

BE-Algebra I | Monday 12-1-08

① DEFINE MONOMIAL.

② Name the exponent rule^(or rules) used to simplify, then simplify:

Ⓐ $(8xy^4z^8)(-4xy^3z^3)$

Ⓑ $(-5x^2y^3)^3$

Ⓒ $[(3x)^2]^2$

③ Use a system of linear equations to find 2 numbers whose sum is 65 and whose difference is 25.

- Q2 Exam 2 Friday
(Bball players - arrange to take before 7th per.)

RECALL THE 3 EXPONENT RULES
used so far:

$$\text{MR } a^n \cdot a^m = a^{n+m}$$

$$\text{PPR } (a^n)^m = a^{n \cdot m}$$

$$\text{GPR } (ab)^n = a^n b^n$$

THE GPR ALSO WORKS FOR A "GROUP"
that includes division.

$$\textcircled{\text{EX}} \left(\frac{1}{2}\right)^3 = \left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\left(\frac{1}{2}\right) = \frac{1^3}{2^3} = \frac{1}{8}$$

SEE THE SHORTCUT?

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

COMPLETE
THIRD EXPONENT RULE

$$\text{GPR } (ab)^n = a^n b^n \text{ OR } \left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

EX 2
pg 418

$$\left(\frac{2p^2}{3}\right)^4$$

$$= \frac{2^4 p^8}{3^4} = \boxed{\frac{16p^8}{81}}$$

Let's try to find the 4th
Exponent rule:

$$\textcircled{\text{EX}} \quad \frac{5^5}{5^2} = \frac{5 \cdot 5 \cdot 5 \cdot 5 \cdot 5}{5 \cdot 5}$$

see a
SHORTCUT?

$$= \frac{5}{5} \cdot \frac{5}{5} \cdot \frac{5}{1} \cdot \frac{5}{1} \cdot \frac{5}{1}$$

$$= \boxed{5^3} \text{ or } 125$$

DR When dividing powers with the
same base, subtract the EXponents
(top minus bottom)

$$\boxed{\text{DR} \quad \frac{a^n}{a^m} = a^{n-m}}$$

$$\textcircled{\text{EX}} \quad \frac{x^8 y^3 z}{x^5 y^2} = \boxed{x^3 y z}$$

$$\overline{\text{EX 1}} \quad \overline{\text{pg 417}} \quad \frac{a^5 b^8}{a b^3} = \boxed{a^4 b^5}$$

$$\textcircled{\text{EX}} \quad \left(\frac{3x^4}{2x} \right)^2 = \frac{3^2 x^8}{2^2 x^2} = \boxed{\frac{9x^6}{4}}$$

$$\textcircled{\text{EX}} \quad (2x^5)^2 (3x^3)^2 \left(\frac{x^2}{x} \right)^3$$

$$(4x^{10})(9x^6) \left(\frac{x^6}{x^3} \right)$$

$$(36x^{16})(x^3)$$

$$\boxed{36x^{19}}$$

THE LAST 2 RULES FOLLOW DIRECTLY
 FROM THE $\boxed{DR \Rightarrow \frac{a^N}{b^m} = a^{N-m}}$

IF $N > m \Rightarrow$ NO WORRIES

RULE 5 $\Rightarrow N = m$

RULE 6 $\Rightarrow N < m$

SUPPOSE $N = m$

$$\textcircled{\text{EX}} \quad \frac{5^3}{5^3} = \frac{125}{125} = 1$$

$$\text{BUT THE DR} \Rightarrow \frac{5^3}{5^3} = 5^{3-3} = 5^0$$

ZER ANYTHING TO THE 0 POWER IS 1
 (EXCEPT $0^0 = 0$)

$$\boxed{\text{ZER } a^0 = 1}$$

$$\textcircled{\text{EX}} \quad 4^0 = 1$$

$$\textcircled{\text{EX}} \quad (8x^3y^2)^0 = 1$$

$$\textcircled{\text{EX}} \quad (3x^5y^0)^2 =$$

$$3^2 x^{10} y^0 = \boxed{9x^{10}}$$

EX 3
pg 419

$$\textcircled{\text{a}} \quad \left(-\frac{3x^5y}{8xy^7} \right)^0 = 1$$

$$\textcircled{\text{b}} \quad \frac{t^3 s^0}{t} = t^2$$

What if $n < m$?

$$\textcircled{\text{EX}} \quad \frac{5^2}{5^3} = \frac{5 \cdot 5}{5 \cdot 5 \cdot 5} = \frac{1}{5} ??$$

The last exponent rule is the
NEGATIVE EXPONENT RULE.

IT DOES NOT MEAN YOU HAVE
 A NEGATIVE NUMBER !!!!!

It just means there ARE MORE
 OF THE "base" in the denominator
 than the top (the bottom)

$$\frac{5^2}{5^3} \Rightarrow 5^{2-3} = 5^{-1} = \frac{1}{5^1}$$


 more 5's in bottom

NER a^{-N} is the reciprocal of a^N
 a^N is the reciprocal of a^{-N}

NER $a^{-N} = \frac{1}{a^N}$

or $a^N = \frac{1}{a^{-N}}$

$$\textcircled{\text{EX}} \quad \frac{x^4}{x^7} = x^{-3} = \frac{1}{x^3}$$

$\nwarrow$ NOT SIMPLIFIED $\nearrow$ SIMPLIFIED
 $\textcircled{*d}$ DON'T LEAVE A NEGATIVE EXPONENT IN FINAL ANSWER

$$\textcircled{\text{EX}} \quad \frac{x^{-3}}{x^2} = x^{-3-2} = x^{-5} = \boxed{\frac{1}{x^5}}$$

$$\textcircled{\text{EX}} \quad \frac{x^{-3}}{x^{-2}} = x^{-3-(-2)} = x^{-3+2} = x^{-1} = \boxed{\frac{1}{x}}$$

or

$$\frac{\frac{1}{x^3}}{\frac{1}{x^2}} = \frac{1}{x^3} \cdot \frac{x^2}{1} = x^{-1} = \boxed{\frac{1}{x}}$$

$$\textcircled{\text{EX}} \quad 2^{-3} = \frac{1}{2^3} = \boxed{\frac{1}{8}} \quad \left\{ \begin{array}{l} \textcircled{\text{EX}} \quad \frac{1}{2^{-3}} = \frac{1}{\frac{1}{8}} = 8 \\ \frac{1}{2^{-3}} = 2^3 = 8 \end{array} \right.$$

EX 4 Pg 420

$$\frac{-3a^{-4}b^7}{21a^2b^7c^{-5}}$$

$$-\frac{1}{7}a^{-6}b^0c^5$$

$$\text{since } \frac{1}{c^{-5}} = c^5$$

$$= \boxed{\frac{-c^5}{7a^6}}$$

Homework: Pg 421 # 4 to 12

Summary of Exponent Rules

Multiplication
Rule

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

EX) $(x^4 y^3)(x^5 y) = x^9 y^4$

EX) $8^3 \cdot 8^7 = 8^{10}$

Division
Rule

$m > n$

$$\frac{a^m}{a^n} = a^{m-n}$$

EX) $\frac{x^8}{x^3} = x^5$

EX) $\frac{5^{12}}{5^4} = 5^8$

Zero Exponent
Rule

Division Rule
where $m = n$

$$a^0 = 1$$

EXCEPT FOR
 $0^0 = 0$

EX) $(4x^3 y)^0 = 1$

EX) $5^0 = 1$

Negative Exponent
Rule

Division Rule
where $m < n$

$$a^{-n} = \frac{1}{a^n}$$

EX) $5^{-2} = \frac{1}{5^2} = \frac{1}{25}$

EX) $4x^{-3} = 4 \cdot \frac{1}{x^3} = \frac{4}{x^3}$

⚡ Never LEAVE A
NEGATIVE EXPONENT

Power TO A Power
Rule

$$(a^m)^n = a^{m \cdot n}$$

EX) $(5^2)^5 = 5^{10}$

EX) $[(4^3)^2]^6 = [4^6]^6 = 4^{36}$

Group TO A Power
Rule

$$(ab)^n = a^n b^n$$

OR
 $\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$

EX) $(4x)^2 = 4^2 x^2 = 16x^2$

EX) $\left(\frac{2x}{y}\right)^3 = \frac{2^3 x^3}{y^3} = \frac{8x^3}{y^3}$