

1.5 Algebraic Properties

Binary operation - operation that starts by combining two numbers and gives a single number for the answer.

Ex: addition
subtraction
multiplication
division

1. Commutative Property - ORDER CHANGE

Root: commute

$$\text{addition: } a+b = b+a$$

$$\text{multiplication: } ab = ba$$

2. Associative Property - what is inside the () will

Root: Associate
(groups) change

*** NO ORDER CHANGE

$$\text{addition: } (a+b)+c = a+(b+c)$$

$$\text{multiplication: } (ab)c = a(bc)$$

3. Distributive Property -

Root: distribute

$$a(b \pm c) = ab \pm ac$$

$$ab \pm ac = a(b \pm c)$$

4. Zero Product Property -

*Anything times zero is zero.

$$a(0) = 0$$

5. Additive Identity Property -

*Get out what you put in.

$$a + 0 = a$$

additive identity element = 0

6. Multiplicative Identity Property -

$$a(1) = a$$

multiplicative identity element = 1

7. Additive Inverse Property -

* Answer will be = identity element

$$a + -a = 0$$

additive inverse = opposite

8. Multiplicative Inverse Property -

$$a\left(\frac{1}{a}\right) = 1$$

$$\begin{array}{l} a \div a = 1 \\ \text{stay, change, flip} \\ a\left(\frac{1}{a}\right) = 1 \end{array}$$

multiplicative inverse = reciprocal = "flip"

Examples:

Identify the property:

1. $7 + (3 + 2) = (7 + 3) + 2 \rightarrow$ Associative Property for Addition
2. $5(1) = 5 \rightarrow$ Multiplicative Identity Property
3. $3(x + 2) = 3(x) + 3(2) \rightarrow$ Distributive Property
4. $7(8) = 8(7) \rightarrow$ Commutative Property for Multiplication
5. $3 + -3 = 0 \rightarrow$ Additive Inverse Property
6. $x + 4 = 4 + x \rightarrow$ Commutative Property for Addition
7. $2 + 0 = 2 \rightarrow$ Additive Identity Property
8. $7(0) = 0 \rightarrow$ Zero Product Property
9. $6\left(\frac{1}{6}\right) = 1 \rightarrow$ Multiplicative Inverse Property
10. $(3 + 1) + 6 = 6 + (3 + 1) \rightarrow$ Commutative Property for addition

Example: For $\frac{3}{4}$, name the following:

a. Additive inverse: $-\frac{3}{4}$

b. Multiplicative identity: 1

c. Reciprocal: $\frac{4}{3}$

d. Additive identity: 0

e. Multiplicative inverse: $\frac{4}{3}$

HOMEWORK:

Worksheet - HW 1.5 Properties