

# Multiplying Powers w/ the Same Base (Section 1-1)

$$* a^m \cdot a^n = \underbrace{(a \cdot a \cdot a \dots a)}_{m \text{ times}} \cdot \underbrace{(a \cdot a \cdot a \dots a)}_{n \text{ times}} = a^{m+n}$$

$$\text{ex: } 9^{-3} \cdot 9^2 \cdot 9^6$$
$$= 9^{-3+2+6}$$
$$= 9^5$$

$$\text{ex: } (-6)^{12} \cdot (-6)^5 \cdot (-6)^2$$
$$= (-6)^{12+5+2}$$

$$= (-6)^{19}$$

\* These are NOT the same order of operations!

$$= -6^{19}$$

\* This answer will be negative!

$$\text{ex: } 5x^4 \cdot x^9 \cdot 3x$$
$$= (5 \cdot 3)x^{4+9+1}$$
$$= 15x^{14}$$

$$\text{ex: } -4c^3 \cdot 7d^2 \cdot 2c^{-2}$$
$$= (-4 \cdot 7 \cdot 2)c^{3+2}d^2$$
$$= -56cd^2$$

$$\text{ex: } -m^2 \cdot 4r^3 \cdot 12r^{-4} \cdot 5m$$
$$= (-1 \cdot 4 \cdot 12 \cdot 5)m^{2+1}r^{3+4}$$
$$= -240m^3r^{-1}$$

\* For scientific notation: you multiply the "a"s together and then use same base multiplication for the  $10^b$ s.

$$\text{ex: } (9.98 \times 10^5)(3.34 \times 10^{22})$$
$$= (9.98 \cdot 3.34) \times 10^{5+22}$$
$$= 33.3332 \times 10^{27}$$

too big!

$$= 3.33332 \times 10^{28}$$

$$\text{ex: } 2.7 \times 10^4 \mu\text{L}/\text{lb}$$
$$1 \mu\text{L} = 7 \times 10^4 \text{ white blood cells}$$
$$= (2.7 \times 10^4 \mu\text{L}/\text{lb}) \times (7 \times 10^4 \text{ wbc}/\mu\text{L})$$
$$= 1.89 \times 10^9 \text{ wbc}/\text{lb} * 140 \text{ lb}$$
$$= 2.646 \times 10^{11} \text{ wbc}$$

\* Fractional exponents are called rational exponents.

so  $a^{m/n} = \sqrt[n]{a^m}$

ex:  $16^{1/4} = \sqrt[4]{16^1} \rightarrow$  on calc: Math #5  
 $= 2$

ex:  $27^{1/3} = \sqrt[3]{27^1}$   
 $= 3$

ex:  $25^{3/2} = \sqrt{25^3} \rightarrow$  on calc 25  $\wedge$  (3 $\div$ 2)  
 $= 25 \cdot 5$   
 $= 125$

ex:  $16^{3/4} = \sqrt[4]{16^3}$   
 $= 4 \cdot 2$   
 $= 8$

ex:  $9^{5/2} = \sqrt{9^5}$   
 $= 9 \cdot 9 \cdot 3$   
 $= 243$

ex:  $2c^{3/5} \cdot 2c^{1/5} = (2 \cdot 2)c^{3/5+1/5}$   
 $= 4c^{4/5}$

ex:  $(b^{2/3} \cdot c^{2/5})(b^{4/9} \cdot c^{9/10})$   
 $= b^{2/3+4/9} \cdot c^{2/5+9/10}$   
 $= b^{4/3+4/9} \cdot c^{4/10+9/10}$   
 $= b^{10/9} \cdot c^{13/10}$

ex:  $(4r^{2/5} \cdot 5s^{2/7})(5s^{5/7} \cdot 4r^{3/5})$   
 $= (4 \cdot 5 \cdot 5 \cdot 4)r^{2/5+3/5} \cdot s^{2/7+5/7}$   
 $= 400r^{5/5} \cdot s^{7/7}$   
 $= 400rs$