Mr. Rogove

Date:

LEARNING OBJECTIVE: We will take powers of powers and raise products to powers. (G8M1L3)

CONCEPT DEVELOPMENT:

Taking Powers of Powers

$$(x^{6})^{4} \otimes x^{6} \times (x^{m})^{n} = x^{m \cdot n}$$

$$(x^{m})^{n} = x^{m \cdot n}$$

$$Examples:$$

$$(3^2)^3 = 3^2 \cdot 3^2 \cdot 3^2 = 3^{2 \cdot 3}$$
 $((-4)^3)^4 = (-4)^3 \cdot (-4)^3 \cdot (-4)^3 \cdot (-4)^3 = (-4)^{3 \cdot 4}$

Raising Products to Powers

ts to Powers
$$(xy)^n = x^n y^n$$

$$(12 \cdot 2)^3 = 12^3 \cdot 2^3$$

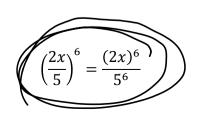
Raising Quotients to Powers

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

Examples:

$$\left(\frac{3}{2}\right)^4 = \frac{3^4}{2^4}$$

$$\frac{3}{2} \cdot \frac{3}{2} \cdot \frac{3}{2} \cdot \frac{3}{2} = \frac{3 \cdot 3 \cdot 3 \cdot 3}{2 \cdot 2 \cdot 2 \cdot 2} = \frac{3^4}{2^4}$$



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GUIDED PRACTICE:

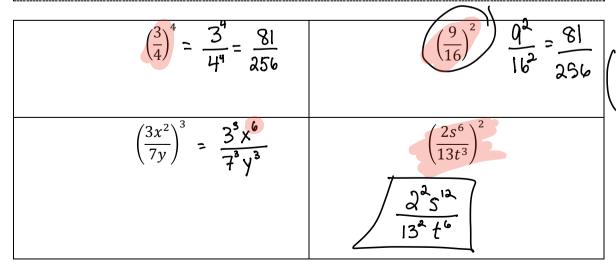
Steps for Evaluating Powers of Powers

- 1. Raise each factor to the power outside of the parentheses.
- 2. Multiply the exponents for each factor.

BASE: 116 (116)9 $= \sqrt{54}$ 9times	BASE: 54 (54)7 54.7
·	5 ²⁸
BASE: - Fabe (-7'd'b'c')5	$((4xy)^3)$
- 7abc · - 7abc · - 7abc · - 7abc	4xy·4xy·4xy
-7 ⁵ 2 ⁵ 6 ⁵ 6 ⁵	$4^3\chi^3y^3$
BASE: $3s \cdot 12t$ $(3s \cdot 12t)^3$	BASE: $20x \frac{(4\cdot5x)^3}{}$
$\frac{36st}{(36st)^3}$	(20x) ³
$36^{3}5^{3}t^{3}$	$20^3 \chi^3$
BASE: $3ab^3c^7$ $(3ab^3c^7)^8$	BASE BXY32 $(13x^4y^3z^2)^5$
3ab3c3.3ab3c3	,
3° 2° (3°)° (2°)°	135 x y 2 10

Steps for Evaluating Powers of Quotients

- 1. Raise the numerator and denominator to the power.
- 2. Simplify if possible.



INDEPENDENT PRACTICE: Simplify		
$(3x^3)^4$	$\left(\frac{6}{7}\right)^4$	
$(q^3r)^4$	$(10h^7)^3$	
$(2x \cdot y^5)^4$	$\left(\frac{2a^4b^5}{ab^4}\right)^3$	
Challenge: $(12x^2y^3)^2(2x^3y^{13})^3$	Solve for x . $(5^8)^{3x} = 5^{48}$	
$\frac{Challenge:}{\frac{5y^3}{(5y)^3}}$	$\left(\frac{(-3)^2}{(-2)^4}\right)^2$	

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ACTIVATING PRIOR KNOWLEDGE:

We know how to multiply exponents with the same base

$5^3 \cdot 5^4$	$(2x)^6\cdot(2x)^5$

CLOSURE:

1. Simplify: $(x^m y^n z^p)^q$

TEACHER NOTES:

Students are ready to complete the In the Cloud activity after this lesson.

Have students log on to Khan and complete the "positive exponents with positive and negative bases"

Homework: Problem #1192 from Math Forum.