Math 4c. Class work 27.

$4 \cdot 12$	$96:8$	$52:2$
$+12$	$\cdot 30$	$+24$
$\cdot 3$	-300	$:25$
$:9$	$:4$	$\cdot 36$
?	?	?

Properties of natural exponent:

If the same base raised to the different power and then multiplied:

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

Or in a more general way:

$$b^n \cdot b^m = b^{n+m}$$

If the base raised to the power of n then raised again to the power of m:

$$(b^2)^3 = (b \cdot b)^3 = (b \cdot b) \cdot (b \cdot b) \cdot (b \cdot b) = b^{2 \cdot 3}$$

$$(b^m)^n = b^{mn}$$

If we want to multiply $b^n = \underbrace{b \cdot b \cdot b \ldots \cdot b}_{n\ times}$ by another b we will get the following expression:

$$b^n \cdot b = \underbrace{b \cdot b \cdot b \ldots \cdot b}_{n\ times} \cdot b = \underbrace{b \cdot b \cdot b \cdot b \ldots \cdot b}_{n+1\ times} = b^{n+1} = b^n \cdot b^1$$

In order to have the set of power properties consistent, $b^1 = b$ for any number b.

If we multiply b^n by 1, we won't change anything, so we can write

$$b^n \cdot 1 = b^{n+0} = b^n \cdot b^0$$

In order to have the set of power properties consistent, $b^0 = 1$ for any number $b \neq 0$

If two different bases raised to the same power, then:

$$(a \cdot b)^3 = (a \cdot b) \cdot (a \cdot b) \cdot (a \cdot b) = a \cdot a \cdot a \cdot b \cdot b \cdot b = a^3 b^3$$

$$(a \cdot b)^n = a^n b^n$$

1. Write the following expressions in a shorter way:

   Example: $7 \cdot 7 \cdot 7 \cdot 8 \cdot 8 \cdot 8 \cdot 8 \cdot 9 \cdot 9 \cdot 9 \cdot 9 \cdot 9 = 7^3 \cdot 8^4 \cdot 9^5$

   $2 \cdot 3 \cdot 3 \cdot 3 \cdot 3 \cdot 7 \cdot 7;$

   $\underbrace{3 \cdot 3 \cdot \ldots \cdot 3}_{n\ times} \cdot \underbrace{5 \cdot 5 \cdot \ldots \cdot 5}_{m\ times}$

   $\underbrace{(-4) \cdot (-4) \cdot \ldots \cdot (-4)}_{k\ times} \cdot \underbrace{6 \cdot 6 \cdot \ldots \cdot 6}_{l\ times}$

2. Compare the numbers:

   $a.\ 5^3 \quad 5 \cdot 3$ $\qquad$ $b.\ 12^2 \quad 12 \cdot 2$

   $c.\ 2^5 \quad 5^2$ $\qquad$ $d.\ 3^4 \quad 4^3$

   $e.\ 5^3 \quad 5 \cdot 3$ $\qquad$ $f.\ 2^4 \quad 4^2$

3. Simplify the following expressions:
   a. $3 \cdot 3^4(-3)^2;$
   b. $2^5 \cdot 2(-2^2)c^{4-1}c^3;$
   c. $5^3 \cdot 5(-5^5)5^3 \cdot 5;$
   d. $2 \cdot 3^2 \cdot 5^3 \cdot (-4 \cdot 3 \cdot 5^2);$
   e. $0.5a(-b)^6 \cdot 10a^2b^2;$
   f. $\frac{1}{6}(-5)^3 5 \cdot 3 \cdot (-6 \cdot 5 \cdot 3^3);$
   g. $2^4 + 2^4;$
   h. $2^m + 2^m;$
   i. $2^m \cdot 2^m;$
   j. $3^2 + 3^2 + 3^2;$
   k. $3^k + 3^k + 3^k;$
   l. $3^k \cdot 3^k \cdot 3^k;$

4. Jane and Mary are planting flowers. Jane can plant all flowers in 2 hours, Mary can do it in 3 hours. How many hours they need to plant all flowers together?

5. A swimming pool can be filed with one pipe in 10 hours. Full pool can be drain out with another pipe in 20 hours. How long it will take to fill up the pool with opened drain pipe?

6. Jane and Mary are doing fall clean up in a backyard. Mary can do the job in 6 hours; together they can do it in 4 hours. How many hours does Jane need to clean up the backyard?

7. 5 hamsters will eat 5 bags of hamster food in 5 days. How many days 10 hamsters need to eat 10 bags of food?

8. Two pipes fill together a pool in 1 h and 20 minutes. If the fist pipe is open for 10 minutes, and the second pipe is open for 12 minutes, the pool will be filled on 2/15. How fast each pipe will fill the pool?