3.3 Solving Equations with Variables on Both Sides

Goal: Solve equations with variables on both sides.

Example 1 ***Solving an Equation with the Variable on Both Sides***

Solve $5n - 7 = 9n + 21$.

$5n - 7 = 9n + 21$	Write original equation.
$5n - 7 - \boxed{} = 9n + 21 - \boxed{}$	Subtract $\boxed{}$ from each side.
$-7 = \boxed{} + 21$	Simplify.
$-7 - \boxed{} = \boxed{} + 21 - \boxed{}$	Subtract $\boxed{}$ from each side.
$\boxed{} = \boxed{}$	Simplify.
$\dfrac{\boxed{}}{\boxed{}} = \dfrac{\boxed{}}{\boxed{}}$	Divide each side by $\boxed{}$.
$\boxed{} = n$	Simplify.

Answer: The solution is $\boxed{}$.

Example 2 ***An Equation with No Solution***

Solve $3(2x + 1) = 6x$.

$3(2x + 1) = 6x$	Write original equation.
$\boxed{} = 6x$	Distributive property

Notice that this statement $\boxed{}$ true because the number $6x$ $\boxed{}$. The equation has $\boxed{}$ $\boxed{}$. As a check, you can continue solving the equation.

$\boxed{} = 6x \boxed{}$	Subtract $\boxed{}$ from each side.
$\boxed{} = \boxed{}$	Simplify.

The statement $\boxed{}$ $\boxed{}$ true, so the equation has $\boxed{}$.

Example 3 ***Solving an Equation with All Numbers as Solutions***

Solve $4(x + 2) = 4x + 8$.

$4(x + 2) = 4x + 8$ Write original equation.

$\boxed{} = 4x + 8$ Distributive property

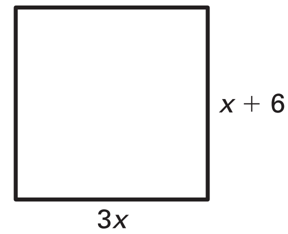
Notice that for all values of x, the statement $\boxed{} = 4x + 8$ is $\boxed{}$. The equation has $\boxed{}$.

✔ ***Checkpoint*** **Solve the equation. Check your solution.**

1. $3n - 6 = 5n + 20$	**2.** $12x = 4(3x - 1)$
3. $3(2n + 4) = 2(3n + 6)$	**4.** $2x + 7 = -2x - 13$

Example 4 *Solving an Equation to Find a Perimeter*

Geometry Find the perimeter of the square.



Solution

1. A square has four sides of equal length. Write an equation and solve for x.

$\square = \square$	Write equation.
$\square - \square = \square - \square$	Subtract $\square$ from each side.
$\square = \square$	Simplify.
$\dfrac{\square}{\square} = \dfrac{\square}{\square}$	Divide each side by $\square$.
$x = \square$	Simplify.

2. Find the length of one side by substituting $\square$ for x in either expression.

$3x = 3(\square) = \square$	Substitute for x and multiply.

3. To find the perimeter, multiply the length of one side by $\square$.

$\square \cdot \square = \square$

Answer: The perimeter of the square is $\square$ units.

Checkpoint Find the perimeter of the square.

5.