the Power of each Factor
and Multiply

$$(2w)^4 = 2^4 * w^4 = 16w^4$$

(it's like the distributive property, but with exponents!)

$$2w * 2w * 2w * 2w = 16 \cdot w^4$$

Power of a Product Property



Finding a Power of a Product

a. $(2x)^3 = 2^3 \cdot x^3 = 8 \cdot x^3$

b. $(3xy)^2 = 3^2 \cdot x^2 \cdot y^2 = 9 \cdot x^2 \cdot y^2$

Try These with your partner!

Simplify the expression.

1. $6^2 \cdot 6^4$

6^6

2. $\left(-\frac{1}{2}\right)^3 \cdot \left(-\frac{1}{2}\right)^6$

$\left(-\frac{1}{2}\right)^9$

3. $z \cdot z^{12}$

z^{13}

4. $(4^4)^3$

4^{12}

5. $(y^2)^4$

y^8

6. $((-4)^3)^2$

$(-4)^6$

7. $(5y)^4$

$625y^4$

$625 \cdot y^4$

8. $(ab)^5$

$a^5 b^5$

9. $(0.5mn)^2$

$0.5^2 \cdot m^2 \cdot n^2$



Write a number

Using a base and an exponent

$$4 = 2^2$$

$$9 = 3^2$$

$$49 = 7^2$$

$$25 = 5^2$$

$$32 = 2^5 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$$

$$81 = 9^2$$

$$125 = 5^3$$



A gigabyte (GB) of computer storage space is 2^{30} bytes. The details of a computer are shown. How many bytes of total storage space does the computer have?

Total number of bytes = $\frac{\text{Number of bytes in a gigabyte}}{\text{Number of gigabytes}}$

$$\text{Total} = 2^{30} \cdot 64$$

The computer has 64 gigabytes of total storage space.

$$64 = 2^6$$

$$T = 2^{30} \cdot 2^6$$
$$2^{36} \text{ bytes}$$

Homework

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