OBJECTIVE 1: Evaluating Exponential Expressions
Remember exponents only affect what it is touching ( ) matter!

$$2^5$$

"raised to the 5th" or "to the power of 5"

2^5 = exponential expression

base   exponent
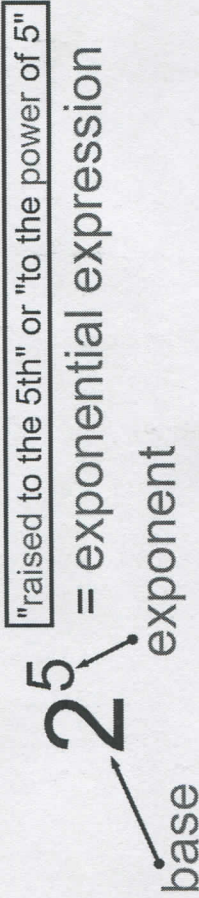
TASK 1: Evaluate each expression. State the value when simplified.

a) 2^3
$2 \cdot 2 \cdot 2 = \boxed{8}$

b) 3^1
$\boxed{3}$

c) $(-4)^2$
$-4 \cdot -4 = \boxed{16}$

d) -4^2
$\boxed{-16}$

e) $\left(\frac{1}{2}\right)^4$
$\frac{1}{2^4} = \boxed{\frac{1}{16}}$

f) $(0.5)^3$
$0.5 \cdot 0.5 \cdot 0.5 = \boxed{\frac{1}{8}}$

g) $4 \cdot 3^2$
$4 \cdot 3 \cdot 3 = 12 \cdot 3 = \boxed{36}$

TASK 2: Evaluate each expression for the given value of x. State the value when simplified.

a) $2x^3$, $x = 5$
$2(5)^3 = 2 \cdot 5 \cdot 5 \cdot 5 = \boxed{250}$

b) $\frac{9}{x^2}$, $x = -3$
$\frac{9}{(-3)^2} = \frac{9}{(-3)(-3)} = \frac{9}{9} = \boxed{1}$

c) $-4x^4$, $x = -1$
$-4(-1)^4 = -4 \cdot -1 \cdot -1 \cdot -1 \cdot -1 = \boxed{-4}$

OBJECTIVE 2: Using the Product Rule
Exponential expressions can be multiplied, divided, added, subtracted, and raised to powers.

$5^4 \cdot 5^3 = (5 \cdot 5 \cdot 5 \cdot 5)(5 \cdot 5 \cdot 5)$
$= 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5 \cdot 5$
$= 5^7$

$x^2 \cdot x^3 = (x \cdot x)(x \cdot x \cdot x)$
$= x \cdot x \cdot x \cdot x \cdot x$
$= x^5$

So....
$$a^m \cdot a^n = a^{m+n}$$

Add exponents.
Keep the common base!

TASK 3: Use the product rule to simplify.

a) $4^2 \cdot 4^5$
$4^{2+5} = 4^7 = \boxed{16,384}$

b) $x^4 \cdot x^6$
$x^{4+4} = \boxed{x^{10}}$

c) $y^3 \cdot y$
$y^{3+1} = \boxed{y^4}$

d) $y^3 \cdot y^2 \cdot y^7$
$y^{3+2+7} = \boxed{y^{12}}$

e) $(-5)^7 \cdot (-5)^8$
$(-5)^{7+8} = (-5)^{15}$

f) $a^2 \cdot b^2$
$\boxed{a^2 b^2}$

$= -3.052 \times 10^{10}$

TASK 4: Use the product rule to simplify.

a) $(2x^2)(-3x^5)$

$-6x^{2+5} = \boxed{-6x^7}$

b) $(-5y^3)(-3y^4)$

$(-5)(-3)y^{3+4} = \boxed{15y^7}$

c) $(4a^2)(-6a^3)$

$4 \cdot -6a^{2+3} = \boxed{-24a^5}$

TASK 5: Use the product rule to simplify.

a) $(x^2y)(x^3y^2)$

$x^{2+3}y^{1+2} = \boxed{x^5y^3}$

b) $(-a^7b^4)(3ab^9)$

$-3a^{7+1}b^{4+9} = \boxed{-3a^8b^{13}}$

c) $(-p^3q^4)(-4p^5q^6)$

$-1 \cdot -4p^{3+5}q^{4+6} = \boxed{4p^8q^{10}}$

OBJECTIVE 3: Using the Power Rule

$$(x^2)^3 = (x^2)(x^2)(x^2)$$
$$= x^{2+2+2} = x^6$$

$$(x^2)^3 = (x^{2\cdot 3}) = x^6$$

So…
$$(a^m)^n = a^{mn}$$
Multiply exponents.
Keep common base!

TASK 6: Use the product rule to simplify.

a) $(y^8)^2$

$y^{8\cdot 2} = \boxed{y^{16}}$

b) $(8^4)^5$

$8^{4\cdot 5} = 8^{20} = \boxed{1.153 \times 10^{18}}$

c) $[(-5)^3]^7$

$(-5)^{3\cdot 7} = (-5)^{21} = \boxed{-4.768 \times 10^{14}}$

NOTES to MYSELF: (What mistakes did I keep making?)

Keep the same base, check on my calculator when possible!

Still need help with: