3.3 Operations with Exponents

October 3, 2018 11:01 AM

3.3. Operations with Exponents

Name:_____ Block_____

In Chapter 1 we practiced evaluating more complicated expressions that required the **order of operations**. Now we will build on these skills with the ***addition of exponent rules.***

B rackets E xponents M ULTIPLY (Left to right) D IVIDE

A DD (Left to right) S UBTRACT

letters that stand for numbers → variables

Determining the Product of a Power

Expressions with powers can have a ***numerical coefficient***.

1. evaluate the power
2. multiply by the coefficient.

$y = 7x + 8$

number with a variable attached to it (means multiply) — coefficient — operator "signs" + - x ÷ — constant — a number by itself

Expression	Coefficient	Power	Repeated Multiplication	Value
$3(4)^3$	3	$(4)^3$	3 x 4 x 4 x 4	192
$2(-2)^3$	2	$(-2)^3$ ↑ base	$2 \cdot (-2) \cdot (-2) \cdot (-2)$	-16
-2^3 (coefficient is -1; exponent; base)	-1	2^3	$-1 \cdot 2 \cdot 2 \cdot 2$	-8

(+) · (+) · (−) = (−)

(−) · (+) = (−)

PRACTICE

Expand+ ***Evaluate*** each expression:

a) $3(6)^2$ (coeff. 3, power 2) $3 \cdot 6 \cdot 6 = 108$

b) $2(-4)^2$ (power 2) $2 \cdot (-4) \cdot (-4) = 32$ ((+) · (−) · (−) = (+))

c) -4^6 $-1 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = -4096$

d) $-3(2)^4$ $-3 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = -48$

e) $-3(-5)^3$ $-3 \cdot (-5) \cdot (-5) \cdot (-5)$ $-3 \cdot -125 = 375$

f) $5 \bullet -6^3$ $5 \cdot -(6 \cdot 6 \cdot 6)$ $5 \cdot -(216) = -1080$

Evaluate Expressions with Powers

Evaluate expressions with powers using the proper order of operations (BEDMAS)

PRACTICE

a) $7 + 3(-2)^3$

$7+3\cdot(-2)\cdot(-2)\cdot(-2)$

$7+3\cdot(-8)$

$7+(-24)$

$7-24 = -17$

b) $4 - (2 + 3)^2 \div 25$

$4-(5)^2\div 25$

$4-(25)\div 25$

$4-1 = 3$

even exponents = + number

c) $5(4)^3 \div (-2)^4$

L→R

$5(64)\div(16)$

$(5\times 64)\div 16$

$320\div 16 = 20$

d) $[(-7)^2 - (-2)^6]^2$

$[(49)-(64)]^2$

$[-15]^2$

$-15\cdot -15 = 225$

$\ominus\cdot\ominus = \oplus$

e) $\left(\frac{2x^3y^2}{3xy}\right)^2$ when $x=2$ $y=3$ — variables.....

$\left(\frac{m}{n}\right)^a = \frac{m^a}{n^a}$; $(m^a)^b = m^{a\cdot b}$

$\left(\frac{2^2(x^3)^2(y^2)^2}{3^2x^2y^2}\right)$

$\left(\frac{2^2x^6y^4}{3^2x^2y^2}\right) = \left(\frac{2^2x^{6-2}y^{4-2}}{3^2}\right)$

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

$\left(\frac{4\cdot 64\cdot 81}{9\cdot 4\cdot 9}\right)$

$\frac{20736}{324} = 64$

f) $\frac{-16+(-3)^2}{(6-2)^2-(-4)^2}$

$(-4)\cdot(-4) = +16$

$\frac{-16+9}{(4)^2-(16)}$

$= \frac{-7}{0}$ = "undefined"

cannot divide by zero

g) $[5(-4)^3]^2$

$(-4)\cdot(-4)\cdot(-4) = \oplus\cdot\ominus = \ominus$

$[5\cdot(-64)]^2$

$[-320]^2$

$(-320)\cdot(-320) = 102400$

h) $\left[\frac{(-3)^5}{3^3}\right]^2 - \left[\frac{(-2)^5}{2^0}\right]^3$

$\left[\frac{(-3)^{5-3}}{3^{3-3}}\right] - \left[\frac{(-2)^{5-3}}{2^{0-3}}\right]$

$\left[\frac{(-3)^{16}}{3^6}\right] - \left[\frac{(-2)^{15}}{2^0}\right]$

$\left[\frac{59049}{729}\right] - \left[\frac{-32768}{1}\right]$

$[81] - [-32768]$

$81 + 32768 = 32849$

Homework ASSIGNMENT #4 — Section 3.3 pg 91-93

Questions #1-14, 16 — *15, 17, 18