CMillsap PROPERTIES A

Given: $a \in R$, $b \in R$, $c \in R$ where $R = \{$Real Numbers$\}$, then:

I

Addition

① $a+b=b+a$ Commutative Property of Addition
② $a+(b+c)=(a+b)+c$ Associative Property of Addition
③ $a+(-a)=(-a)+a=0$ Additive Inverse Property
④ $a+0=0+a=a$ Additive Identity Element
⑤ $a+b=c$ Closure for Addition

Multiplication

① $a \cdot b = b \cdot a$ ① Commutative Property of Multiplication
② $(a \cdot b) \cdot c = a \cdot (b \cdot c)$ ② Associative Property of Multiplication
③ $a \cdot \frac{1}{a} = \frac{1}{a} \cdot a = 1$, $a \neq 0$ ③ Multiplicative Inverse Property
④ $a \cdot 1 = 1 \cdot a = a$ ④ Multiplicative Identity Element.
⑤ $a \cdot b = c$ ⑤ Closure for Multiplication
⑥ $a \cdot 0 = 0 \cdot a = 0$ ⑥ Multiplication Property of Zero

II Axioms of Equality: ① $a=a$ Reflexive Property of Equality.
② If $a=b$, then $b=a$. Symmetrical Property of Equality
③ If $a=b$, $b=c$, then $a=c$. Transitive Property of Equality.

III Distributive Property: $a[b+c]=ab+ac$

IV Axiom of Opposites: $-(-a)=a$

V $-(a+b)=(-a)+(-b)$ Property of Opposite of a Sum

VI $a \cdot (-1) = (-1) \cdot a = -a$ Multiplication Property of -1

VII $(-a)(b) = a(-b) = -ab$ and $(-a)(-b)=ab$ Property of Opposites in Products.

VIII $\frac{1}{\frac{1}{a}} = a$ and $\frac{1}{-a} = -\frac{1}{a}$, $a \neq 0$. Axiom of Reciprocals

IX $\frac{1}{ab} = \frac{1}{a} \cdot \frac{1}{b}$ Property of the Reciprocal of a Product.

X $a-b=a+(-b)$ Definition of Subtraction.

XI $\frac{a}{b} = \frac{1}{b} \cdot a = a \cdot \frac{1}{b}$, $b \neq 0$ Definition of Division

XII If $a=b$, then $a+c=b+c$ Addition Property of Equality

XIII If $a=b$, then $a-c=b-c$ Subtraction Property of Equality

XIV If $a=b$, then $ac=bc$ Multiplication Property of Equality

XV If $a=b$, $c \neq 0$, then $\frac{a}{c}=\frac{b}{c}$ Division Property of Equality.

XVI For all Real Numbers a and b, one and only one of the following statements is true: $a<b$, $a=b$, $a>b$ Axiom of Comparison.

XVII Every decimal represents a real Number and every real Number has a decimal representation. Axiom of Completeness.

XVIII Between any two real Numbers there is another real Number. Property of Density.