Learning Targets:

I will understand how algebraic properties can help me solve equations.

Core Concept

Algebraic Properties of Equality

Let a, b, and c be real numbers.

Addition ~~Property of Equality~~ POE	If $a = b$, then $a + c = b + c$.
Subtraction Property of Equality	If $a = b$, then $a - c = b - c$.
Multiplication Property of Equality	If $a = b$, then $a \cdot c = b \cdot c$, $c \neq 0$.
Division Property of Equality	If $a = b$, then $\frac{a}{c} = \frac{b}{c}$, $c \neq 0$.
Substitution Property of Equality	If $a = b$, then a can be substituted for b (or b for a) in any equation or expression.

Substitution POE → $x = 5$

$2x = 10$
$2 \cdot 5 = 10$

$2 \cdot 5 = 10$
$2x = 10$

Solve $3x + 2 = 23 - 4x$. Justify each step.

$+4x \quad +4x$

$7x + 2 = 23$

$-2 \quad -2$

$\frac{7x}{7} = \frac{21}{7}$

$x = 3$

Addition POE
Simplify
Subtraction POE
simplify
Division POE
simplify

$3x + 2 = 23 - 4x$

$7x + 2 = 23$

$7x = 21$

$x = 3$

Addition POE
Subtraction POE
Division POE

Solve the equation. Justify each step.

1. $6x - 11 = -35$

$+11 \quad +11$ Addition POE

$\frac{6x}{6} = \frac{-24}{6}$ simplify

$x = -4$ Division POE

simplify

2. $-2p - 9 = 10p - 17$

$+2p \quad +2p$ Addition POE

$-9 = 12p - 17$ simplify

$+17 \quad +17$ Addition POE

$\frac{8}{12} = \frac{12p}{12}$ simplify

$\frac{4}{6} = p$ Division POE

$\frac{2}{3} = p$ simplify

Core Concept

Distributive Property

Let a, b, and c be real numbers.

Sum $a(b + c) = ab + ac$ **Difference** $a(b - c) = ab - ac$

Solve $-5(7w + 8) = 30$. Justify each step.

$-35w - 40 = 30$ — Dist. Prop.

$+40 \quad +40$ — Addition POE

$\frac{-35w}{-35} = \frac{70}{-35}$ — simplify

$w = -2$ — Division POE, simplify

4. $3(3x + 14) = -3$

$9x + 42 = -3$ — Dist. Prop.

$-42 \quad -42$ — subtraction POE

$\frac{9x}{9} = \frac{-45}{9}$ — simplify

$x = -5$ — Division POE, simplify

Core Concept

Reflexive, Symmetric, and Transitive Properties of Equality

	Real Numbers	Segment Lengths	Angle Measures
Reflexive Property	$a = a$	$AB = AB$	$m\angle A = m\angle A$
Symmetric Property	If $a = b$, then $b = a$.	If $AB = CD$, then $CD = AB$.	If $m\angle A = m\angle B$, then $m\angle B = m\angle A$.
Transitive Property	If $a = b$ and $b = c$, then $a = c$.	If $AB = CD$ and $CD = EF$, then $AB = EF$.	If $m\angle A = m\angle B$ and $m\angle B = m\angle C$, then $m\angle A = m\angle C$.

symmetric → $5 = x$, $x = 5$

Name the property of equality that the statement illustrates.

7. If $m\angle 6 = m\angle 7$, then $m\angle 7 = m\angle 6$. — Symmetric Prop.

8. $34° = 34°$ — Reflective Prop.

9. $m\angle 1 = m\angle 2$ and $m\angle 2 = m\angle 5$. So, $m\angle 1 = m\angle 5$. — Transitive Prop.

Practice
Pg. 96
1, 2, 3-41 EOO