Section 2.5: Exponent Laws II

Oct 31-7:51 PM

Power of a Power Investigation

Power of a Power	Repeated Multiplication	Product of Factors	Power Form
$(2^4)^3$	2^4 x 2^4 x 2^4	(2 x 2 x 2 x 2) x (2 x 2 x 2 x 2) x (2 x 2 x 2 x 2)	2^{12}
$(3^2)^4$	3^2 x 3^2 x 3^2 x 3^2	(3 x 3) x (3 x 3) x (3 x 3) x (3 x 3)	3^8
$(4^2)^3$	4^2 x 4^2 x 4^2	(4 x 4) x (4 x 4) x (4 x 4)	4^6
$(5^3)^3$	5^3 x 5^3 x 5^3	(5 x 5 x 5) x (5 x 5 x 5) x (5 x 5 x 5)	5^9
$[(-4)^3]^2$	$(-4)^3$ x $(-4)^3$	(-4 x -4 x -4) x (-4 x -4 x -4)	$(-4)^6$

Oct 31-7:51 PM

Exponent Law for a Power of a Power: $(a^m)^n = a^{m \times n}$, where $a \neq 0$, and m and n are whole numbers.

When you have a power to a power, the base remains the same and the exponents are multiplied.

Write as a power.

A. $(3^2)^2$

$= 3^{2 \times 2}$

$= 3^4$

B. $[(-7)^3]^2$

$= (-7)^{3 \times 2}$

$= (-7)^6$

Oct 31-8:08 PM

C. $-(2^2)^4$

$= -(2^{2 \times 4})$

$= -(2^8)$

$= -2^8$

D. $(3^0)^2$

$= 3^{0 \times 2}$

$= 3^0$

Simplify first, then evaluate.

A. $(-3^2)^3 \times (-3^0)^9$

$= (-3)^{2 \times 3} \times (-3)^{0 \times 9}$

$= (-3)^6 \times (-3)^0$

$= (-3)^{6 + 0}$

$= (-3)^6$

$= 729$

B. $(2^3)^2 \times (3^2)^2$

$= 2^{3 \times 2} \times 3^{2 \times 2}$

$= 2^6 \times 3^4$

$= 64 \times 81$

$= 5184$

Nov 2-8:13 AM

Power of a Product Investigation

Power	Repeated Multiplcation	Product of Factors	Product of Powers
$(2 \times 5)^3$	$(2 \times 5) \times (2 \times 5) \times (2 \times 5)$	2 x 2 x 2 x 5 x 5 x 5	$2^3 \times 5^3$
$(3 \times 4)^2$	$(3 \times 4) \times (3 \times 4)$	3 x 3 x 4 x 4	$3^2 \times 4^2$
$(4 \times 2)^4$	$(4 \times 2) \times (4 \times 2) \times (4 \times 2) \times (4 \times 2)$	4 x 4 x 4 x 4 x 2 x 2 x 2 x 2	$4^4 \times 2^4$
$(5 \times 3)^4$	$(5 \times 3) \times (5 \times 3) \times (5 \times 3) \times (5 \times 3)$	5 x 5 x 5 x 5 x 3 x 3 x 3 x 3	$5^4 \times 3^4$
$(5 \times 6)^2$	$(5 \times 6) \times (5 \times 6)$	5 x 5 x 6 x 6	$5^2 \times 6^2$
$[7 \times (-2)]^3$	$[7 \times (-2)] \times [7 \times (-2)] \times [7 \times (-2)]$	7 x 7 x 7 x (-2) x (-2) x (-2)	$7^3 \times (-2)^3$

Oct 31-8:38 PM

Exponent Law for a Power of a Product: $(ab)^m = a^m b^m$, where $a \neq 0$, $b \neq 0$ and m is a whole number.

When you have a power of a product, the exponent is applied to each factor inside the brackets.

Write as a product of powers.

A. $(5 \times 7)^3$ B. $(8 \times 2)^2$ C. $[(-1) \times (-4)]^3$

$= 5^3 \times 7^3$ $= 8^2 \times 2^2$ $= (-1)^3 \times (-4)^3$

Oct 31-8:51 PM

3

Evaluate each question two ways. Use power of a product (Method 1) and BEDMAS (Method 2).

A. $[(-7) \times 5]^2$

Method 1:   Method 2:

$= (-7)^2 \times 5^2$ $= (-35)^2$

$= 49 \times 25$ $= 1225$

$= 1225$

B. $-(3 \times 2)^2$

Method 1:   Method 2:

$= -[3^2 \times 2^2]$ $= -(6)^2$

$= -(9 \times 4)$ $= -(36)$

$= -(36)$ $= -36$

$= -36$

Practice Exercises: Pg. 84 #'s 4, 6, 10a, b, e & f (simplify and evaluate)

Oct 31-8:54 PM

Power of a Quotient Investigation

Power	Repeated Multiplication	Product of Factors	Product of Quotients
$\left(\dfrac{5}{6}\right)^3$	$\dfrac{5}{6} \times \dfrac{5}{6} \times \dfrac{5}{6}$	$\dfrac{5 \times 5 \times 5}{6 \times 6 \times 6}$	$\dfrac{5^3}{6^3}$
$\left(\dfrac{2}{3}\right)^4$	$\dfrac{2}{3} \times \dfrac{2}{3} \times \dfrac{2}{3} \times \dfrac{2}{3}$	$\dfrac{2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 3}$	$\dfrac{2^4}{3^4}$
$\left(\dfrac{1}{5}\right)^5$	$\dfrac{1}{5} \times \dfrac{1}{5} \times \dfrac{1}{5} \times \dfrac{1}{5} \times \dfrac{1}{5}$	$\dfrac{1 \times 1 \times 1 \times 1 \times 1}{5 \times 5 \times 5 \times 5 \times 5}$	$\dfrac{1^5}{5^5}$
$\left(\dfrac{3}{10}\right)^2$	$\dfrac{3}{10} \times \dfrac{3}{10}$	$\dfrac{3 \times 3}{10 \times 10}$	$\dfrac{3^2}{10^2}$
$\left(\dfrac{-4}{7}\right)^3$	$\dfrac{(-4)}{7} \times \dfrac{(-4)}{7} \times \dfrac{(-4)}{7}$	$\dfrac{(-4) \times (-4) \times (-4)}{7 \times 7 \times 7}$	$\dfrac{(-4)^3}{7^3}$

Oct 31-9:20 PM

Exponent Law for a Power of a Quotient: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}$, where $a \neq 0$, $b \neq 0$ and m is a whole number.

When you have a power of a quotient, the exponent is applied to the numerator and denominator inside the brackets.

Write as a quotient of powers.

A. $\left(\frac{2}{3}\right)^8$ B. $\left[\frac{(-6)}{5}\right]^4$ C. $\left(\frac{3}{5}\right)^2$

$= \frac{2^8}{3^8}$ $= \frac{(-6)^4}{5^4}$ $= \frac{3^2}{5^2}$

Oct 31-9:38 PM

Your turn...

D. $(6 \div 8)^3$ E. $(9 \div 13)^8$ F. $[(-4) \div 11]^5$

$= 6^3 \div 8^3$ $= 9^8 \div 13^8$ $= (-4)^5 \div 11^5$

Evaluate each question two ways. Use power of a quotient (Method One) and BEDMAS (Method Two).

A. $[(-24) \div 6]^4$

Method 1:   Method 2:

$= (-24)^4 \div 6^4$ $= (-4)^4$

$= 331\ 776 \div 1296$ $= 256$

$= 256$

Nov 2-10:35 AM

5

C. $\left(\dfrac{(-27)}{3}\right)^2$

Method 1:

$= \dfrac{(-27)^2}{3^2}$

$= \dfrac{729}{9}$

$= 81$

Method 2:

$= (-9)^2$

$= 81$

Practice Exercises: Pgs. 84 - 85 #'s 5, 8, 15b,c, 16a,b,c, & 19a,b,c

Nov 2-10:25 AM

6