



ALGEBRA 1:
Focus on Linear Functions

**SOLVING LINEAR
EQUATIONS**



SOLVING LINEAR EQUATIONS		
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TABLE OF STANDARDS

	Standard	Page
READINESS STANDARD	(A.5) Linear functions, equations, and inequalities. The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions. The student is expected to:	
	A.5A solve linear equations in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides.	10 , 25

	Standard	Page
SUPPORTING STANDARD	(A.2) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. The student is expected to:	
	A.2D write and solve equations involving direct variation.	5

OVERVIEW

Algebra I: Focus on Linear Functions provides a variety of activities that address select standards bundled in the lead4ward Linear Functions TEKS Cluster. See below for descriptions of the three types of activities.

Skill Builders

Skill Builders address one Readiness or Supporting standards with an activity that builds understanding and fluency of the concept. Students learn a skill or underlying skill in bitesize pieces making these activities perfect for reteaching, tutoring, or intervention. Activities include guided learning and/or steps that lead students to successfully solving problems. Skill Builders are designed to be done with teacher-facilitated support or in small groups.

Testing Success Guides

Testing Success Guides address one Readiness Standard with 3-8 problems that represent a variety of ways that STAAR as assessed (or may assess) the SE. Students learn to read a problem, recognize what the problem is asking them to do, and answer the right question.

Students work through a Guided Analysis of the problems, seeing a variety of ways the content has been tested, examining both right and wrong answer choices. Testing Success Guides are designed to be done in small groups leaving the teacher time for small group support.

Note: Testing Success Guides represent a mix of multiple-choice items and interactive item types included on STAAR assessments. While not identical to interacting with these items electronically, the goal in this resource is to build on the thinking and reasoning skills necessary to be successful on STAAR assessments.

Concept Connectors

Concept Connectors address the concepts in 2-3 student expectations. Activities help students understand how concepts are related, reducing the cognitive load when concepts are mixed as on STAAR. Concept connectors are designed to be done in small groups with a facilitated discussion after the activity.

Each activity includes:

- Focus of the activity
- Setting Up for Instruction – What needs to be copied and any simple supplies needed for the activity
- How-To Guide – How to run the activity in your classroom, including, in some cases, suggestions for classroom conversations about the concepts
- Answer Key
- Students pages or recording sheets

**Focus**

Set up and solve direct proportion problems.

**Setting Up For Instruction**

- Make 1 copy of **A.2(D) Skill Builder** (PG. 8–9) for each pair of students (or per student).
- Materials:
 - Highlighters:** 2 different colors per pair

**How-To Guide**

1. Place students in pairs and hand out materials.
2. Work with students to:
 - Underline the words “is directly proportional to” or “varies directly”.
 - Highlight the values for x using one color highlighter.
 - Use the other color highlighter to highlight the values for y .
 - Write a proportion and solve the problem.

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SOLVING LINEAR EQUATIONS

A.2(D) Direct Proportions

SKILL BUILDER

ANSWER KEY

(PG. 1 OF 2)

Directions: Choose two highlighter colors and color the boxes below. Use these colors for all of the problems.



= x values



= y values

Direct proportion or direct variation is a mathematical way of saying: If the x value increases, the y also increases at the same rate. For example, if you are paid \$10/hour for a job and work 8 hours, you earn \$80. The hours are x . The more you work, the more you earn.

Direct proportion or direct variation problems are all set up similarly. The problem tells:

- the relationship between y and x using the words "is directly proportional" or "varies directly"
- the value of three of the variables

You use the relationship to set up a proportion and solve it to find the missing value.

Use the process below to solve each problem.

Process	Problem
<ol style="list-style-type: none">1. Underline the words "is directly proportional".2. Highlight the information in the problem about x.3. Highlight the information in the problem about y.4. Set up a proportion and solve it.	<p>1 The value of y <u>is directly proportional</u> to x. If $y = 20$ when $x = 100$, what is the value of y when $x = 400$?</p> $\frac{20}{100} = \frac{y}{400}$ <p>$y = 8$</p>
<ol style="list-style-type: none">1. Underline the words "is directly proportional".2. Highlight the information in the problem about x.3. Highlight the information in the problem about y.4. Set up a proportion and solve it.	<p>2 The value of y <u>is directly proportional</u> to x. When $x = 350$, $y = 175$. What is the value of x when $y = 262.5$? Round to the nearest tenth.</p> $\frac{175}{350} = \frac{262.5}{x}$ <p>$x = 525$</p>

SOLVING LINEAR EQUATIONS

A.2(D) Direct Proportions

SKILL BUILDER

ANSWER KEY

(PG. 2 OF 2)

Directions: Choose two highlighter colors and color the boxes below. Use these colors for all of the problems.



= x values



= y values

Process	Problem
<ol style="list-style-type: none">Underline the words "varies directly".Highlight the information in the problem about x.Highlight the information in the problem about y.Set up a proportion and solve it.	<p>3 The height of the water in a cylindrical glass <u>varies directly</u> as the number of ounces poured in the glass. If there are 2 inches of water in the glass, there are 1.5 ounces of water. How many inches of water are in the glass if there are 8 ounces of water in it? Round to the nearest tenth.</p> $\frac{1.5}{2} = \frac{8}{x}$ <p>$x = 10.7$ inches</p>
<ol style="list-style-type: none">Underline the words "is directly proportional".Highlight the information in the problem about x.Highlight the information in the problem about y.Set up a proportion and solve it.	<p>4 In an electrical circuit, the voltage across a resistor <u>is directly proportional</u> to the current running through the resistor. If a current of 12 amps produces 360 volts across a resistor, how many amps would produce 480 volts across an identical resistor?</p> $\frac{360}{12} = \frac{480}{x}$ <p>$x = 16$ amps</p>

A.2(D) Direct Proportions

SKILL BUILDER

(PG. 1 OF 2)

Directions: Choose two highlighter colors and color the boxes below. Use these colors for all of the problems.

= x values

= y values

Direct proportion or direct variation is a mathematical way of saying: If the x value increases, the y also increases at the same rate. For example, if you are paid \$10/hour for a job and work 8 hours, you earn \$80. The hours are x . The more you work, the more you earn.

Direct proportion or direct variation problems are all set up similarly. The problem tells:

- the relationship between y and x using the words "is directly proportional" or "varies directly"
- the value of three of the variables

You use the relationship to set up a proportion and solve it to find the missing value.

Use the process below to solve each problem.

Process	Problem
<ol style="list-style-type: none"> Underline the words "is directly proportional". Highlight the information in the problem about x. Highlight the information in the problem about y. Set up a proportion and solve it. 	<p>1 The value of y is directly proportional to x. If $y = 20$ when $x = 100$, what is the value of y when $x = 400$?</p> <div style="text-align: center;"> </div>
<ol style="list-style-type: none"> Underline the words "is directly proportional". Highlight the information in the problem about x. Highlight the information in the problem about y. Set up a proportion and solve it. 	<p>2 The value of y is directly proportional to x. When $x = 350$, $y = 175$. What is the value of x when $y = 262.5$? Round to the nearest tenth.</p> <div style="text-align: center;"> </div>

A.2(D) Direct Proportions

SKILL BUILDER

(PG. 2 OF 2)

Directions: Choose two highlighter colors and color the boxes below. Use these colors for all of the problems.

= x values

= y values

Process	Problem
<ol style="list-style-type: none"> Underline the words "varies directly". Highlight the information in the problem about x. Highlight the information in the problem about y. Set up a proportion and solve it. 	<p>3 The height of the water in a cylindrical glass varies directly as the number of ounces poured in the glass. If there are 2 inches of water in the glass, there are 1.5 ounces of water. How many inches of water are in the glass if there are 8 ounces of water in it? Round to the nearest tenth.</p> $\frac{\square}{\square} = \frac{\square}{\square}$
<ol style="list-style-type: none"> Underline the words "is directly proportional". Highlight the information in the problem about x. Highlight the information in the problem about y. Set up a proportion and solve it. 	<p>4 In an electrical circuit, the voltage across a resistor is directly proportional to the current running through the resistor. If a current of 12 amps produces 360 volts across a resistor, how many amps would produce 480 volts across an identical resistor?</p> $\frac{\square}{\square} = \frac{\square}{\square}$



Focus Solving equations with variables on both sides of the "=" and using the distributive property.



Setting Up For Instruction

- Choose which part(s) of the activity to use. Consider using the Preview prior to assigning Parts 1, 2, and/or 3.
 - Solving Equations Preview** (PG. 18): Remember the process of solving equations
 - Part 1** (PG. 19–20): Solving equations with variables on both sides of the "="
 - Part 1** (PG. 21–22): Solving equations using the distributive property
 - Part 1** (PG. 23–24): Solving equations with both the distributive property and variables on both sides of the "="
- Make 1 copy of the part(s) you chose of **A.5(A) Skill Builder** for each student.
- Materials:
 - Colored pencils:** 1 pack per pair

Note: Specific steps are given for solving equations that should work for *all* classrooms. The solution method in the answer key may vary from the way students are taught to write the solutions to equations in *individual teachers'* classrooms.



How-To Guide

1. Place students in pairs and hand out materials.
2. If using the Preview, discuss with students.
3. Have students work together to complete Parts 1, 2, and/or 3.

Solving Equations: Preview

Process	Problem
<p>In 6th Grade, you learned to solve equations like this:</p> $6x = 8$ <p>Solve the equation.</p> $6x = 8$ $\frac{6x}{6} = \frac{8}{6}$ $x = \frac{4}{3}$	<p>In 7th Grade, you learned to solve equations like this:</p> $6x - 3 = 8$ <p>Solve the equation.</p> $6x - 3 = 8$ $6x - 3 + 3 = 8 + 3$ $6x = 11$ $\frac{6x}{6} = \frac{11}{6}$ $x = \frac{11}{6}$
<p>What process did you use to solve the equation?</p> <p>I divided and simplified.</p>	<p>What process did you use to solve the equation?</p> <p>I added, and then divided. The fraction could not be simplified further and was left in improper form.</p>

In 8th Grade, equations included variables on both sides of the "=". In Algebra 1, equations include variables, and the distributive property on both sides of the "=".

Follow the process below. Circle the steps used in 6th Grade. Put a ★ by the steps used in 7th grade.

Step 1: Use the distributive property to simplify the parentheses.

Step 2: Add or subtract to move the variables so that they are one side of the "=".

★ **Step 3:** Add or subtract to move the constants (numbers) so they are opposite the variables.

★ **Step 4:** Multiply or divide by the coefficient of the variable.

★ **Step 5:** Simplify if needed and write the solution.

Every problem won't require all the steps. But *each step* must be considered when solving every equation.

Part 1: Solving Equations with Variables on Both Sides of the "="

Solution methods may vary.

PROBLEM #1

$$4x + 8 = 3x + 21$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

Step 5: Simplify if needed and write the solution.

$$4x + 8 = 3x + 21$$

$$4x - 3x + 8 = 3x - 3x + 21$$

$$x + 8 - 8 = 21 - 8$$

$$x = 13$$

PROBLEM #2

$$4x + 8 = -3x + 21$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

Step 5: Simplify if needed and write the solution.

$$4x + 8 = -3x + 21$$

$$4x + 3x + 8 = -3x + 3x + 21$$

$$7x + 8 - 8 = 21 - 8$$

$$\frac{7x}{7} = \frac{3}{7}$$

$$x = \frac{3}{7}$$

Part 1: Solving Equations with Variables on Both Sides of the "="

PROBLEM #3

$$-4x + 8 = -3x + 21$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

Step 5: Simplify if needed and write the solution.

$$-4x + 8 = -3x + 21$$

$$-4x + 3x + 8 = -3x + 3x + 21$$

$$-x + 8 - 8 = 21 - 8$$

$$-x = 13$$

$$x = -13$$

PROBLEM #4

$$2x - 8 = 3x - 8$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

Step 5: Simplify if needed and write the solution.

$$2x - 8 = 3x - 8$$

$$2x - 3x - 8 = 3x - 3x - 8$$

$$-x - 8 + 8 = -8 + 8$$

$$-x = 0$$

$$x = 0$$

Part 2: Solving Equations using the Distributive Property

Solution methods may vary.

PROBLEM #1

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

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

Step 5: Simplify if needed and write the solution.

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

$$6x - 3 = 5$$

$$6x - 3 + 3 = 5 + 3$$

$$\frac{6x}{6} = \frac{8}{6}$$

$$x = \frac{4}{3}$$

PROBLEM #2

$$-2(2x + 4) = 22$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

Step 5: Simplify if needed and write the solution.

$$-2(2x + 4) = 22$$

$$-4x - 8 = 22$$

$$-4x - 8 + 8 = 22 + 8$$

$$\frac{-4x}{-4} = \frac{30}{-4}$$

$$x = \frac{-15}{2}$$

Part 2: Solving Equations using the Distributive Property

Solution methods may vary.

PROBLEM #3

$$-(4x + 6) = -4$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

$$-4(x + 6) = -4$$

$$-4x - 24 = -4$$

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

$$-4x - 24 + 24 = -4 + 24$$

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

$$\frac{-4x}{-4} = \frac{20}{-4}$$

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

$$x = -5$$

Step 5: Simplify if needed and write the solution.

PROBLEM #4

$$5(x - 4) - 3(2x - 6) = 2$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

$$5(x - 4) - 3(2x - 6) = 2$$

$$5x - 20 - 6x + 18 = 2$$

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

$$-x - 2 + 2 = 2 + 2$$

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

$$-x = 4$$

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

$$x = -4$$

Step 5: Simplify if needed and write the solution.

Part 3: Solving Equations with Variables on Both Sides of the = and the Distributive Property

Solution methods may vary.

PROBLEM #1

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

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

Step 5: Simplify if needed and write the solution.

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

$$6x - 3 = 5 + 3x$$

$$6x - 3x - 3 = 5 + 3x - 3x$$

$$3x - 3 + 3 = 5 + 3$$

$$\frac{3x}{3} = \frac{8}{3}$$

$$x = \frac{8}{3}$$

PROBLEM #2

$$-(-3x + 4) = -(3x - 6)$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

Step 5: Simplify if needed and write the solution.

$$-(-3x + 4) = -(3x - 6)$$

$$-3x - 12 = -3x + 18$$

$$3x + 3x - 12 = -3x + 3x + 18$$

$$6x - 12 + 12 = 18 + 12$$

$$\frac{6x}{6} = \frac{30}{6}$$

$$x = 5$$

Part 3: Solving Equations with Variables on Both Sides of the = and the Distributive Property

Solution methods may vary.

PROBLEM #3

$$4(x + 6) = -4(x + 12)$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

$$4(x + 6) = -4(x + 12)$$

$$4x + 24 = -4x - 48$$

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

$$4x + 4x + 24 = -4x + 4x - 48$$

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

$$8x + 24 - 24 = -48 - 24$$

$$\frac{8x}{8} = \frac{-72}{8}$$

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

$$x = -9$$

Step 5: Simplify if needed and write the solution.

PROBLEM #4

$$5(x - 4) - 3(2x - 6) = 2(4x + 8)$$

Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".

Hint: If there is a negative on the outside of the parentheses, multiply each term by -1 .

$$5(x - 4) - 3(2x - 6) = 2(4x + 8)$$

$$5x - 20 - 6x + 18 = 8x + 16$$

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1 .

$$-x - 8x - 2 = 8x - 8x + 16$$

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Hint: If there is a subtraction sign in front of the constant, the constant is negative.

$$-9x - 2 + 2 = 16 + 2$$

$$\frac{-9x}{-9} = \frac{18}{-9}$$

Step 4: Multiply or divide by the coefficient of the variable and circle the answer.

$$x = -2$$

Step 5: Simplify if needed and write the solution.

Solving Equations: Preview

Process	Problem
<p>In 6th Grade, you learned to solve equations like this:</p> $6x = 8$ <p>Solve the equation.</p>	<p>In 7th Grade, you learned to solve equations like this:</p> $6x - 3 = 8$ <p>Solve the equation.</p>
<p>What process did you use to solve the equation?</p>	<p>What process did you use to solve the equation?</p>

In 8th Grade, equations included variables on both sides of the "=". In Algebra 1, equations include variables, and the distributive property on both sides of the "=".

Follow the process below. Circle the steps used in 6th Grade. Put a ★ by the steps used in 7th grade.

Step 1: Use the distributive property to simplify the parentheses.

Step 2: Add or subtract to move the variables so that they are one side of the "=".

Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.

Step 4: Multiply or divide by the coefficient of the variable.

Step 5: Simplify if needed and write the solution.

Every problem won't require all the steps. But *each step* must be considered when solving every equation.

Part 1: Solving Equations with Variables on Both Sides of the "="

PROBLEM #1

$$4x + 8 = 3x + 21$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
<p>Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.</p> <p>Hint: If there is a subtraction sign in front of the constant, the constant is negative.</p>	
<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	
<p>Step 5: Simplify if needed and write the solution.</p>	

PROBLEM #2

$$4x + 8 = -3x + 21$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
<p>Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.</p> <p>Hint: If there is a subtraction sign in front of the constant, the constant is negative.</p>	
<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	
<p>Step 5: Simplify if needed and write the solution.</p>	

Part 1: Solving Equations with Variables on Both Sides of the "="

PROBLEM #3

$$-4x + 8 = -3x + 21$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
<p>Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.</p> <p>Hint: If there is a subtraction sign in front of the constant, the constant is negative.</p>	
<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	
<p>Step 5: Simplify if needed and write the solution.</p>	

PROBLEM #4

$$2x - 8 = 3x - 8$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	
<p>Step 5: Simplify if needed and write the solution.</p>	

Part 2: Solving Equations using the Distributive Property

PROBLEM #1

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

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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<p>Step 5: Simplify if needed and write the solution.</p>	

PROBLEM #2

$$-2(2x + 4) = 22$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	
<p>Step 5: Simplify if needed and write the solution.</p>	

Part 2: Solving Equations using the Distributive Property

PROBLEM #3

$$-(4x + 6) = -4$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	
<p>Step 5: Simplify if needed and write the solution.</p>	

PROBLEM #4

$$5(x - 4) - 3(2x - 6) = 2$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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<p>Step 5: Simplify if needed and write the solution.</p>	

Part 3: Solving Equations with Variables on Both Sides of the = and the Distributive Property

PROBLEM #1

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

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
<p>Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.</p> <p>Hint: If there is a subtraction sign in front of the constant, the constant is negative.</p>	
<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	
<p>Step 5: Simplify if needed and write the solution.</p>	

PROBLEM #2

$$-(-3x + 4) = -(3x - 6)$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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<p>Step 5: Simplify if needed and write the solution.</p>	

Part 3: Solving Equations with Variables on Both Sides of the = and the Distributive Property

PROBLEM #3

$$4(x + 6) = -4(x + 12)$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	
<p>Step 5: Simplify if needed and write the solution.</p>	

PROBLEM #4

$$5(x - 4) - 3(2x - 6) = 2(4x + 8)$$

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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<p>Step 5: Simplify if needed and write the solution.</p>	



Focus

Solving equations with variables on both sides of the = and using the distributive property.



Setting Up For Instruction

- Make 1 single-sided copy of **A.5(A) Testing Success Guide Problems** [#1–2] (PG. 30).
- Make 1 single-sided copy of **A.5(A) Testing Success Guide Analysis** [#1–2] (PG. 31).
- Make 1 single-sided copy of **A.5(A) Testing Success Guide Problems** [#1–2] (PG. 32).
- Make 1 single-sided copy of **A.5(A) Testing Success Guide Analysis** [#1–2] (PG. 33).



How-To Guide

1. Place students in pairs and hand out materials.
2. Have students place the Problems side by side with their Analysis.
3. Students work together to use the Analysis to understand and solve the Problems.

Note: Specific steps are given for solving equations that should work for *all* classrooms. The solution method in the answer key may vary from the way students are taught to write the solutions to equations in *individual teachers'* classrooms.



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[Table of Standards](#)

1

Which value of x makes the equation $13.75 = 2.5(3x - 5)$ true?

- A 4
- B 3.5
- C 0.17
- D 2.68

2

What is the solution to the equation $5(4 + 2x) = 3(3x + 8)$?

- A -4
- B 4
- C 44
- D $\frac{12}{7}$

When you solve equations, use this process:

Step 1: Use the distributive property to simplify the parentheses first. If there is a negative on the outside of the parentheses, multiply each term by -1 .

Step 2: Move the variables so that they are the same side of the $=$.

Step 3: Move the constants (numbers) so they are opposite the variables.

Step 4: Divide by the coefficient of the variable.

PROBLEM #1

<p>Step 1: Use the distributive property to simplify the parentheses.</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	$13.75 = 2.5(3x - 5)$ $13.75 = 7.5x - 12.5$
<p>Step 2: Add or subtract to move the variables so that they are one side of the $=$.</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
<p>Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.</p> <p>Hint: If there is a subtraction sign in front of the constant, the constant is negative.</p>	$13.75 + 12.5 = 7.5x - 12.5 + 12.5$
<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	$\frac{26.25}{7.5} = \frac{7.5x}{7.5}$
<p>Step 5: Simplify if needed and write the solution.</p>	$3.5 = x$

PROBLEM #2

<p>Step 1: Use the distributive property to simplify the parentheses.</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	$5(4 + 2x) = 3(3x + 8)$ $20 + 10x = 9x + 24$
<p>Step 2: Add or subtract to move the variables so that they are one side of the $=$.</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	$20 + 10x - 9x = 9x - 9x + 24$ $20 - 20 + x = 24 - 20$
<p>Step 3: Add or subtract to move the constants (numbers) so they are opposite the variables.</p> <p>Hint: If there is a subtraction sign in front of the constant, the constant is negative.</p>	
<p>Step 4: Multiply or divide by the coefficient of the variable and circle the answer.</p>	$x = 4$
<p>Step 5: Simplify if needed and write the solution.</p>	

3

What is the solution to $3(2y + 2) - (y - 3) = -11$?

- A** -4
- B** -2.8
- C** 2.8
- D** 4

4

What value of n makes the equation $5(n - 2) = -2(n + 12)$ true?

- A** $\frac{6}{7}$
- B** 2
- C** -2
- D** $\frac{2}{3}$

PROBLEM #3

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	$3(2y + 2) - (y - 3) = -11$ $6y + 6 - y + 3 = -11$ $5y + 9 = -11$ $5y + 9 - 9 = -11 - 9$ $\frac{5y}{5} = \frac{-20}{5}$ $y = -4$
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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PROBLEM #4

<p>Step 1: Use the distributive property to simplify the parentheses. Then combine like terms on the same side of the "=".</p> <p>Hint: If there is a negative on the outside of the parentheses, multiply each term by -1.</p>	$5(n + 2) = -2(n + 12)$ $5n - 10 = -2n - 24$ $5n + 2n - 10 = -2n + 2n - 24$ $7n - 10 + 10 = -24 + 10$ $\frac{7n}{7} = \frac{-14}{7}$ $n = -2$
<p>Step 2: Add or subtract to move the variables so that they are one side of the "=".</p> <p>Hint: If there is a negative sign in front of the variable, treat it like a coefficient of -1.</p>	
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1

Which value of x makes the equation $13.75 = 2.5(3x - 5)$ true?

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- D** 2.68

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What is the solution to the equation $5(4 + 2x) = 3(3x + 8)$?

- A** -4
- B** 4
- C** 44
- D** $\frac{12}{7}$

A.5(A) Solving Equations

TESTING SUCCESS GUIDE ANALYSIS

(PG. 2 OF 4)

When you solve equations, use this process:

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What value of n makes the equation $5(n - 2) = -2(n + 12)$ true?

- A** $\frac{6}{7}$
- B** 2
- C** -2
- D** $\frac{2}{3}$

A.5(A) Solving Equations

TESTING SUCCESS GUIDE ANALYSIS

(PG. 4 OF 4)

PROBLEM #3

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