Lesson 3.2: Exponent Laws Part 2

Main Idea/Tips

Learning Outcomes

- Explain and apply the exponent laws:
  - Power with a Product Base
  - Power with a Fractional Base
  - Zero Exponents
  - Negative Exponents

Power with a Product Base

When any base is multiplied by an exponent, **distribute** the exponent to **every part** of the base.

General Case:
Where x and y are in the base and m is power

$$(xy)^m = x^m y^m$$

Example 1: $(2 \times (-3)^3$
Write the following as repeated multiplication, then using the product rule.
Write in standard form (evaluate)

a. Repeated multiplication:

b. Product rule

Notes

Try it Yourself

Solve the following using repeated multiplication and using the power of a product rule.

a. $(2 \times 6)^5$

b. $(xy)^3$

c. $(8x)^4$

Power with a Fraction Base Rule

When the base of an exponent is a fraction, **distribute** the power to both the **numerator** and **denominator**.

General case:
Where x and y are part of the base and a is the power.

$$\left(\frac{x}{y}\right)^a = \frac{x^a}{y^a}$$

Write the following as repeated multiplication, then use the quotient rule to write in standard form

$\left(\frac{3}{4}\right)^3$

	Notes
Zero Exponents	. Anything to the power of zero is _____. 1. 3^0 = 2. $(-5)^0$ = 3. $(-5 + 2 -4 \times 6)^0$ 4. -5^0
Substitution	We can substitute numbers like we did before Example: The area of a circle is **$A = \pi r^2$**. What is the area of a Circle if **r = 6?** What if **r = 10?** Leave as an exact answer. $A = \pi r^2$.

Notes

Negative Exponents

Complete the table below:

Power	Standard Form	The Rule	Rewritten
2^4		$\div 2$	
2^3		$\div 2$	
2^2		$\div 2$	
2^1		$\div 2$	
2^0		$\div 2$	
2^{-1}		$\div 2$	
2^{-2}		$\div 2$	
2^{-3}		$\div 2$	
2^{-4}		$\div 2$	

Raising a number to a negative exponent is equal to taking the reciprocal of the base raised to the associate negative exponent.

General Case:

$$X^{-a} = \frac{1}{x^a}$$

Reciprocal: *The multiplicative inverse of a number*

Notes

Examples:

a. 5^{-3}

b. $\left(\frac{2}{5}\right)^{-2}$

c. $\left(\frac{a}{b}\right)^{-1}$

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