BE-Algebra II Monday 11-30-09

① Define monomial.

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

Ⓐ $(8xy^4z^8)(-4xy^3z^3)$

Ⓑ $(-5x^{11}y^3)^3$

Ⓒ $[(3x)^2]^2$

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

- Q2 Exam 2 Friday

RECALL THE 3 EXPONENT RULES USED SO FAR:

MR $a^N \cdot a^M = a^{N+M}$

PPR $(a^N)^M = a^{N \cdot M}$

GPR $(ab)^N = a^N b^N$

THE GPR ALSO WORKS FOR A "group" THAT INCLUDES DIVISION.

(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

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

Ex 2 Pg 418 $\left(\frac{2p^2}{3}\right)^4$

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

Lets try to find the 4th Exponent rule:

(Ex) $\frac{5^5}{5^2} = \frac{5 \cdot 5 \cdot 5 \cdot 5 \cdot 5}{5 \cdot 5}$

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

See a shortcut?

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

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

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

(Ex) $\dfrac{x^8 y^3 z}{x^5 y^2} = \boxed{x^3 y z}$

Ex 1 Pg 417 $\dfrac{a^5 b^8}{a b^3} = \boxed{a^4 b^5}$

(Ex) $\left(\dfrac{3x^4}{2x}\right)^2 = \dfrac{3^2 x^8}{2^2 x^2} = \boxed{\dfrac{9x^6}{4}}$

(Ex) $(2x^5)^2 (3x^3)^2 \left(\dfrac{x^2}{x}\right)^3$

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

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

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

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 $N = m$

(EX) $\frac{5^3}{5^3} = \frac{125}{125} = 1$

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

ZER ANYTHING to the 0 power is 1
(except $0^0 = 0$)

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

(Ex) $4^0 = 1$

(Ex) $(8x^3y^2)^0 = 1$

(Ex) $(3x^5y^0)^2 =$

$3^2x^{10}1^2 = \boxed{9x^{10}}$

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ex 3 pg 419

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

(b) $\frac{t^3s^0}{t} = t^2$

What if $N < m$?

(Ex) $\frac{5^2}{5^3} = \frac{5 \cdot 5}{5 \cdot 5 \cdot 5} = \frac{1}{5}$??

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 $5^{\text{"}}$ 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 $a^N = \frac{1}{a^{-N}}$

(Ex) $\frac{x^4}{x^7} = x^{-3} = \frac{1}{x^3}$

NOT SIMPLIFIED ↑ ↑ SIMPLIFIED

(*d) DONT LEAVE A NEGATIVE EXPONENT IN FINAL ANSWER

(Ex) $\frac{x^{-3}}{x^2} = x^{-3-2} = x^{-5} = \boxed{\frac{1}{x^5}}$

(Ex) $\frac{x^{-3}}{x^{-2}} = x^{-3-(-2)} = x^{-3+2}$

$= x^{-1} = \boxed{\frac{1}{x}}$

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

(Ex) $2^{-3} = \frac{1}{2^3} = \boxed{\frac{1}{8}}$

(Ex) $\frac{1}{2^{-3}} = \frac{1}{\frac{1}{8}} = 8$

$\frac{1}{2^{-3}} = 2^3 = 8$

Ex 4 Pg 420

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

$-\frac{1}{7}a^{-6}b^0c^5$ 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) $(x^4y^3)(x^5y) = x^9y^4$

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

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

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