Lesson 2-5: Solving Equations with the Variable on Each Side

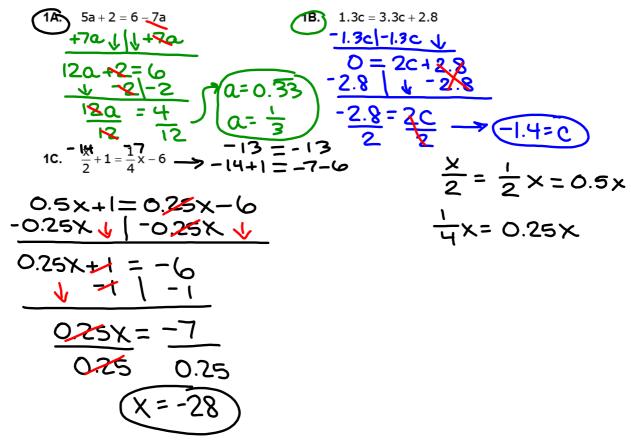
Variables on Each Side To solve an equation that has variables on each side, use the Addition or Subtraction Property of Equality to write an equivalent equation with the variable terms on one side.

Example 1 Solve an Equation with Variables on Each Side

Solve 2 + 5k = 3k - 6. Check your solution.

EXERCISE 1

Solve each equation. Check your solution.



Grouping Symbols If equations contain grouping symbols such as parentheses or brackets, use the Distributive Property first to remove the grouping symbols.

Example 2 Solve an Equation with Grouping Symbols

Solve
$$6(5m - 3) = \frac{1}{3}(24m + 12)$$
.
 $6(5m - 3) = \frac{1}{3}(24m + 12)$.
 $30m - 18 = 8m + 4$.
 $30m - 18 - 8m = 8m + 4 - 8m$.
 $22m - 18 = 4$.
 $22m - 18 + 18 = 4 + 18$.
 $22m = 22$.
 $22m = 22$.
 $22m = 1$.

Original equation

distributive prop

Subtraction prop.

Simplify

addition prop.

Simplify

division prop.

Simplify

EXERCISE 2

Solve each equation. Check your solution.

2A.
$$8s-10=3(\tilde{6}-2s)$$

 $8S-10=18-6S$
 $+6S\sqrt{1}\sqrt{1+6S}$
 $14S-10=18$
 $\sqrt{1+10}$
 $14S=28$
 $14S=28$
 $14S=28$

2B.
$$7(n-1) = -2(3+n)$$
 $7n-7 = -6-2n$
 $+2n + 2n$
 $9n-7 = -6$
 $4+7 + 7$
 $9n = -6$
 9

Some equations may have no solution. That is, there is no value of the variable that will result in a true equation. Some equations are true for all values of the variables. These are called **identities**.

Example 3 Find Special Solutions

Solve each equation.

a.
$$5x + 5 = 3(5x - 4) - 10x$$

 $5x + 5 = 3(5x - 4) - 10x$
 $5x + 5 = 15x - 12 - 10x$
 $5x + 5 = 5x - 12$
 $-5x + 5 = 5x - 12$
 $5 \neq -12$

Original equation

distributive prop.

Combined like terms

Subtraction prop.

Since $5 \neq -12$, this equation has no solution.

b.
$$3(2b-1)-7=6b-10$$

 $3(2b-1)-7=6b-10$
 $6b-3-7=6b-10$
 $6b-10=6b-10$
 $0=0$

Original equation

distributive prop.

Simplify

Subtraction and addition prop.

left side = right side

Since the expressions on each side of the equation are the same, this equation is an identity. It is true for all values of b.

EXERCISE 3

