

Study Guide

Identity and Equality Properties

The identity and equality properties in the chart below can help you solve algebraic equations and evaluate mathematical expressions.

Additive Identity Property	For any number a , $a + 0 = 0 + a = a$.
Multiplicative Identity Property	For any number a , $a \cdot 1 = 1 \cdot a = a$.
Multiplicative Property of Zero	For any number a , $a \cdot 0 = 0 \cdot a = 0$.
Substitution Property	For any numbers a and b , if $a = b$ then a may be replaced by b .
Reflexive Property	$a = a$
Symmetric Property	If $a = b$, then $b = a$.
Transitive Property	If $a = b$ and $b = c$, then $a = c$.

Example: Evaluate $24 \cdot 1 - 8 + 5(9 \div 3 - 3)$. Indicate the property used in each step.

$$\begin{aligned}
 24 \cdot 1 - 8 + 5(9 \div 3 - 3) &= 24 \cdot 1 - 8 + 5(3 - 3) && \text{Substitution (=)} \\
 &= 24 \cdot 1 - 8 + 5(0) && \text{Substitution (=)} \\
 &= 24 - 8 + 5(0) && \text{Multiplicative identity} \\
 &= 24 - 8 + 0 && \text{Multiplication property of zero} \\
 &= 16 + 0 && \text{Substitution (=)} \\
 &= 16 && \text{Additive identity}
 \end{aligned}$$

Solve each equation.

1. $a(9) = 0$ 2. $15 \cdot m = 15$ 3. $0 + p = 3$ 4. $7(0) = y$

Name the property or properties illustrated by each statement.

5. $0 + 21 = 21$ 6. $(0)15 = 0$ 7. If $4 + 5 = 9$,
then $9 = 4 + 5$.

8. $(1)94 = 94$ 9. If $3 + 3 = 6$ and $6 = 3 \cdot 2$, then $3 + 3 = 3 \cdot 2$.

10. $(14 - 6) + 3 = 8 + 3$ 11. $23 \cdot 1 = 23$ 12. $4 + 3 = 4 + 3$

Evaluate each expression. Name the property used in each step.

13. $10 \div 5 - 2^2 \div 2 + 13$ 14. $3(5 - 5 \cdot 1^2) + 21 \div 7$