2-18-2016

MULTIPLYING EXPONENTIAL NUMBERS

$$\begin{array}{r} 100. \\ \times\ 10. \\ \hline 1000. \end{array} \qquad \begin{array}{r} 1.00 \times 10^{2} \\ \times\ 1.00 \times 10^{1} \\ \hline 1.00 \times 10^{3} \end{array}$$

- DON'T NEED ~~DEN~~ EXPONENTS TO BE SAME
- MULTIPLY THE MANTISSAS
- ADD THE EXPONENTS
- PUT INTO STANDARD FORM

PRACTICE:

$$\begin{array}{r} 3.4 \times 10^{-2} \\ \times\ 5.8 \times 10^{3} \\ \hline 19.72 \times 10^{1} \end{array} \qquad -2+3=1$$

$$1.972 \times 10^{2} \qquad \boxed{1.97 \times 10^{2}}$$

DIVISION OF EXPONENTIALS

SAME AS FOR MULTIPLICATION EXCEPT:

- DIVIDE MANTISSAS
- SUBTRACT EXPONENTS

PRACTICE:

$$\begin{array}{r} 3.18 \times 10^{-2} \\ \div\ 1.04 \times 10^{-3} \\ \hline 3.057692 \times 10^{1} \end{array} \qquad -2-(-3)=1$$

$$\boxed{3.06 \times 10^{1}}$$

$$3-4=-1$$

$$\frac{4.27 \times 10^{3}}{6.18 \times 10^{4}} = 0.6909 \times 10^{-1}$$

$$6.909 \times 10^{-2}$$

$$\boxed{6.91 \times 10^{-2}}$$

PROPERTIES OF OPERATORS ON REAL NUMBERS

$+ \quad - \quad \times \quad \div$

ASSOCIATIVE PROPERTY OF ADDITION FOR REALS

DOES GROUPING MATTER?

EXAMPLE: $(1 + 2) + 3 = 1 + (2 + 3)$

$$6 \stackrel{\checkmark}{=} 6$$

$$(1 + {}^{-}2) + ({}^{-}3) \stackrel{?}{=} 1 + ({}^{-}2 + {}^{-}3)$$

$$-1 + {}^{-}3 \qquad 1 + {}^{-}5$$

$$-4 \stackrel{\checkmark}{=} -4$$

GENERALLY, $\boxed{(A + B) + C = A + (B + C)}$

A, B, AND C ARE REAL

DOES IT WORK FOR SUBTRACTION?

$$(1 - 2) - 3 \stackrel{?}{=} 1 - (2 - 3)$$

$$-1 - 3 \qquad 1 - {}^{-}1$$

$$-4 \neq 2$$

REPLACE SUBRACTION WITH ADDITION:

$$(1 + {}^{-}2) + {}^{-}3 \stackrel{\checkmark}{=} 1 + ({}^{-}2 + {}^{-}3)$$

DOES IT WORK FOR MULTIPLICATION?

$\boxed{(A * B) * C \stackrel{?}{=} A * (B * C)}$ YES

$$2 * (3 * 4) = (2 * 3) * 4$$

$$2 * 12 \qquad 6 * 4$$

$$24 \stackrel{\checkmark}{=} 24$$

FOR DIVISION? NO

$$(12 \div 6) \div 3 \neq 12 \div (6 \div 3)$$

$$2 \div 3 \qquad 12 \div 2$$

$$2/3 \neq 6$$

COMMUTATIVE PROPERTY OF ADDITION

DOES ORDER MATTER?

$$\boxed{A + B = B + A}$$ A, B ARE REAL

$$(4 + 3 = 3 + 4)$$

$$(4 + -2 = -2 + 4)$$

FOR SUBTRACTION? NO

$$4 - 3 \neq 3 - 4$$

$$1 \neq -1$$

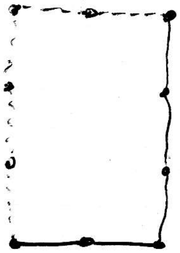
FOR MULTIPLICATION

$$\boxed{A * B = B * A}$$ YES

FOR DIVISION NO

$$1 \div 2 \neq 2 \div 1$$

$$\tfrac{1}{2} \neq 2$$



EXAMPLE:

$$(8 \times 10^3) * (4 \times 10^3)$$

$$8 * 4 * (10^3 \times 10^3)$$

$$32 \times 10^6 \qquad \boxed{3.20 \times 10^7}$$

DISTRIBUTIVE PROPERTY OF MULTIPLICATION OVER ADDITION

$$\boxed{A*(B+C) = AB + AC}$$ A, B, C ARE REAL

TRY: $3*(2+5) = 3\cdot 2 + 3\cdot 5$

$3*7 = 6 + 15$

$21 \overset{\checkmark}{=} 21$

ORDER OF OPERATIONS

P = PARENTHESES
E = EXPONENTS
M = MULTIPLICATION
D = DIVISION
A = ADDITION
S = SUBTRACTION

$\xrightarrow{\text{ARITHMETIC}}$
(PEMDAS)
$\xleftarrow[\text{ALGEBRA}]{}$

EXAMPLES: $a*(2+3) = a*2 + a*3$

$= a2 + a3$

$= 2a + 3a$

$a(2+b) = a\cdot 2 + ab$

$= 2a + ab$

$a(2+a) = a\cdot 2 + a\cdot a$

$= 2a + a^2$

DOES THE DISTRIBUTIVE PROPERTY WORK FOR MULTIPLICATION OVER SUBTRACTION?

$$A*(B-C) \stackrel{?}{=} AB - AC \quad \text{(IS OK)}$$

$$A*(B+{}^{-}C) \stackrel{\checkmark}{=} AB + A({}^{-}C)$$

$$AB - AC$$

THIS IS NOT THE DISTRIBUTIVE PROPERTY:

$$A*(B*C) \neq A*B * A*C$$

FACTORING IS THE DISTRIBUTIVE PROPERTY IN REVERSE

$$\underline{A}B + \underline{A}C = A(B+C)$$

IDENTIFY COMMON FEATURES IN EACH TERM AND FACTOR THEM OUT

$$3 \cdot 5 + 3 \cdot 6 = 3 \cdot (5+6) = (5+6) \cdot 3$$

$$a \cdot b + c \cdot a =$$

$$a \cdot b + a \cdot c = a \cdot (b+c)$$