

3.3 Operations with Exponents

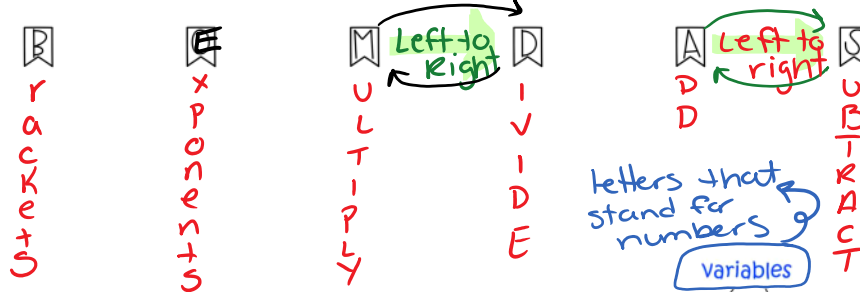
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3.3. Operations with Exponents

Name: _____

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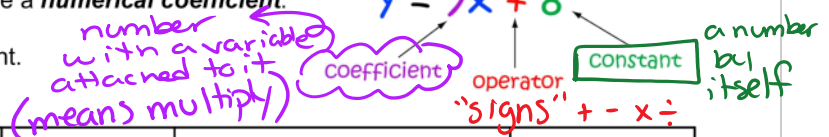
In Chapter 1 we practiced evaluating more complicated expressions that required the **order of operations**. Now we will build on these skills with the **addition of exponent rules**.



Determining the Product of a Power

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

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



Expression	Coefficient	Power	Repeated Multiplication	Value
$3(4)^3$	3	$(4)^3$	$3 \times 4 \times 4 \times 4$	192
$2(-2)^3$	2	$(-2)^3$	$2 \cdot (-2) \cdot (-2) \cdot (-2)$ $(+) \cdot (+) \cdot (-) = (-)$	-16
-2^3	-1	2^3	$-1 \cdot 2 \cdot 2 \cdot 2$ $(-) \cdot (+) = (-)$	-8

coefficient is -1
base
exponent

PRACTICE

Expand + Evaluate each expression:

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

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

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

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) $[(-7)^2 - (-2)^6]^2$
 $[(49) - (64)]^2$
 $[-15]^2$
 $-15 \cdot -15 = 225$
 $0 \cdot 0 = 0$

e) $\left(\frac{2x^3y^2}{3xy}\right)^2$ when $x=2, y=3$
variables.....
 $\left(\frac{2^2(x^3)^2(y^2)^2}{3^2x^2y^2}\right)$
 $\left(\frac{2^2 \cdot 2^6 \cdot 3^4}{3^2 \cdot 2^2 \cdot 3^2}\right)$
 $\left(\frac{2^2 \cdot x^6 \cdot y^4}{3^2 \cdot x^2 \cdot y^2}\right)$
 $\left(\frac{4 \cdot 64 \cdot 81}{9 \cdot 4 \cdot 9}\right)$
 $\frac{20736}{81} = 64$

f) $\frac{-16 + (-3)^2}{(6-2)^2 - (-4)^2}$
 $\frac{-16 + 9}{(4)^2 - (16)}$
 $\frac{-7}{0} = \text{"undefined"}$
cannot divide by zero
 $(-4) \cdot (-4) = +16$

g) $[5(-4)^3]^2$
 $[5 \cdot (-64)]^2$
 $[-320]^2$
 $(-320) \cdot (-320) = 102400$
 $(-4) \cdot (-4) \cdot (-4) = -64$
 $0 = 0$

h) $\left[\frac{(-3)^5}{3^3}\right]^2 - \left[\frac{(-2)^5}{2^0}\right]^3$
 $\left[\frac{(-3)^{5 \cdot 2}}{3^{3 \cdot 2}}\right] - \left[\frac{(-2)^{5 \cdot 3}}{2^{0 \cdot 3}}\right]$
 $\left[\frac{(-3)^{10}}{3^6}\right] - \left[\frac{(-2)^{15}}{2^0}\right]$
 $\left[\frac{59049}{729}\right] - \left[\frac{-32768}{1}\right]$
 $[81] - [-32768]$
 $81 + 32768 = 32849$

Homework ASSIGNMENT #4 Section 3.3 pg 91-93 Questions #1-14, 16 *15, 17, 18