Skills to Enhance Learning GED Math

The objective of this paper is to provide an introduction to the different types of numbers and their properties at the Pre-GED level. Number properties are important to algebra because they allow us to write equivalent expressions.[1] Those properties are for addition and multiplication of whole numbers and for order of operations (PEMDAS).

This basic knowledge will provide the student with the necessary skills to be successful when solving algebraic operations. In addition, the knowledge will provide an understanding of those algebraic rules which are an important element for the manipulation of equations.

The first part of this paper will describe the whole numbers properties while the remaining part will focus on the exponent rules.

Rational and Irrational numbers – Real numbers [2]

A-- Types of numbers

Natural numbers are those used in counting

N= (1, 2, 3, 4, 5, 6, 7….)

Whole numbers are the set of natural numbers including zero

W= (0, 1, 2, 3, 4, 5…….)

Integers are the whole numbers set positive and negative numbers. L = (….-4, -3, -2, -1 0 1, 2, 3, 4,…) . The integer set can be represented by the number line as a useful connecting link with geometry.

_______________________|________________________

-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8

The distance for corresponding points positive or negative is the same. For example the distance from 0 to 5 is the same as the distance from -5 to 0.

Rational numbers Those are numbers that can be written in the form of a / b. Both a and b are integers and b ≠ 0. Rational numbers can be written also as decimals, a terminating decimal or an infinite repeating series.

Irrational numbers

[1] S.Smith, R J. Charles, John Dossey, M.L Keedy and Marvin L. Bittinger, Algebra. Addison Wesley Publishing Company, 1990. P. 102-107.

[2] D. Franklin Wright, Introductory Algebra, Fifth Edition, Hawkes Publishing, A division of Quest Systems, Inc. 2003, p. 51.

A set of numbers known as irrational numbers are those that are infinite non repeating decimals. For example: Pie π, Epsilon ϵ, Cube root $\sqrt[3]{}$ and others.

Real numbers

The entire set of rational and irrational numbers.

B-- Number Properties: [3]

I- Commutative for Addition and Multiplication of whole numbers.

Addition: for any two numbers a and b, a + b = b + a. We can change the order of the numerals without affecting the sum. Let a = 5 and b = 6 then a+b = 5 + 6 =11 and b + a= 6 + 5 = 11.

Multiplication: for any number a x b = b x a. We can change the order of the numerals without affecting the sum. For example b x a = a x b. Let a =5 and b = 6 then a x b = 5 x 6 = 30 and b x a = 6 x 5 = 30.

II- Associative for Addition and Multiplication of whole numbers.

Addition: for any three numbers a, b, c, a + (b + c) = (a + b) + c. Let a = 5 b = 6 and c = 4 then 5 + (6 + 4) = 15 and (5 + 6) + 4 = 15. Therefore, you can group the numbers in any order.

Multiplication: for any three numbers a, b, c, a (bxc) = (a x b) x c.

Let a = 5 b = 6 and c = 4 then 5 x (6 x 4)= 120.

You can group the numbers in any order.

III- Distributive of multiplication over addition. For any three numbers a, b, c, then a (b + c) you can multiply or add by distributing them. For example: a (b + c) = ab + ac. You can use the distributive property to remove parenthesis. For example: 3 (x + 2) is the same as 3 x X + 3 x 2 = 3x +6. The reverse of the distributive property is called factoring. Factoring is an essential element in the learning of higher algebra to solve equations of second and higher degree.

IV Identity Property

Addition a + 0 = a

Multiplication a x 1 = a

V Closure property

Addition a + b is a rational number
Multiplication a x b is a rational number

[3] D. Franklin Wright, Introductory Algebra, p, 45-54.

VI Inverse property

Additive – for each rational number a there is one and only one -a such as a + (-a) = 0. The inverse of the inverse will be -(-a) = a.

Multiplicative a(a ≠ 0) x 1/a = a/a =1. Double negative results in a positive number. For example: [+ 8= -(- 8)]

VII Other properties

Reflexive a = a

Symetric a = b, b = a,

Transitive a = b b = c then a = c

Reciprocals: For any two rational products whose number is one then 7/8 x 8/7 = 1. In general m/n x n/m = 1. For example 8/3 ÷ 40/15 = 1.

C-- Order of Operations--PEMDAS- Please Excuse My Dear Aunt Sally.[4]

P= Parenthesis, E=Exponents, M=Multiplication, A=Addition and S=Subtraction.

Rules for the order of operations:

a) Compute within grouping symbols
b) Multiply and divide in order from left to right
c) Add and subtract in order from left to right

For example: 8 x 4 + 16÷2 = 32 + 8 = 40 and 2m÷n for m = 6 and n = 3 and 2 x 6 =

12÷ 3 = 4. In the preliminary preparation of knowledge prior to teaching algebra operations, it essential to have an understanding of the properties and rules of exponents.

D-- Rules of Exponents. Exponents are composed of two elements the base and the index a^4 The exponent base is “a” and the index is a number that tells the number of times the base must be multiplied. For example: a^4 indicates that the base “a” is multiplied four times. If we let base “a” equal to two then the base will be 2 x 2 x 2 x 2 equals 16. Follow the set of exponent properties that should be included in the math learning process at the Pre-GED level prior to learning algebra.

[4] Franklyn, Introductory Algebra Fifth Edition, p. 41.

Properties of Exponents

$a^n . a^m = a^{m+n} a \neq 0$ for example let $a = 5, m = 3$ and n=2 then $5^{3+2} = 5^5 = 3125$

$\frac{a^m}{a^n} = a^{m-n} a \neq 0$ for example let a =5 , m=3 and n=2 then $\frac{5^3}{5^2} = 5^1 = 5$

$(a^m)^n = a^{m.n}$ for example let a=5 and m=3 and n=2 then $5^6 = 15625$

$a^0 = 1$

$a^{-n} = \frac{1}{n}$ for example let a=5 then $5^{-1} = \frac{1}{5}$

$(ab)^n = a^n b^n$ for example let a=5, b=2 and n=2 then $5^2 x 2^2 = 25x4 = 100$

$(\frac{a}{b})^n = \frac{a^n}{b^n}$ for example let a=6 , b=2 and n=2 then $\frac{6^2}{2^2} = \frac{36}{4}$

$(\frac{a}{b})^{-n} = \frac{a^{-n}}{b^{-n}} = \frac{\frac{1}{a^n}}{\frac{1}{b^{-n}}}$ for example let a=6 b=2 and n=3 then $\frac{6^{-3}}{2^{-3}} = \frac{\frac{1}{6^3}}{\frac{1}{2^3}} = \frac{\frac{1}{216}}{\frac{1}{8}} = \frac{1}{216} \text{ x } \frac{8}{1} = \frac{1}{27}$

Teaching the above materials will prepare the students for Algebra I and mathematical subjects such as: Analytic Geometry, Trigonometry and Calculus. The understanding and mastering of the above concepts are necessary tools in the students learning process towards obtaining their GED and their future endeavors, if college is an objective

Exercises

Name the property of real numbers if for addition and multiplication:

5 +16 = 16 + 5 ______________________________

5 + (3+1) = (5 + 3) + 1 ________________________

5 (X+18) = 5x +90 ______________________________

(6. Y) . 9 = 6 . (Y. 9) _____________________________

(Y + 2) (Y – 4) = (Y – 4) (Y + 2) ______________________

Order of Operations

20 ÷ 5 + 2 ____________________________________

20 . 2 ÷ 2^2 + 5 (-2) _____________________________

4^2 ÷ (-8) (- 2) + 3 (2^2 - 5^2) _______________________

2 – 5 [(-20) ÷ (- 4) . 2 – 40] _______________________

Exponents

$\frac{12x^6}{-3x^3}$ =

10. 10^{-1} / 10^2 =

-8x^2 y^4 / 4x^3y^2 =

(-3xy) (-5 x^2y^{-3})=

(- 2 x^{-3} y^5) 1^0 =