

### 3.3 Operations with Exponents

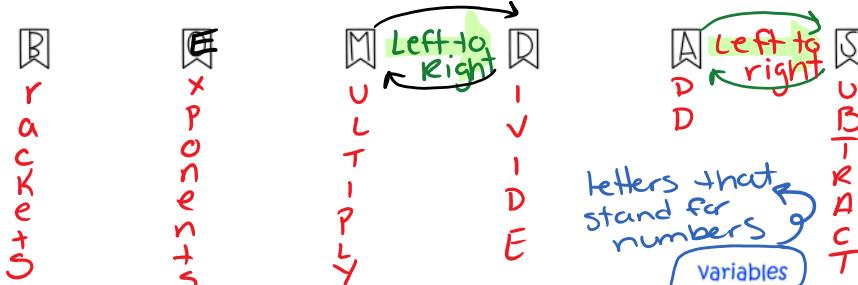
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### 3.3. Operations with Exponents

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.

*number with a variable attached to it means multiply*

$$y = 7x + 8$$

a number but itself

operator "signs"  $+$   $-$   $\times$   $\div$

constant

Expression	Coefficient	Power	Repeated Multiplication	Value
$3(4)^3$	3	$(4)^3$	$3 \times 4 \times 4 \times 4$	192
$2(-2)^3$	2	$(-2)^3$ ↑ base	$2 \cdot (-2) \cdot (-2) \cdot (-2)$ $(+)\cdot(+)\cdot(-)\cdot(-)=0$	-16
$2^3$ Coefficient is -1 base -2	-1	$2^3$	$-1 \cdot 2 \cdot 2 \cdot 2$ $(-) \cdot (+) = 0$	-8



Expand Evaluate each expression:

coeff.  $\rightarrow$  power

a)  $3(6)^2$

$3 \cdot 6 \cdot 6 = 108$

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

c)  $-4^6$

$-1 \cdot 4 \cdot 4 \cdot 4 \cdot 4 \cdot 4 = -4096$

d)  $-3(2)^4$

$-3 \cdot 2 \cdot 2 \cdot 2 \cdot 2 = -48$

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

f)  $5 \cdot -6^3$

$5 \cdot -(6 \cdot 6 \cdot 6) = -1080$

### Evaluate Expressions with Powers

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



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  
 $= \text{+ number}$

c)  $5(4)^3 \div (-2)^4$   
 $5(64) \div (16)$   
 $(5 \times 64) \div 16$   
 $320 \div 16 = 20$

d)  $[-7]^2 - (-2)^{12}$   
 $[(49) - (14)]^2$   
 $[-15]^2$   
 $-15 \cdot -15 = 225$   
 $0 \cdot 0 = \text{+}$

e)  $\left(\frac{2x^3y^2}{3xy}\right)^2$  when  $x=2, y=3$   
 $\left(\frac{2^3(x^3)^2(y^2)^2}{3^2x^2y^2}\right)$   
 $\left(\frac{2^2x^6y^4}{3^2x^2y^2}\right)$   
 $\frac{20736}{324} = 64$

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

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

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



ASSIGNMENT #4  
 Questions #1-14, 16

Section 3.3 pg 91-93  
 \*15, 17, 18