Properties of Equality

Addition Property of Equality

Words: When you add the same number to each side of an equation, the two sides remain equal.

Numbers: \[ 6 + 4 = 6 + 4 \]
\[ 10 = 10 \]

Algebra: \[ x - 5 + 5 = 3 + 5 \]
\[ x = 8 \]

Subtraction Property of Equality

Words: When you subtract the same number from each side of an equation, the two sides remain equal.

Numbers: \[ 7 - 2 = 7 - 2 \]
\[ 5 = 5 \]

Algebra: \[ y + 3 - 3 = 1 - 3 \]
\[ y = -2 \]

Example 1

Solve each equation. Tell which algebraic property of equality you used.

a. \[ c - 3 = -2 \]
\[ c - 3 + 3 = -2 + 3 \]
\[ c = 1 \]

Addition Property of Equality

The solution is \( c = 1 \). The property is the Addition Property of Equality.

b. \[ \frac{d}{5} = 7 \]
\[ d \cdot 5 = 7 \cdot 5 \]
\[ d = 35 \]

Multiplication Property of Equality

The solution is \( d = 35 \). The property is the Multiplication Property of Equality.

Practice

Solve the equation. Tell which algebraic property of equality you used.

1. \( h - 6 = 2 \) \( h = 8 \); Addition
2. \( \frac{j}{3} = 9 \) \( j = 27 \); Multiplication
3. \( k + 8 = -9 \) \( k = -17 \); Subtraction
4. \( 4m = 12 \) \( m = 3 \); Division
5. \( n + 2 = 6 \) \( n = 4 \); Subtraction
6. \( \frac{p}{6} = -2 \) \( p = -12 \); Multiplication
7. \( q - 3 = -8 \) \( q = -5 \); Addition
8. \( 8r = 48 \) \( r = 6 \); Division
9. \( s + 9 = 5 \) \( s = -4 \); Subtraction
10. \( 6t = 48 \) \( t = 8 \); Division
11. \( w + 3 = 29 \) \( w = 26 \); Subtraction
12. \( \frac{z}{7} = 7 \) \( z = 49 \); Multiplication