

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...

$$a + c = b + c \quad | \quad ac = bc$$

$$a - c = b - c \quad | \quad \frac{a}{c} = \frac{b}{c}$$

(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.

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

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

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*

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 **Least Common Denominator** 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 ×/÷ 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 ×/÷ 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.

(A)

$$4.1x + 2.4 = 3.6x - (-4)$$

(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.

NewCategories of Linear Equations		
$2x + 4 = 14$ $\quad \quad \quad \cancel{-4} \quad \quad \quad \cancel{-4}$ $\quad \quad \quad \frac{\cancel{2}x}{\cancel{2}} = \frac{10}{2}$ $\quad \quad \quad x = 5$ • Conditionally _____ • Exactly ____ solution Solution set:	$3x + 2 + x = 4x + 2$ • Always _____ • _____ solutions Solution set: $\{x x$ }	$7x + 3 = 7x$ • 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]