TOPIC: SOLVING LINEAR EQUATIONS

Strategy for Solving Linear Equations

◆ To solve ***ANY*** linear equation, *simplify* & then use *multiple* properties of equality. You can follow these steps:

EXAMPLE Solve the linear equation.

$$3(x-2)+2=x+8$$

Recall

If $a=b$, then…

$$a+c=b+c \qquad ac=bc$$

$$a-c=b-c \qquad \frac{a}{c}=\frac{b}{c}$$

(Properties of Equality)

HOW TO: Solve Linear Equations

1) Simplify both sides of the equation
- *Distribute* into ( )
- *Combine* like terms

2) Use _____ props. to **collect**:
- All *variable* terms on one side
- All *constant* terms on other side

3) Use _____ props. to **isolate** variable

4) Check solution by plugging in *orig. eqn*

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PRACTICE Solve the given linear equation. Check your solution.

$(\boldsymbol{A})$

$$2(x+3)=14$$

HOW TO: Solve Linear Equations

1) **Simplify** both sides of the equation
- *Distribute* into ( )
- *Combine* like terms

2) Use $+/-$ props. to **collect**:
- All *variable* terms on one side
- All *constant* terms on other side

3) Use $\times/\div$ props. to **isolate** variable

4) **Check** solution by plugging in *orig. eqn*

$(\boldsymbol{B})$

$$-5-y=3(y+9)$$

PRACTICE Solve the given linear equation. Check your solution.

$$4(x+1)-3(x-2)=2x+5$$

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Solving Linear Equations with Fraction or Decimal Coefficients

◆ Some linear equations have **fractions** or **decimals** that should be _____ before following the steps for solving.

► For equations with **fractions**, _____ both sides by the **L**east **C**ommon **D**enominator of all fractions.

► For equations with **decimals**, multiply both sides by powers of 10 to move the _____ to the right.

EXAMPLE Solve the linear equation.

(A) $\frac{1}{3}x - \frac{5}{6} = \frac{1}{2}$

(B) $0.36 = 0.03x + 0.3$

HOW TO: Solve Linear Equations

0) Clear Fractions or Decimals
- *Multiply* by ____ or power of ____

1) Simplify both sides of the equation

2) Use $+/-$ props. to **collect**:
- All *variable* terms on one side
- All *constant* terms on other side

3) Use $\times/\div$ props. to **isolate** variable

4) Check solution by plugging in *orig. eqn*

◆ Multiplying by 10^1 moves the decimal right _____, multiplying by 10^2 moves the decimal right _____, etc.

PRACTICE Solve the following equations with fractions.

(A) $\frac{x}{4} - \frac{2}{3} = \frac{x}{6}$

(B) $\frac{2}{5}y - 3 = \frac{1}{4}$

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EXAMPLE Solve the following equation.

$$\frac{2x-1}{5}+\frac{3x+2}{9}=x+1$$

HOW TO: Solve Linear Equations

0) Clear Fractions or Decimals
- *Multiply* by **LCD** or power of **10**

1) Simplify both sides of the equation

2) Use $+/-$ props. to **collect**:
- All *variable* terms on one side
- All *constant* terms on other side

3) Use $\times/\div$ props. to **isolate** variable

4) Check solution by plugging in *orig. eqn*

EXAMPLE Solve the following equation.

$$\frac{x}{3}+\frac{10}{15}=\frac{4x}{6}$$

PRACTICE Solve the following equations with decimals.

$(\boldsymbol{A})$ $4.1x+2.4=3.6x-(-4)$

$(\boldsymbol{B})$ $1.5(z-2)+0.6=0.3z+9$

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Classifying Linear Equations

◆ Recall: The solution set of a linear eq. is the set of all values of x that make a true statement when plugged in.

► Linear equations can be classified by the ___ of solutions in their solution set.

New **Categories of Linear Equations**

$2x + 4 = 14$ $-4 \quad -4$ $\frac{2x}{2} = \frac{10}{2}$ $x = 5$ • Conditionally _____ • Exactly ____ solution Solution set:	$3x + 2 + x = 4x + 2$ • Always _____ • _____ solutions Solution set: $\{x \mid x \qquad \}$	$7x + 3 = 7x$ • Always _____ • _____ solutions Solution set:

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PRACTICE How many solutions do the following equations have?

(A)

$4(x-3) = 4x - 12$ **[ONE SOLUTION | INFINITE SOLUTIONS | NO SOLUTION]**

(B)

$\frac{1}{2}(x+4) - \frac{1}{3} = \frac{1}{6}x - 2$ **[ONE SOLUTION | INFINITE SOLUTIONS | NO SOLUTION]**

(C)

$0.25x + 0.6 = 0.25(x+3)$ **[ONE SOLUTION | INFINITE SOLUTIONS | NO SOLUTION]**

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PRACTICE Classify each of the following equations.

(A) $12(x-4) = 4(3x+12)$ **[CONDITIONAL | IDENTITY | CONTRADICTION]**

(B) $6(x-1) + 13 - x = 5x + 7$ **[CONDITIONAL | IDENTITY | CONTRADICTION]**

(C) $2.5x + 3.1 = 1.2(x-2)$ **[CONDITIONAL | IDENTITY | CONTRADICTION]**