

NAME _____

Module 3 Solving Linear Equations
of One Variable
Lesson 1 Identifying Properties of Equality



**independent
practice**

Identify the algebraic property in the following statements.

1. If this = that, then that = this.

Symmetric Property of Equality

2. If $2u = 6$, then $3 \cdot (2u) = 3 \cdot 6$.

Multiplication Property of Equality

3. If $8.6 + 2 = 10.6$, then
 $5 + 8.6 + 2 = 5 + 10.6$.

Addition Property of Equality

4. Reversing the left and right side of an equation
produces an equivalent equation.

Symmetric Property of Equality

5. If $w \div 5 = 2$, then $w = 10$.

Multiplication Property of Equality

6. If $M - 7 = 5$, then $M = 12$.

Addition Property of Equality

7. If $8 = 2 \cdot 4$, then $8 - 4 = (2 \cdot 4) - 4$.

Subtraction Property of Equality

8. If $-5 + 6 = 1$, then $(-5 + 6) \div 2 = 1 \div 2$.

Division Property of Equality

9. When two different expressions are equal to the
same quantity, they are also equal to each other.

Transitive Property of Equality

10. If $9 = 3 \cdot 3$, then $9 \cdot 2 = (3 \cdot 3) \cdot 2$.

Multiplication Property of Equality

Write an example for the given algebraic property. **Answers may vary.**

11. Multiplication Property of Equality See below.

12. Addition Property of Equality See below.

13. Symmetric Property of Equality See below.

14. Reflexive Property of Equality See below.

15. Transitive Property of Equality See below.

11. Students should show that if two quantities are equal, then multiplying both sides of the equation by the same number will maintain the equality. For example, if $7 = 3 + 4$, then $7 \cdot 2 = (3 + 4) \cdot 2$.

12. Students should show the same quantity being added to both sides of an equation. For example,
 $3 + k = (2 + 1) + k$.

13. Students should show an equation with the left and right side quantities reversed. For example,
if $3 = 2 + 1$ then $2 + 1 = 3$.

14. Students should show some quantity equal to itself. For example, $3 = 3$.

15. Students should show that when two different expressions are equal to the same quantity, they are also equal to each other. For example, if $3 = 3 \cdot 1$ and $3 \cdot 1 = 2 + 1$, then $3 = 2 + 1$.

Journal

1. Explain the difference in the Reflexive Property of Equality and the Symmetric Property of Equality.
2. Use a non-mathematical situation to demonstrate the Addition Property of Equality and the Subtraction Property of Equality.
3. $4 - 2 = 2$. By the Multiplication Property of Equality $3(4 - 2) = (3)(2)$. Since multiplication can be written as successive addition, we can write $3(4 - 2)$ as $(4 - 2) + (4 - 2) + (4 - 2)$. Does $(3)(2) = (4 - 2) + (4 - 2) + (4 - 2)$? If so, what property does this illustrate?
4. Your friend is having trouble remembering the Multiplication Property of Equality. Help this person by designing a memory aid.
5. Explain how you would show that $x = 9$ in the equation $x - 4 = 5$, using the properties of equality.

Cumulative Review

Simplify.

- | | |
|---|------------------------|
| 1. $2 \cdot \frac{1}{2}$ 1 | 2. $-7 + 7$ 0 |
| 3. $3 \cdot 5$ 15 | 4. $2(-6)$ -12 |
| 5. $4 \cdot 0$ 0 | 6. $3 \div 3$ 1 |
| 7. $5 - 5$ 0 | 8. $4 + (-4)$ 0 |
| 9. $4 \div 8$ $\frac{1}{2}$ | 10. $5 - 0$ 5 |

Possible Journal Answers

1. The Reflexive Property of Equality states that for some quantity Q , $Q = Q$. The Symmetric Property of Equality states that for some quantities Q and R , $Q = R$ implies $R = Q$. The Reflexive Property states that the relation of the quantity to itself, it is equal with itself. The Symmetric Property states that the equality relationship between two quantities goes both ways, if $Q = R$, then $R = Q$.
2. An example of the Addition Property of Equality:
On any given year, if the number of fish raised on a fish farm and the number of fish growing in a river are equal, then if you put some amount of fish in the river and give the same amount to the fish farm, the amount of fish on the farm and in the river are equal.
An example of the Subtraction Property of Equality:
On any given year, if the number of fish raised on a fish farm and the number of fish growing in a river are equal, then if you catch some amount of fish from the river and buy the same amount of fish from the fish farm, the amount of fish on the farm and in the river are equal.
3. Yes, they are equal. This uses the Transitive Property of Equality. Since $3(4 - 2) = (3)(2)$ and $3(4 - 2) = (4 - 2) + (4 - 2) + (4 - 2)$, this implies $(3)(2) = (4 - 2) + (4 - 2) + (4 - 2)$.
4. You know that $3 = 5 - 2$. Use the Multiplication Property of Equality to show that $(3)(3) = 3(5 - 2)$. Say you have some checkers stacked 3 high. If you have three such stacks we would have 9 checkers in total. Now on the right hand side of the equation we would have 5 stacks of 3 checkers minus 2 stacks of 3 checkers. This would leave 3 stacks of 3 checkers, or 9 total checkers.
5. By the Addition Property of Equality $x - 4 + 4 = 5 + 4$, or $x = 9$.