KNOW THESE "TRAFFIC LAWS" OF MATH !!!!!

Name – Use This!	Mathematical Representation
OPERATIONS PROPERTIES	
1. Commutative Property of Addition	$a + b = b + a$ ("you commute from home to work and reverse")
2. Commutative Property of Multiplication	$a \cdot b = b \cdot a$ (notice the order changes!)
3. Associative Property of Addition	$(a + b) + c = a + (b + c)$ ("you associate with different groups")
4. Associative Property of Multiplication	$(a \cdot b) \cdot c = a \cdot (b \cdot c)$ (notice NO order change!)
5. Identity Property of Addition	$a + 0 = a$ ("0" is the additive identity element)
6. Identity Property of Multiplication	$a \cdot 1 = a$ ("1" is the multiplicative identity element)
7. Inverse Property of Addition	$a + (- a) = 0$ (additive inverse of a number is its opposite)
8. Inverse Property of Multiplication	$a \cdot (1/a) = 1$ (Multiplicative inverse of a number is its reciprocal)
9. Distributive Property (Includes + AND $\cdot$)	$a \cdot (b + c) = ab + ac$ and $a \cdot (b - c) = ab - ac$ (multiplication distributes OVER addition or subtraction)
RELATIONSHIP PROPERTIES	
10. Reflexive Property	$a = a$
11. Symmetric Property	If $a = b$, then $b = a$
12. Transitive Property	If $a = b$ and $b = c$, then $a = c$
13. Substitution Property	If $a = b$, then a can be substituted for b in any expression.
EQUALITY PROPERTIES	
14. Addition Property of Equality	If $a = b$, then $a + c = b + c$
15. Subtraction Property of Equality	If $a = b$, then $a - c = b - c$ (Careful about order!)
16. Multiplication Property of Equality	If $a = b$, then $a \cdot c = b \cdot c$
17. Division Property of Equality	If $a = b$, then $a / c = b / c$ (Careful about order & dividing by zero!)

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Properties – Supplemental Descriptions & Examples

Name	Hints	Example	Notes
Associative "Grouping"	You "associate" with different groups.	$5 + (15 + 4) = (5 + 15) + 4$	Works with addition and multiplication, not subtraction or division.
Commutative "Ordering"	Since Commutative has an "o" in it, think "order".	$5 + 4 + 3 = 4 + 3 + 5$	Works with addition and multiplication, not subtraction or division.
Distributive "Distributing or Pushing Through Parentheses"	Think of "distributing" something to your friends.	$5 \times (3 + 4) = 5 \times 3 + 5 \times 4 = 15 + 20 = 35$ $5 - 2(x - 3) = 5 - 2x + 6$ $5x + 7x = (5 + 7)x = 12x$	When negatives are on the outside of the parenthesis, make sure you distribute the negatives to second number, too. Remember that multiplying two negatives results in a positive.
Identity "Staying the Same"	You always come back to your "identity".	$9 + 0 = 9$ $9 \times 1 = 9$	**Additive** identity is 0. **Multiplicative** identity is 1.
Inverse "Undoing"	When you put your car in "inverse", you go backwards.	$9 + -9 = 0$ $9 \times \frac{1}{9} = 1$	Additive inverse is –a, since –a + a = 0. Multiplicative inverse is $\frac{1}{a}$, since $\frac{1}{a} \times \frac{a}{1} = 1$. Note that the inverse of $\frac{a}{b}$ is $\frac{b}{a}$, since $\frac{a}{b} \times \frac{b}{a} = 1$.

Property	Explanation	Example
Reflexive property of equality	Any number is equal to itself.	$19 = 19$
Symmetric property of equality	An equation may be written in the opposite order.	If $x = 7$, then $7 = x$.
Transitive property of equality	Two quantities that are equal to the same thing are equal to each other.	If $a = 9$ and $9 = b$, then $a = b$.
Addition property of equality	The same number can be added to both sides of an equation.	If $a = 16$, then $a + 3 = 16 + 3$.
Subtraction property of equality	The same number can be subtracted from both sides of an equation.	If $q = 9$, then $q - 5 = 9 - 5$.
Multiplication property of equality	The same number can be multiplied by both sides of an equation.	If $z = 6$, then $z \times 2 = 6 \times 2$.
Division property of equality	Both sides of an equation can be divided by any non-zero number.	If $a = 3$, then $a \div 2 = 3 \div 2$.
Substitution property of equality	A number may be substituted for its equal in any expression.	If $a = 90$ and $b = 90$, then $a = b$.