Lesson Summary

Solving an equation means taking steps to determine a *solution*. A solution to an equation is a value that makes the equation true.

There are many ways to solve an equation, including working backwards, inverse operations, and moves that keep the equation balanced.

Here are two strategies for solving the equation $-4(x + 2) = 20$:

-2 ÷-4

x	$x + 2$	$-4(x + 2)$
-7	-5	20

$$\frac{-4(x + 2)}{-4} = \frac{20}{-4}$$

$$x + 2 = -5$$

$$-2 \quad -2$$

$$x = -7$$

You can check that the value you determined is a solution to an equation by substituting the value back into the equation to see if it makes the equation true. The solution to the equation $-4(x + 2) = 20$ is $x = -7$ because $-4(-7 + 2) = 20$ is a true statement.

Things to Remember:

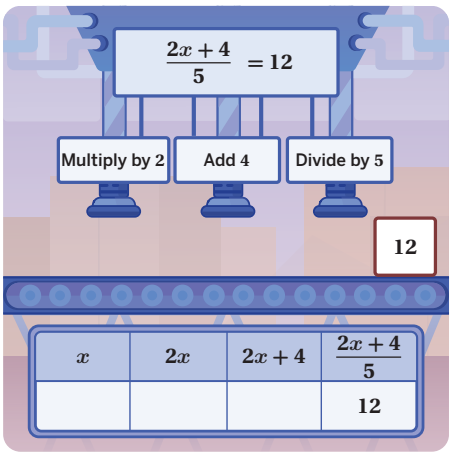
Lesson Practice
A1.2.01

Name: ..... Date: ..... Period: .....

Problems 1–2: Solve each equation for x. Use the tables if they help with your thinking.

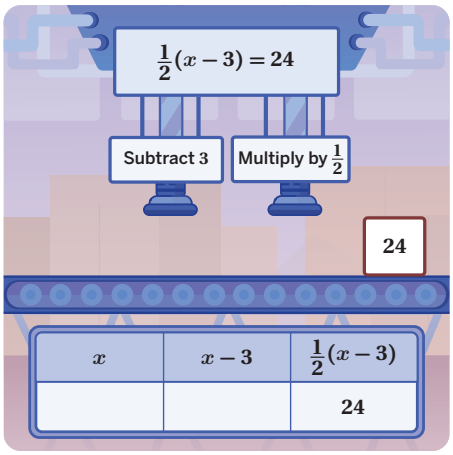
1. Here is a machine for the equation $\frac{2x+4}{5} = 12$.

$x = 28$



2. Here is a machine for the equation $\frac{1}{2}(x-3) = 24$.

$x = 51$



Problems 3–4: Solve each equation for x.

3. $5(3x-2) = -55$

$x = -3$

4. $\frac{6x-2}{2} = x+9$

$x = 5$

Problems 5–6: Zwena made a mistake when solving $3(x-4) = 5x$ for x.

Zwena

Step 1: $3(x-4) = 5x$

Step 2: $3x - 12 = 5x$

Step 3: $8x - 12 = 0$

Step 4: $8x = 12$

Step 5: $x = 1.5$

5. Show or explain Zwena's mistake.

Responses vary. After Step 2, Zwena added $5x$ to both sides of the equation, but $5x + 5x$ does not equal 0.

6. What is the correct solution to this equation?

$x = -6$

Name: _____ Date: _____ Period: _____

Problems 7–10: Solve each equation for x.

7. $3x + 19 = 40$

$x = 7$

8. $5 = x + 1 + 3x$

$x = 1$

9. $4x + 18 = 6x$

$x = 9$

10. $3x + 5 = 4x + 1$

$x = 4$

11. Determine the value of x that makes the given equation true: $2(5x + 6) = 17$.

$x = 0.5$ (or equivalent)

Spiral Review

12. Select *all* the equations where $x = 0.5$ is a solution.

- ☐ **A.** $8 = 4x$
- ☑ **B.** $13x = 6.5$
- ☑ **C.** $3x + 8 = 9.5$
- ☐ **D.** $3 = 2x + 1$
- ☐ **E.** $5 - x = 5.5$

Reflection

1. Put a smiley face next to a problem you were stuck on and then figured out.

2. Use this space to ask a question or share something you're proud of.

Lesson Summary

You can solve one-variable equations by creating *equivalent equations*. To create equivalent equations, use moves that keep the equation balanced, such as combining like terms or using inverse operations to move a variable from one side of the equation to the other.

Here is an example of a set of moves that keep an equation balanced:

$-3m + 5 + m = 2(6m + 3)$	This is the original equation.
$-2m + 5 = 12m + 6$	Combine like terms on the left and distribute on the right.
$5 = 14m + 6$	Add $2m$ to each side of the equation.
$-1 = 14m$	Subtract 6 from each side of the equation.
$\frac{-1}{14} = m$	Divide each side of the equation by 14.

All of the equations created at each step of this solution process are *equivalent equations* because they have the same solution: $m = -\frac{1}{14}$.

Things to Remember:

Lesson Practice
A1.2.02

Name: ..... Date: ..... Period: .....

1. Which equation is equivalent to $6x + 9 = 12$?

A. $x + 9 = 6$

B. $2x + 3 = 4$

C. $3x + 9 = 6$

D. $6x + 12 = 9$

2. Write another equation that is equivalent to $6x + 9 = 12$.

Responses vary. $6x = 3$

3. Select *all* the equations that are equivalent to $\frac{-8x - 6}{2} = 15$.

☐ **A.** $4x + 3 = 15$

☐ **B.** $\frac{1}{2}(-4x - 3) = 15$

☑ **C.** $-4x - 3 = 15$

☑ **D.** $-8x - 6 = 30$

☐ **E.** $8x + 6 = 30$

Problems 4–6: Solve each equation.

4. $26 - 2x = 3(x + 2)$

$x = 4$

5. $\frac{4x - 6}{2} = x - 8$

$x = -5$

6. $\frac{1}{4}x - 5 = x - 14$

$x = 12$

Problems 7–9: Paz made a mistake when solving $-3(x + 7) = 24$ for x.

Paz

Step 1: $-3(x + 7) = 24$

Step 2: $x + 7 = 27$

Step 3: $x = 20$

7. What is one thing that Paz did well?

Responses vary.

- She subtracted 7 from both sides to make $7 - 7 = 0$.
- She tried to get rid of -3 as a first step.
- She organized her work clearly.

8. What is one thing that Paz did incorrectly?

Responses vary. She added 3 to both sides instead of dividing by -3.

Name: ..... Date: ..... Period: .....

9. Which equation is equivalent to $0.05n + 0.1d = 3.65$?

A. $5n + d = 365$

B. $0.5n + d = 365$

C. $5n + 10d = 365$

D. $0.05d + 0.1n = 365$

10. Select *all* the moves that could be the first step to solving the equation $4(x + 3) = 8x - 4 + 12x$.

☑ **A.** Divide each side by 4.

☐ **B.** Take away $12x$ on the right side.

☑ **C.** Distribute 4 on the left side.

☑ **D.** Combine like terms on the right side.

☐ **E.** Add 4 to the right side.

11. Determine a value for x that makes this equation true: $9x - 4(x - 3) = 27 + 2x$. Show or explain your thinking.

$x = 5$. *Work varies.*

$$9x - 4x + 12 = 27 + 2x$$
$$5x + 12 = 27 + 2x$$
$$3x + 12 = 27$$
$$3x = 15$$
$$x = 5$$

Spiral Review

12. Rio scored 409 points in a video game. This was 223 more points than Sadia scored, s. Which equation does *not* represent this situation?

A. $223 = 409 - s$ **B.** $s = 409 - 223$ **C.** $s = 409 + 223$ **D.** $223 + s = 409$

Reflection

1. Put a question mark next to a response you'd like to compare with a classmate's.

2. Use this space to ask a question or share something you're proud of.

Lesson Summary

Not all one-variable linear equations have a single solution. Some linear equations have *infinitely many solutions*, and some have *no solution*.

In the process of solving, there is a difference between equations with one solution, no solution, or infinitely many solutions:

- In an equation with one solution, *a single value* of x will make the equation true.
- In an equation with no solution, *no value* of x will make the equation true.
- In an equation with infinitely many solutions, *any value* of x will make the equation true.

Here are examples of equations with one solution, no solution, and infinitely many solutions.

One Solution	No Solution	Infinitely Many Solutions
$3x + 4 = 2x + 10$	$2x + 4 = 2x + 10$	$2(x + 5) = 2x + 10$
$3x = 2x + 6$	$4 = 10$	$2x + 10 = 2x + 10$
$x = 6$	This is *never* true!	$10 = 10$
		This is *always* true!

If the variable in an equation is eliminated during the solving process, the equation has either no solution or infinitely many solutions. If the statement remaining is false, the equation has no solution. If the statement remaining is true, the equation has infinitely many solutions.

Things to Remember:

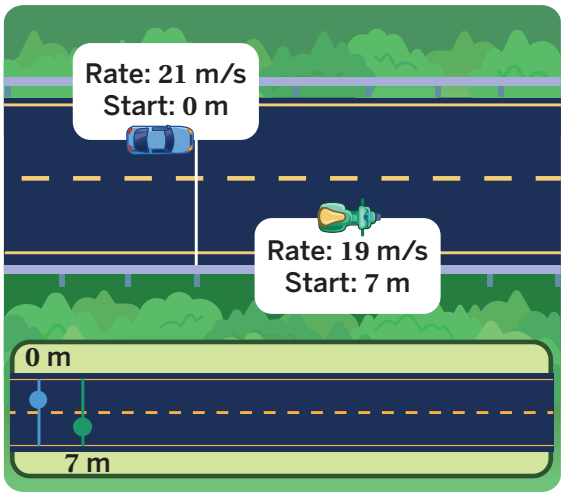
Lesson Practice
A1.2.03

Name: _____ Date: _____ Period: _____

1. The car and scooter are moving at constant speeds. The equation $21t = 19t + 7$ represents the time, t, when they will be in the same position.

When will the car and scooter be in the same position?

3.5 seconds



Problems 2–3: The equation $10t = 2.5t$ represents the time, t, when two vehicles will be in the same position.

2. When will these two vehicles be in the same position? Circle one.

(Once) Never Always

3. Explain how you know.

Explanations vary. **$t = 0$ makes the equation true because $10(0) = 2.5(0)$. No other values make the equation true, so the vehicles will be in the same position once.**

4. Here is Kiandra's work to solve $16x = 10x$. She says there is no solution.

Is this correct? Show or explain your thinking.

No. ***Explanations vary.*** **If Kiandra subtracted $10x$ from each side of the equation, she would get $6x = 0$. If she then divided by 6, she would get a solution: $x = 0$.**

Kiandra

$\frac{16x}{x} = \frac{10x}{x}$

$16 = 10$

There is no solution.

5. Group the equations based on their number of solutions.

$5t = 3t$	$2t = 10 - 2t$	$15 - 3(t + 5) = -3t$
$4t + 7 = 4(t + 2)$	$6t + 2 = -3 + 6t$	

One Solution	No Solution	Infinitely Many Solutions
$5t = 3t$ $2t = 10 - 2t$	$4t + 7 = 4(t + 2)$ $6t + 2 = -3 + 6t$	$15 - 3(t + 5) = -3t$

Name: ..... Date: ..... Period: .....

Problems 6–7: Create two different equations that each have a solution of $x = 1$.

6. Fill in each blank using the whole numbers 0 to 9 only once each.

$\square x + \square = \square x + \square$

$\square x + \square = \square x + \square$

Responses vary.

- $1x + 8 = 2x + 7$ and $3x + 6 = 4x + 5$
- $7x + 1 = 6x + 2$ and $5x + 3 = 8x + 0$

7. Explain what you notice about your equations.

Explanations vary. The digits used on each side of each equation sum to the same total.

Spiral Review

8. Select *all* the equations where $x = 2$ is a solution.

- ☐ A. $\frac{x}{4} = 8$
- ☑ B. $19 = 2(x + 6) + 3$
- ☐ C. $2x + 10 = 2x + 8$
- ☑ D. $5 - 3x = -1$
- ☑ E. $4 - x = x$

9. Select *all* the expressions that are equivalent to $2(x + 3)$.

- ☑ A. $(x + 3) \cdot 2$
- ☐ B. $2x + 5$
- ☑ C. $2x + 3 \cdot 2$
- ☐ D. $2x + 3$
- ☑ E. $2x + 6$

10. Select the expression that is equivalent to $6 - 2(x + 1)$.

A. $4(x + 1)$ B. $7 - 2x$ (C.) $4 - 2x$ D. $4x + 4$

Reflection

1. Put a heart next to the problem you're most proud of.

2. Use this space to ask a question or share something you're proud of.

Lesson Summary

Two-variable linear equations can be written in different forms. Sometimes the different forms of an equation can reveal information that is useful for solving problems. Depending on what information you are looking for, you might choose to use one form or the other.

Here is an example of two equivalent equations that represent the number of seats and handholds in possible in a subway car that has 300 square feet of floor space. They are each written in different forms, and they each reveal different information about the situation. In each equation, t is the seating capacity and d is the standing capacity.

$$4t + 2d = 300$$

- Each seat takes up 4 square feet of floor space.
- Each standing spot requires 2 square feet of floor space.
- The total amount of floor space is 300 square feet.

$$d = 150 - 2t$$

- When there are no seats ($t = 0$), 150 passengers can stand in the car.
- For every seat that is added, the number of spots for standing decreases by 2.



Things to Remember:

Name: ..... Date: ..... Period: .....

Problems 1–4: Adriana spent $\$24$ on fruit punch and apple juice. Fruit punch costs $\$3$ per bottle. Apple juice costs $\$2$ per bottle.

1. How many bottles of *fruit punch* could Adriana buy if she didn't get any apple juice?

8 bottles

2. How many bottles of *apple juice* could Adriana buy if she did not get any fruit punch?

12 bottles

Adriana wrote the equation $3f + 2a = 24$ to represent the situation.

3. Use the equation to help you complete the table.

f	a
2	**9**
6	**3**

4. Which equation represents the same relationship?

A. $a = 8 - \frac{2}{3}f$

B. $a = 8 - \frac{3}{2}f$

C. $a = 12 - \frac{2}{3}f$

(D.) $a = 12 - \frac{3}{2}f$

Problems 5–6: Here is an equation: $2x + 4y = 80$.

5. Use the equation to help you complete the table.

x	y
6	**17**
12	**14**

6. Which equation represents the same relationship?

A. $y = 20 - 2x$

B. $y = 40 - 2x$

(C.) $y = 20 - \frac{1}{2}x$

D. $y = 40 - \frac{1}{2}x$

Problems 7–8: Nia is buying bananas and apples at the farmer's market. Bananas cost $\$0.50$ each. Apples cost $\$1.00$ each.

7. Select *all* the combinations of bananas and apples that Nia could buy for exactly $\$3.50$.

☑ **A.** 1 banana and 3 apples

☑ **B.** 5 bananas and 1 apple

☐ **C.** 1 banana and 2 apples

☑ **D.** 3 bananas and 2 apples

☐ **E.** 5 bananas and 2 apples

8. The equation $0.5b + 1a = 3.50$ represents the number of bananas and apples that Nia can buy for $\$3.50$. Solve this equation for a.

$a = 3.50 - 0.5b$

Lesson Practice
A1.2.04

Name: ..... Date: ..... Period: .....

Spiral Review

9. Select *all* the expressions that are equivalent to $8 - 12 - (6 + 4)$.

- ☐ **A.** $(6 + 4) - 8 - 12$
- ☐ **B.** $8 - 6 - 12 + 4$
- ☑ **C.** $8 - 12 - 6 - 4$
- ☑ **D.** $8 - (6 + 4) - 12$
- ☐ **E.** $(8 - 12) - 6 + 4$

10. Which equation is equivalent to $\frac{1}{3}m + \frac{1}{2}n = 9$?

A. $3m + 2n = 9$

B. $2m + 3n = 54$

C. $m + 3n = 27$

D. $2m + n = 18$

11. Explain how you know that Equation A and Equation B are equivalent.

Equation A	Equation B
$48 - 5x = 13$	$5x = 35$

Responses vary.
- The solution to each equation is $x = 7$.
- If you subtract 48 from both sides of Equation A, the equation would be $-5x = -35$. Then if you divide or multiply both sides by -1, Equation A would be equivalent to Equation B.

12. Create two equivalent equations by filling in the blanks using the whole numbers 0 to 9 only once.

$$\square x + \square y = \square$$

$$y = \square - \square x$$

Responses vary.
- $6x + 2y = 8$ and $y = 4 - 3x$
- $8x + 2y = 6$ and $y = 3 - 4x$

Reflection

1. Circle the problem you feel most confident about.

2. Use this space to ask a question or share something you're proud of.

Lesson Summary

You can solve equations that contain multiple variables using some of the same strategies for solving equations with one variable. These strategies include working backwards, using inverse operations, and keeping the equation balanced.

When solving problems that model real-world situations, it can be helpful to rearrange an equation to highlight a variable of interest or make calculations easier. Rearranging equations can also reveal different relationships between the variables and the quantities that they represent.

Here is how you could rearrange the equation $y = mx + b$ to solve for m or b.

Solving for m

$$y = mx + b$$
$$y - b = mx + b - b$$
$$\frac{y - b}{x} = \frac{mx}{x}$$
$$\frac{y - b}{x} = m$$

Solving for b

$$y = mx + b$$
$$y - mx = mx + b - mx$$
$$y - mx = b$$

Things to Remember:

Lesson Practice
A1.2.05

Name: ..... Date: ..... Period: .....

Problems 1–2: Solve each equation for y.

1. $6(2.5) - 4y = 11$

$y = 1$

2. $6x - 4y = 11$

$y = \frac{1}{4}(6x - 11)$ (or equivalent)

Problems 3–4: Here is an equation: $2x - 4y - 31 = 123$.

3. Solve for x.

$x = 77 + 2y$ (or equivalent)

4. Solve for y.

$y = \frac{1}{4}(2x - 154)$ (or equivalent)

5. Abdel has \$12 to spend on beans and rice.

- Beans, b, cost \$5 per pound.
- Rice, r, costs \$2 per pound.

Abdel wrote $5b + 2r = 12$ to represent this relationship. Use the equation to complete the table.

Beans (lbs), b	Rice (lbs), r
2	1
0.6	4.5
b	$\frac{12 - 5b}{2}$

6. Solve for b.

$\frac{bh}{2} = A$

$b = \frac{2A}{h}$ (or equivalent)

7. Solve for w.

$2\ell + 2w = P$

$w = \frac{P}{2} - \ell$ (or equivalent)

8. Solve for r.

$C = 2\pi r$

$r = \frac{C}{2\pi}$ (or equivalent)

Name: _____ Date: _____ Period: _____

9. Here is an equation: $x + 3y = 6$.

Use the whole numbers 0 to 6 without repeating to create two pairs of x- and y-values that are solutions and one pair that is not.

Responses vary. **Sample shown in table.**

	x	y
Solution	0	2
Solution	3	1
Not a Solution	4	5

Spiral Review

10. Deven ran 27 miles last week, which was 3 times as far as Hailey ran. Select *all* the equations that represent the number of miles Hailey ran, h.

- ☑ **A.** $h = \frac{1}{3} \cdot 27$
- ☐ **B.** $\frac{1}{3} \cdot h = 27$
- ☑ **C.** $3 \cdot h = 27$
- ☐ **D.** $h = 3 \cdot 27$
- ☑ **E.** $h = 27 \div 3$

11. Which equation has the same solution as $2(x - 5) - 6 = 0$?

- **A.** $2(3x + 8) = 0$
- **B.** $\frac{1}{2}(x + 1) + 1 = 0$
- **C.** $2x + 8 = 0$
- **D.** $3(x - 4) - 12 = 0$

Reflection

1. Put a star next to a problem that looked more difficult than it really was.

2. Use this space to ask a question or share something you're proud of.

Lesson Summary

Equations, tables, and graphs are all different ways to model a situation. The graph of a linear equation represents all the pairs of values that are solutions to the equation (make the equation true).

Linear equations can be written in different but equivalent forms. Rearranging equations helps reveal new information, such as the x-*intercept* and y-*intercept*, which we can see in a graph, table, or description of a situation.

Let's say a lemonade stand sold lemonade for \$3 per cup and cookies for \$2 each. The stand made \$12. ℓ represents the number of cups of lemonade sold and c represents the number of cookies sold. This situation can be represented in many different ways:

Equation

$$3\ell + 2c = 12$$

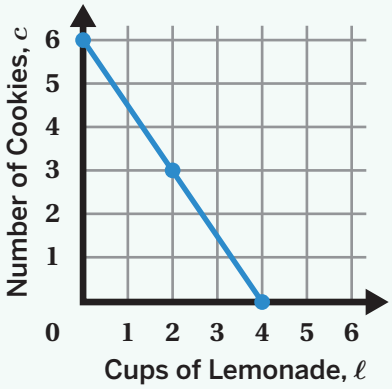
Equation Solved for c

$$c = 6 - \frac{3}{2}\ell$$

Table

ℓ	0	2	4
c	6	3	0

Graph

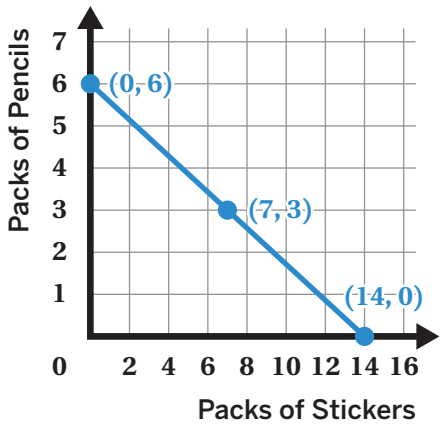


Things to Remember:

Lesson Practice
A1.2.06

Name: _____ Date: _____ Period: _____

Problems 1–2: Here is a graph about school supplies.



1. A teacher spent \$21 on packs of stickers and packs of pencils for her class.

- Stickers cost \$1.50 per pack.
- Pencils cost \$3.50 per pack.

Show or explain how you know that this graph represents this situation.

Responses vary. **I know this graph represents this situation because each coordinate pair corresponds to a total of \$21. When I multiply the x-value by 1.50 and the y-value by 3.50, the total is always 21.**

2. Circle a coordinate pair and explain what it means in this situation.

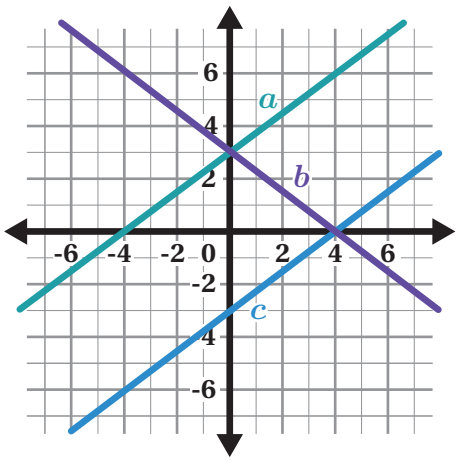
$(0, 6)$ $(7, 3)$ $(14, 0)$

Responses vary.

- **$(0, 6)$ means that the teacher bought 0 packs of stickers and 6 packs of pencils for \$21.**
- **$(7, 3)$ means that the teacher bought 7 packs of stickers and 3 packs of pencils for \$21.**
- **$(14, 0)$ means that the teacher bought 14 packs of stickers and 0 packs of pencils for \$21.**

3. Circle the line that represents $12 = 3x + 4y$.

Line a (Line b) Line c



Show or explain how you know.

Explanations vary. **When I solve $12 = 3x + 4y$ for y, I get $y = 3 - \frac{3}{4}x$. Line b is the only choice that starts at 3 on the y-axis and has a negative slope.**

4. Which equation is equivalent to $15x + 3y = 2$?

A. $y = \frac{2}{3} + 5x$ **B.** $y = \frac{2}{3} - 5x$ **C.** $y = 2 - 15x$ **D.** $y = 2 - 5x$

5. Match each equation with its equivalent equation.

a. $4x + 6y = 20$ **b.** $3x - 6y = 16$ **c.** $2x - 3y = 10$ **d.** $-3x + 6y = 16$

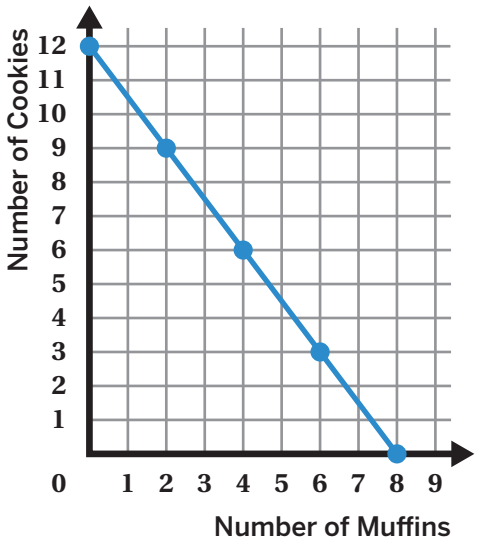
d $y = \frac{8}{3} + \frac{1}{2}x$ c $y = -\frac{10}{3} + \frac{2}{3}x$ a $y = \frac{10}{3} - \frac{2}{3}x$ b $y = -\frac{8}{3} + \frac{1}{2}x$

Name: ..... Date: ..... Period: .....

6. Jordan had a bake sale. Muffins were $3 each and cookies were $2 each. Jordan earned $24.

Here is a graph of Jordan's situation.

Select *all* the combinations of muffins and cookies Jordan could have sold.



- ☐ **A.** 0 muffins and 8 cookies
- ☐ **B.** 9 muffins and 2 cookies
- ☑ **C.** 2 muffins and 9 cookies
- ☐ **D.** 6 muffins and 4 cookies
- ☑ **E.** 4 muffins and 6 cookies

Spiral Review

7. A tourist is trying to predict the price of their next taxi ride.

The tourist recorded their last three rides in the table.

How much can they expect to pay to travel 10 miles?

$38

Distance (mi)	Price ($)
2	10
4	17
7	27.50

8. Select *all* the equations where $x = -2$ is a solution.

- ☐ **A.** $4x = 4 + 2x$
- ☑ **B.** $2(x + 5) = x + 8$
- ☐ **C.** $3x - 5 = 1$
- ☐ **D.** $19 = 2(x - 6) + 3$
- ☑ **E.** $5 + 3x = -1$

9. Solve $-3x + 4y = 28$ for y.

$y = \frac{3}{4}x + 7$ (or equivalent)

10. Solve $6x - 3y = 36$ for y.

$y = -12 + 2x$ (or equivalent)

Reflection

1. Put a star next to a problem you could explain to a classmate.

2. Use this space to ask a question or share something you're proud of.

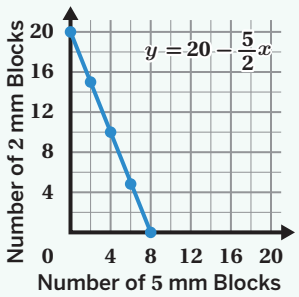
Lesson Summary

There are many ways to represent a situation that involves two variables. Each representation reveals information about how the quantities in the situation are related.

A description explains how the quantities are related verbally or in writing.

For example: A snail needs to cross a gap that is 40 mm tall using 5 mm and 2 mm blocks.

A graph reveals the *slope* and y-*intercept*. This graph shows a slope of $-\frac{5}{2}$ and a y-intercept of 20.



A table reveals several combinations of 5 mm and 2 mm blocks that let the snail cross the gap.

x	0	2	4	6
y	20	15	10	5

The ordered pairs can be used to make a graph or find the rate of change (slope).

Equations reveal how the variables are related. Standard form mirrors the language of the situation. Slope-intercept form shows how the number of 2-mm blocks change as you change the number of 5-mm blocks.

Standard Form

$5x + 2y = 40$

Slope-Intercept Form (solved for one variable)

$y = 20 - \frac{5}{2}x$

Things to Remember:

Name: ..... Date: ..... Period: .....

Problems 1–3: A school is putting on a play. Adult tickets cost \$8 each and student tickets cost \$4 each. The school collected \$320 total.

- a represents the number of adult tickets sold.
- s represents the number of student tickets sold.

1. Which equation represents this relationship?

A. $a + s = 320$

B. $8a + 4s = 320$

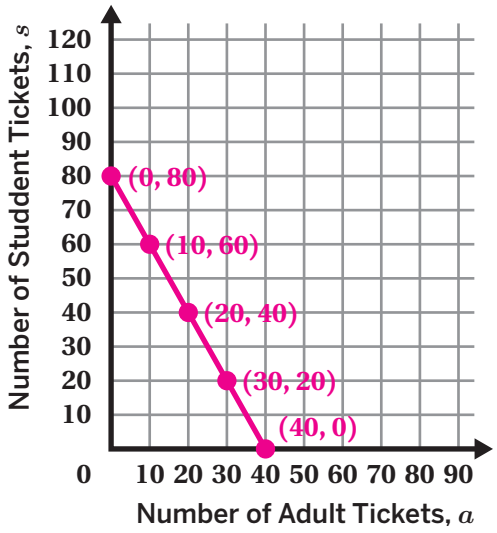
C. $8a - 4s = 320$

D. $8s + 4a = 320$

2. Complete the table representing this relationship. ***Responses in the final row vary.***

Number of Adult Tickets, a	Number of Student Tickets, s
0	**80**
20	**40**
40	**0**

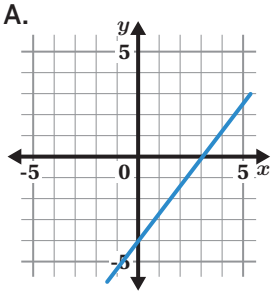
3. Make a graph showing this relationship.

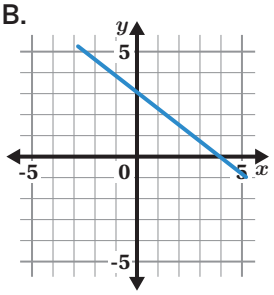


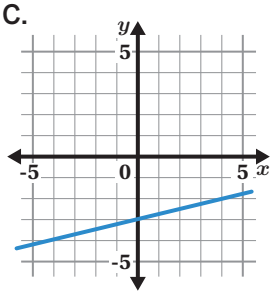
Problems 4–5: Here is the equation $-x + 4y = 12$.

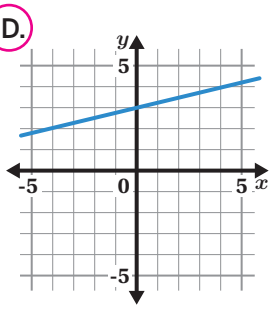
4. Explain how you can determine that $-x + 4y = 12$ is equivalent to $y = 3 + \frac{1}{4}x$.
Responses vary. **When I add x to each side and then divide by 4, I get $y = 3 + \frac{1}{4}x$.**

5. Which graph matches the equations $-x + 4y = 12$ and $y = 3 + \frac{1}{4}x$?

A.


B.


C.


D.


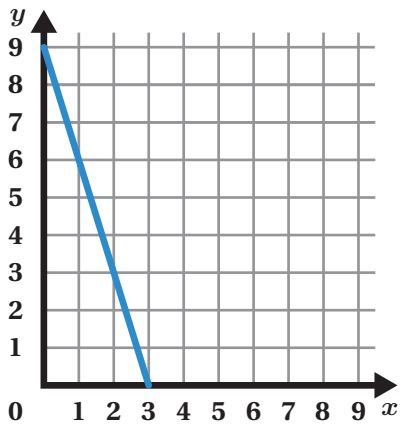
Lesson Practice
A1.2.07

Name: ..... Date: ..... Period: .....

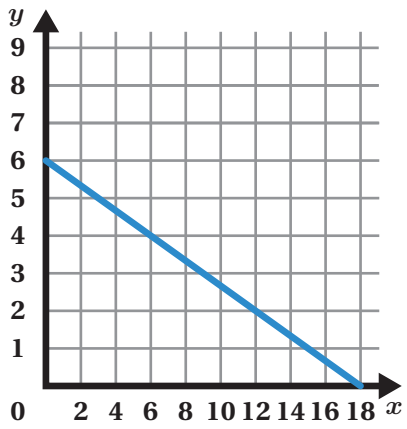
Problems 6–7: Match each graph to two equations. One equation will have no match.

Equation A	Equation B	Equation C	Equation D	Equation E
$y = 6 - \frac{1}{3}x$	$2y + 6x = 18$	$y = 9 - 3x$	$6y + 2x = 36$	$3y + 6x = 18$

6. Equation B Equation C



7. Equation D Equation A



Spiral Review

8. Write at least *three* different equations that are equivalent to $\frac{1}{2}(-10x + 2) = 6$.

Responses vary.

Equation 1	Equation 2	Equation 3
$-10x + 2 = 12$	$-10x = 10$	$x = -1$

9. Select *all* the equations that have no solution.

- ☐ A. $2t + 1 = 1 + 2t$
- ☑ B. $2t + 1 = 2t$
- ☐ C. $2t + t = 2t + 1$
- ☐ D. $2t = 1$
- ☑ E. $2(t + 1) = 2t + 1$

10. Write an equation equivalent to $x = \frac{10 - 5y}{3}$ in the form $Ax + By = C$.

$3x + 5y = 10$

Reflection

1. Put a smiley face next to a problem you were stuck on and then figured out.

2. Use this space to ask a question or share something you're proud of.

Lesson Summary

We can use *inequalities* to model situations with constraints. A **constraint** is a limitation on what values are possible in a model or situation.

Here is an example of a situation, the constraint, and the inequality that models them.

Situation	Constraint	Inequality
Tasia is ordering pizza for a party. Each plain pizza costs $\$12$ and there is a delivery fee of $\$8$.	Tasia can spend *up to* $\$140$.	$12p + 8 \leq 140$ Where p represents the number of pizzas.

When writing inequalities to model situations, you can use the symbols $>$, $\geq$, $<$, and $\leq$ to represent the nature of the constraint. Terms like *greater than, less than, at most, at least*, or *up to* can help you determine which inequality symbol to use.

Constraints modeled by inequalities produce a set of solutions. When using inequalities to model constraints, it is important to note that not all solutions to inequalities are viable solutions or make sense for the situation.

Things to Remember:

Lesson Practice
A1.2.08

Name: _____ Date: _____ Period: _____

1. For each constraint, write the letter of the matching inequality.

a. $x \leq 10$

b. $x > 10$

c. $x \geq 10$

A x is less than or equal to 10.

A x is at most 10.

C x is greater than or equal to 10.

B x is greater than 10.

C x is at least 10.

2. Marquis wants to work at least 20 hours a week to earn enough money to go to a concert. Which inequality represents x, the number of hours Marquis wants to work?

A. $x > 20$ **B.** $x < 20$ **C.** $x \leq 20$ **D.** $x \geq 20$

3. Demetrius can spend as much as \$50 on shirts. Shirts, s, cost \$16 each at a nearby store. Which inequality represents this situation?

A. $16s \geq 50$ **B.** $16s \leq 50$ **C.** $50s \geq 16$ **D.** $50s \leq 16$

Explain your thinking.

Explanations vary. **$16s$ represents \$16 for each shirt and 50 represents \$50, which is the most that Demetrius can spend. He can spend \$50 or anything less than that, so I used the symbol $\leq$.**

4. List *three* values for x that would make $8 + 2x \leq 20$ true.

Responses less than or equal to 6 are considered correct.

$x =$ 0 $x =$ 1 $x = \frac{5}{3}$

Problems 5–7: Write an inequality for each constraint. Use t for time (in hours).

5. Trevon practices the clarinet at least 1 hour each day.

$t \geq 1$

6. At some colleges, students must work 20 hours or less per week.

$t \leq 20$

7. The American Academy of Pediatrics recommends teenagers play video games for no more than 2 hours each day.[1]

$t \leq 2$

[1] Source: *American Academy of Pediatrics*

Name: ..... Date: ..... Period: .....

Problems 8–9: Tell a story about each inequality. Specify the constraint and what the variable represents.

8. $x \geq 3$

Responses vary.

- Sahana needs to practice playing the clarinet at least 3 hours per week.
- x represents the number of hours that she practices each week.

9. $5 > y$

Responses vary.

- Your height must be less than 5 feet to ride the kids' roller-coaster at the fair.
- y represents your height in feet.

10. Fatima makes $\$9.25$ per hour, h, plus $\$150$ in commissions. She created an inequality that could be used to find the number of hours she needs to work to make at least $\$510$ on her next paycheck.

Her inequality is $9.25 + 150h \leq 510$. Find the mistakes in Fatima's inequality and correct it.

Responses vary. There are two mistakes in Fatima's inequality:

- She misidentified what number to multiply variable h by. She multiplied it by 150 when it should be multiplied by 9.25.
- She used the wrong inequality symbol for the phrase "at least". It should be $\geq$ instead of $\leq$.
- The correct inequality is $9.25h + 150 \geq 510$.

Spiral Review

Problems 11–13: Solve each equation.

11. $4x - 6 = 12 - 2x$

$x = 3$

12. $\frac{1}{3}x - 8 = 12 - 3x$

$x = 6$

13. $2x + 7 - 3x = \frac{5}{2}$

$x = \frac{9}{2}$ (or equivalent)

Reflection

1. Circle a problem you want to talk to a classmate about.
2. Use this space to ask a question or share something you're proud of.

Lesson Summary

The *solution set* of an inequality contains all the values that make the inequality true. You can represent a solution set on a number line by marking the *boundary point* and then shading the region of values that make the inequality true. To identify the boundary point, you can solve the equation that corresponds to the inequality. Then you can test one or more values to determine whether the *solution set* is greater than or less than the boundary point.

Here is an example of how you can determine and represent the solution set for $2x - 4 \geq 8$:

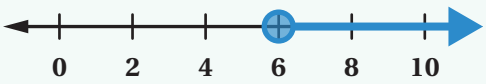
Determine the boundary point:

$$2x - 4 = 8$$
$$2x = 12$$
$$x = 6$$

Determine all the solutions:

$$2x - 4 \geq 8$$
$$2(0) - 4 \geq 8$$
$$-4 \geq 8$$ ***False!***

- 6 is the boundary point and the $\geq$ symbol means it is included in the solution set.
- Since this statement is false when we substitute 0, we know 0 is not in the solution set.



When a boundary point is not included in the solution set, this is represented with an open circle on the number line. Here is an example of the solution $-0.5 > x$ graphed on a number line.

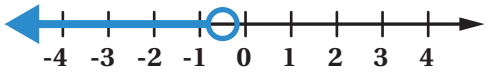


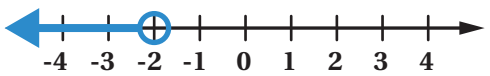
Things to Remember:

Lesson Practice
A1.2.09

Name: ..... Date: ..... Period: .....

1. Which graph represents the solutions to $2x < -4$?

A.


B.


C.


D.


2. Create a graph of the solutions to $2x \leq 10$.



3. Leo is trying to solve $-15 + x < -14$. He knows the boundary point is at $x = 1$. How can he determine whether the solutions are $x < 1$ or $x > 1$?

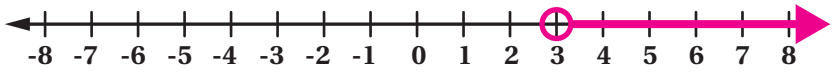
Explanations vary. **Leo could test a point that is less than 1, like 0. If that point is a solution to $-15 + x < -14$, then $x < 1$ are all the solutions. If it's not, then $x > 1$ must be all the solutions.**

4. Diego says that $x = 5$ is a solution to $-3x > 9$ because when you divide both sides by -3, you get $x > -3$. Is this correct? Explain your thinking.

No. *Explanations vary.* I know $x = 5$ is not a solution because when you substitute 5 for x in $-3x > 9$, you get a false statement.

5. Solve and graph the inequality $5x + 7 > 22$.

$x > 3$



6. What are the solutions to $-2(2 + c) + 4 < 6$?

A. $c > -3$

B. $c < -3$

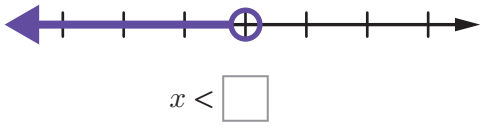
C. $c > -2$

D. $c < -2$

Name: ..... Date: ..... Period: .....

7. Create an inequality and the graph of its solutions by filling in each blank using the numbers 0 to 9 only once.

$\square x + \square > \square x$



$x < \square$

Spiral Review

Problems 8–10: A community pool offers two different membership plans.

Moon wants to spend no more than $48 at the community pool this month.

Plan A	Plan B
$4 per visit	An initial $12 fee, then $2 per visit

8. What is the most number of visits Moon can make with Plan A?

12 visits

9. What is the most number of visits Moon can make with Plan B?

18 visits

10. After how many visits will the cost of both plans be the same?

6 visits

Reflection

1. Circle the problem you feel least confident about.
2. Use this space to ask a question or share something you're proud of.

Lesson Summary

You can solve any one-variable inequality by solving its corresponding equation to determine the boundary point, then testing values to determine the rest of the solutions.

Here's an example of how you could solve the inequality $10 > -3x - 2$.

Step 1: Solve the corresponding equation: $10 = -3x - 2$.

$$10 = -3x - 2$$
$$12 = -3x$$
$$-4 = x$$

The solution to this equation is -4, so the boundary point is $x = -4$.

Step 2: Test values to determine the rest of the solutions.

In this example, we tested $x = -5$ and $x = 0$.

When $x = -5$, the inequality is false, so $x = -5$ is not a solution. This means that the solutions are greater than -4.

$x = -5$	$x = 0$
$10 > -3(-5) - 2$	$10 > -3(0) - 2$
$10 > 13$	$10 > -2$
False!	***True!***

The solutions to an inequality do not always have the same inequality symbol as the original inequality. Since the solutions are *greater than* -4, the solution set can be written as $-4 < x$ or $x > -4$.

Things to Remember:

Name: _____ Date: _____ Period: _____

1. Write three values of n that make this inequality true: $-5(n + 1) > 10$.

Responses less than -3 are considered correct.

2. Here is an inequality: $7x + 6 < 3x + 2$. Select *all* values that are solutions.

- ☐ **A.** $x = 1$
- ☐ **B.** $x = 0$
- ☐ **C.** $x = -1$
- ☑ **D.** $x = -2$
- ☑ **E.** $x = -8$

Problems 3–6: Solve each inequality.

3. $4x + 5 \geq 37$

$x \geq 8$

4. $-3x + 4 \geq 12$

$x \leq -\frac{8}{3}$ (or equivalent)

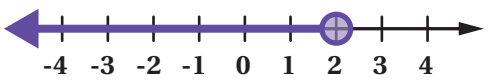
5. $-6 + \frac{x}{2} < 7$

$x < 26$

6. $-8x - 6 > 2x - 26$

$x < 2$

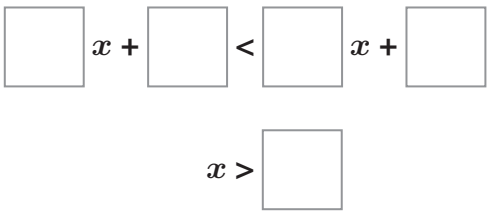
7. Which inequality is represented by the graph?



- **A.** $2x + 6 < 10$
- **B.** $2x + 6 \geq 10$
- **C.** $-2x + 6 \geq 10$
- **D.** $-2x - 6 \geq -10$

Name: ..... Date: ..... Period: .....

8. Make the two inequalities equivalent by filling in each blank using the numbers 0 to 9 only once.



Responses vary.

- $2x + 7 < 4x + 1$ and $x > 3$
- $5x + 6 < 8x + 0$ and $x > 2$

Spiral Review

Problems 9–11: Rewrite each expression as a single power of 10.

9. $\frac{10^2 \cdot 10^5}{10^4}$

10^3

10. $(10^4)^2 \cdot (10^2)^2$

10^{12}

11. Imani is going shopping with a budget of \$125. Which inequality represents the amount of dollars, x, that Imani can spend while shopping?

(A.) $x \leq 125$ B. $x \geq 125$ C. $x > 125$ D. $x < 125$

Reflection

1. Put a star next to the problem you think is the most important.
2. Use this space to ask a question or share something you're proud of.

Lesson Summary

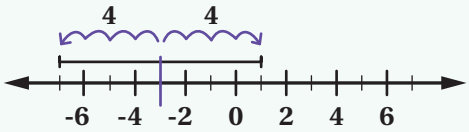
The *absolute value* of a number is its distance from 0 on a number line. Equations with absolute values often have two solutions because there are often two numbers that are the same distance from a number.

For example, the equation $|x + 3| = 4$ has two solutions, $x = 1$ and $x = -7$, because 1 and -7 are both 4 units away from -3.

You can determine the solutions using a number line or by solving two equations.

To determine the solutions to an inequality with an absolute value, you can:

- Step 1: Solve for the boundary points.
- Step 2: Determine whether the boundary points are included in the solution set. 1 and -7 are *not* included.
- Step 3: Test a value between the two boundary points to decide which values make the inequality true.
- Step 4: Graph all the solutions.



$|x + 3| = 4$

$x + 3 = 4$ $\quad$ $-(x + 3) = 4$

$x = 1$ $\quad$ $x = -7$

$|x + 3| > 4$

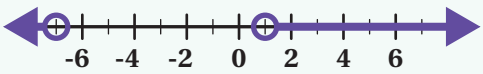
Boundary points:

$x = 1$ $\quad$ $x = -7$

Test $x = 0$:

$|(0) + 3| > 4$

False!



Things to Remember:

Lesson Practice
A1.2.11

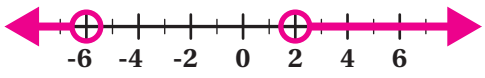
Name: ..... Date: ..... Period: .....

Problems 1–4: Graph all the solutions to each inequality or equation.

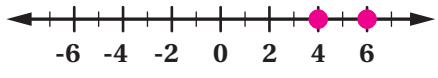
1. $|x| \leq 3$



2. $|x + 2| > 4$



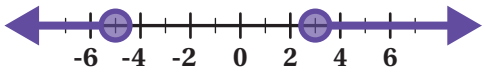
3. $|x - 5| = 1$



4. $2 > |x - 3|$

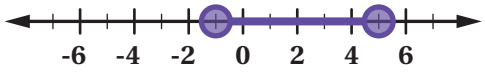


5. What value of p would make $|x - p| \geq 4$ match the graph?



-1

6. Which inequality's solutions are shown by the graph?



A. $|x + 5| < -1$

B. $|x - 2| \leq 3$

C. $|x - 2| \geq 3$

D. $|x + 3| \leq 2$

7. List three numbers that are not solutions to $|x + 1| \geq 2$.

Responses between -3 and 1 are considered correct.

Name: ..... Date: ..... Period: .....

8. Omar is thinking of a number somewhere on this number line. Here are some guesses from Omar's friends.

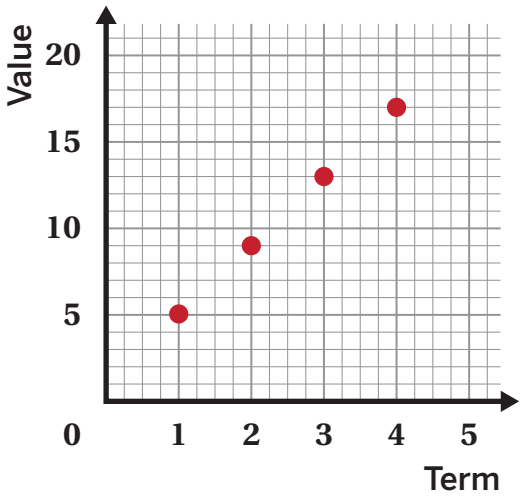


No guess was more than 5 away. Only one guess was correct. What is Omar's number? Explain your thinking.

6. *Explanations vary*. The number has to be 6 because every other number has at least one guess that is more than 5 away.

Spiral Review

Problems 9–11: Here is the graph of a sequence.



9. Is this sequence arithmetic, geometric, or something else? Explain your thinking.

Arithmetic. *Explanations vary*. The value of each consecutive term increases by 4.

10. What is the value of the 5th term?

21

11. What is the value of the nth term?

$4n + 1$ (or equivalent)

Reflection

1. Circle the problem you enjoyed doing the most.

2. Use this space to ask a question or share something you're proud of.

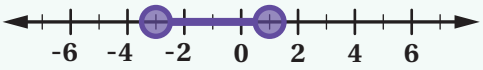
Lesson Summary

We can write the solution to an absolute value inequality using a **compound inequality**. A compound inequality joins two or more inequalities with the words *and* or *or*. Using the word "and" communicates that the solutions are located between the two boundary points. Using the word "or" communicates that the solutions are located to the left of one boundary point and to the right of the other.

Here are two examples of absolute value inequalities and their solutions written as compound inequalities.

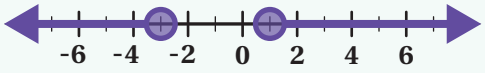
$$|x + 1| \leq 2$$
$$x + 1 = 2 \qquad -(x + 1) = 2$$
$$x = 1 \qquad x = -3$$
$$|0 + 1| \leq 2 \textit{ True!}$$

$x \geq -3$ **and** $x \leq 1$



$$|x + 1| \geq 2$$
$$x + 1 = 2 \qquad -(x + 1) = 2$$
$$x = 1 \qquad x = -3$$
$$|0 + 1| \geq 2 \textit{ False!}$$

$x \leq -3$ **or** $x \geq 1$

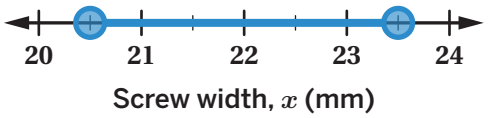


Things to Remember:

Lesson Practice
A1.2.12

Name: ..... Date: ..... Period: .....

1. A chair is designed for 22 mm screws. Screws that are up to 1.5 mm bigger or smaller will also work.



Screw width, x (mm)

Tasia says this is the graph of $|x - 1.5| \leq 22$.

Maria says this is the graph of $|x - 22| \leq 1.5$.

Who is correct? Explain your thinking.

Maria. *Explanations vary.* The number being subtracted is the screw width designed for the chair. The number on the other side of the inequality is how much bigger or smaller the screws can be.

2. Which of the following values are solutions to the equation $|-2x + 3| < 5$? Select *all* that apply.

- ☐ **A.** $x = -2$
- ☑ **B.** $x = 0$
- ☑ **C.** $x = 2$
- ☐ **D.** $x = 4$
- ☐ **E.** $x = 6$

3. Match each compound inequality with an absolute value inequality. One compound inequality will have no match.

$x \geq -3$ and $x \leq 2$	$x \leq -3$ or $x \geq 2$	$x \leq -2$ or $x \geq 3$	$x \geq -2$ and $x \leq 3$

$\|4x - 2\| \leq 10$	$\|4x - 2\| \geq 10$	$\|4x + 2\| \leq 10$
$x \geq -2$ and $x \leq 3$	**$x \leq -2$ or $x \geq 3$**	**$x \geq -3$ and $x \leq 2$**

4. What are the solutions to $\left|\frac{1}{2}x - \frac{2}{3}\right| \geq 2$?

- **A.** $x \geq -\frac{8}{3}$ and $x \leq \frac{16}{3}$
- **B.** $x \leq -\frac{8}{3}$ or $x \geq \frac{16}{3}$
- **C.** $x \geq -\frac{16}{3}$ and $x \leq \frac{8}{3}$
- **D.** $x \leq -\frac{16}{3}$ or $x \geq \frac{8}{3}$

5. An archery target is a circle where the center is elevated 120 centimeters off the ground. The bullseye in the center of the target is 14 centimeters in diameter. Write an absolute value inequality that represents the vertical height above the ground, x, that would result in a bullseye. Explain your thinking.



$|x - 120| \leq 7$. *Explanations vary.* 120 represents the center of the bullseye. The archer can either be 7 centimeters above or below the target and is represented by the number that the expression needs to be less than.

Name: ..... Date: ..... Period: .....

6. Tiara is trying to find the boundary points for the inequality $|3x - 5| \leq 5$. She sets up the two inequalities $3x - 5 \leq 5$ and $3x - 5 \leq -5$. Are her inequalities correct? Explain your thinking.

No. *Explanations vary.* One of the boundary points will not be correct because Tiara didn't negate the expression within the absolute value for the second equation. The second equation should be $-(3x - 5) \leq 5$.

7. Create an inequality and its solutions by filling in each blank using the numbers 0 to 9 only once.

$\left|\square x - \square\right| < \square$

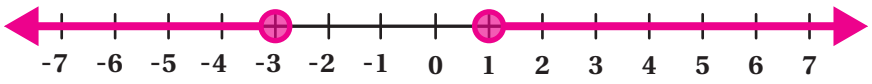
$x > \square$ and $x < \square$

Responses vary.

- **$|2x - 7| < 1$, $x > 3$ and $x < 4$**
- **$|2x - 5| < 3$, $x > 1$ and $x < 4$**

Spiral Review

8. Graph all the solutions to the inequality $|x + 1| \geq 2$.



9. What is the explicit formula for the pattern 3, 6, 12, 24, 48 . . .?

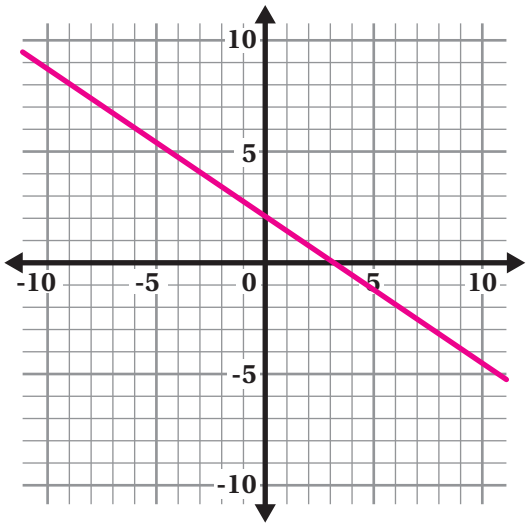
A. $a_n = 3(2)^n$

B. $a_n = 3(2)^{n-1}$

C. $a_n = 6(2)^n$

D. $a_n = 3 + (2)^n$

10. Graph the equation $2x + 3y = 6$.



Reflection

1. Put a star next to a problem where you revised your thinking.
2. Use this space to ask a question or share something you're proud of.

Lesson Summary

The solutions to a two-variable inequality are all of the ordered pairs that make the inequality true.

Here's a situation that can be modeled by an inequality: Marco is making bracelets. Each bracelet needs to cost no more than \$10. Planet beads cost \$1 and oval beads cost \$2. Marco wants to know if he can make a bracelet with 3 planet beads and 4 oval beads.

Marco is wondering if $(4, 3)$ is a solution to the inequality $2x + y \leq 10$, where x represents the number of \$2 beads and y represents the number of \$1 beads.

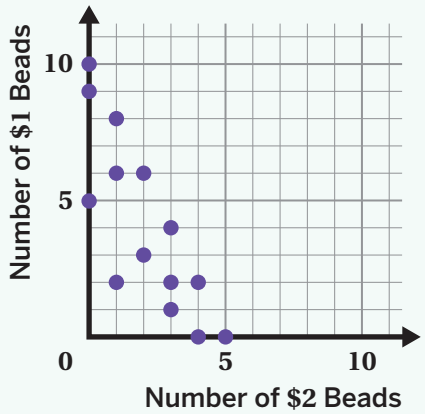
To check, Marco substitutes $x = 4$ and $y = 3$ into the inequality:

$$2(4) + (3) \leq 10$$

$$8 + (3) \leq 10$$

$$11 \leq 10 \quad \textbf{False!}$$

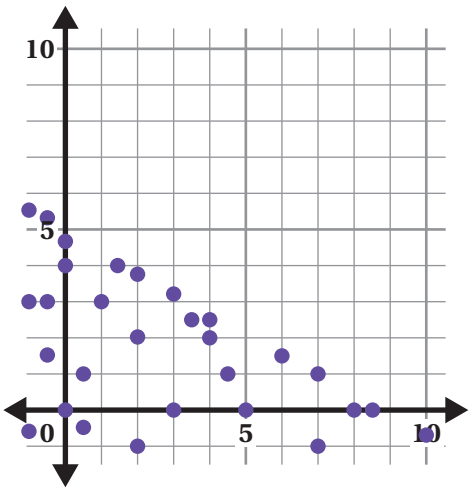
That means that $(4, 3)$ is *not* a solution and Marco *cannot* make a bracelet with 3 planet beads and 4 oval beads while staying within his budget.



Things to Remember:

Name: ..... Date: ..... Period: .....

1. This graph shows some solutions to $5x + 9y < 45$. Select *all* of the points that are also solutions.



- ☑ **A.** $(1, 1)$
- ☑ **B.** $(4, 0)$
- ☐ **C.** $(10, 4)$
- ☐ **D.** $(0, 10)$
- ☑ **E.** $(6, -1)$

2. Write at least *three* coordinate pairs that are solutions to the inequality $x \leq y$.

Responses vary. **$(0, 1)$, $(-2, 2)$, $(3, 5)$**

Problems 3–4: Tyler can spend up to $\$45$ on hats and socks. A hat costs $\$10$ and a pair of socks costs $\$2.50$.

- h is the number of hats.
- s is the number of pairs of socks.

3. Which inequality represents this situation?

A. $10h + 2.50s > 45$

B. $10h + 2.50s < 45$

C. $10h + 2.50s \geq 45$

D. $10h + 2.50s \leq 45$

4. Explain how you know that $h = 2$ and $s = 1$ are solutions to this situation.

Explanations vary. **If you substitute 2 in place of h and 1 in place of s, you get $10(2) + 2.50(1) \leq 45$, which is true because $22.50 \leq 45$.**

5. Marc is making a bracelet for his sister using beads that cost $\$0.50$ and $\$0.75$. He cannot spend more than $\$8.00$ on the bracelet.

- x is the number of $\$0.50$ beads.
- y is the number of $\$0.75$ beads.

Marc says that the inequality $0.5x + 0.75y \geq 8$ represents all the bracelets he can make. Do you agree with him? Explain your thinking.

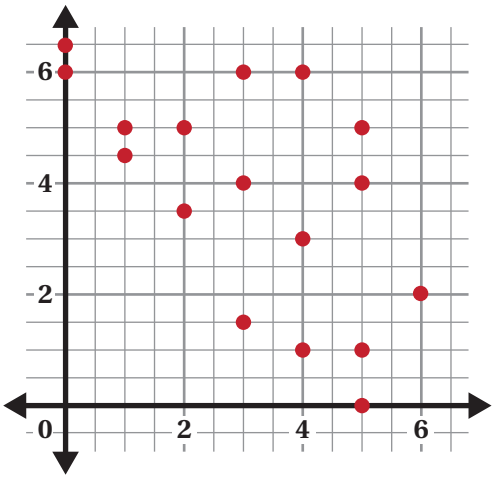
No. *Explanations vary.* Marc's inequality says that he can spend $\$8.00$ or more on the bracelet. He can spend $\$8.00$ or less.

Name: _____ Date: _____ Period: _____

6. This graph shows some solutions to $3x + 2y \geq 12$.

Write an ordered pair for *another* point that is a solution to this inequality.

***Responses vary.* (6, 4)**



7. Write an ordered pair for a point that is *not* a solution to $3x + 2y \geq 12$.

***Responses vary.* (2, 1)**

Spiral Review

Problems 8–9: Write an inequality for each situation.

8. Duri will stay warm in a sleeping bag when the temperature is at least 30°F. Use t to represent temperatures at which Duri will stay warm.

$t \geq 30$

9. Duri's backpack needs to weigh less than 45 pounds. Use w to represent the weight of the backpack.

$w < 45$

Problems 10–11: Here is an equation: $6x + 2y = 36$.

10. For each value of x, determine the value of y.

x	y
2	12
4	6

11. Which equation represents the same relationship?

A. $y = 6 - 3x$ **B.** $y = 18 - 3x$ **C.** $y = 18 - \frac{1}{3}x$ **D.** $y = 6 - \frac{1}{3}x$

Reflection

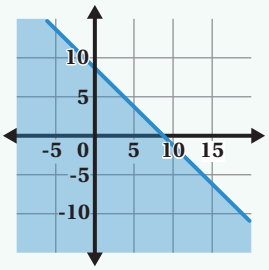
1. Circle the problem you enjoyed doing the most.

2. Use the space to ask a question or share something you're proud of.

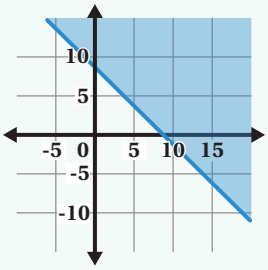
Lesson Summary

The solutions to a two-variable linear inequality can be represented on a graph as a *half-plane*. A **boundary line** separates the plane into the region that contains solutions and the region that does not. The shaded area represents all of the solutions, which are the values of (x, y) that make the inequality true.

$x + y \leq 9$

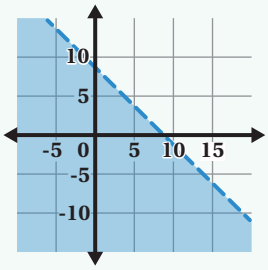


$x + y \geq 9$

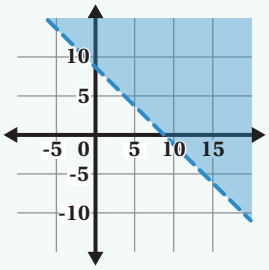


A solid line means that the points on the boundary line *are* included in the solutions. This is represented by the $\leq$ and $\geq$ symbols.

$x + y < 9$



$x + y > 9$



A dashed line means the points on the boundary line are *not* included in the solutions. This is represented by the $<$ and $>$ symbols.

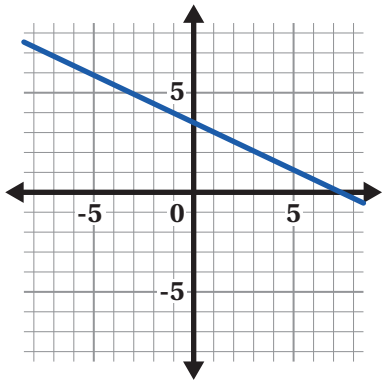
To determine which of the half-planes is the **solution region**, you can test points on either side of the *boundary line* to see whether they make the inequality true or false.

Things to Remember:

Lesson Practice
A1.2.14

Name: ..... Date: ..... Period: .....

1. Here is a graph of the equation $x + 2y = 7$.



Which of these points is a solution to the inequality $x + 2y < 7$?

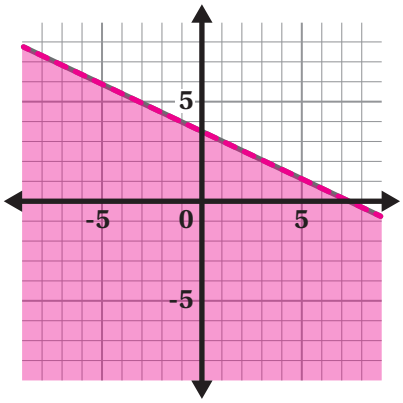
A. $(0, 0)$

B. $(10, 0)$

C. $(7, 0)$

D. $(0, 7)$

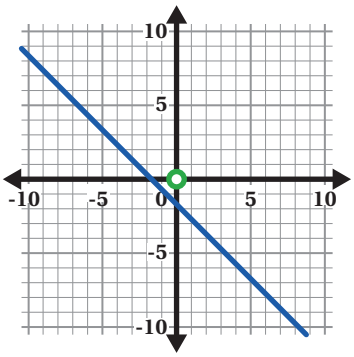
2. Graph all the solutions to $x + 2y < 7$.
Explain your thinking.



Explanations vary. **The line is dashed because the inequality sign is <. When I plugged (0, 0) into the inequality, I got a true statement, so I shaded that side of the line.**

3. Here is an inequality: $x + y \leq -2$.

- Ada graphed the equation $x + y = -2$.
- Ada noticed that $(0, 0)$ is not a solution to $x + y \leq -2$.



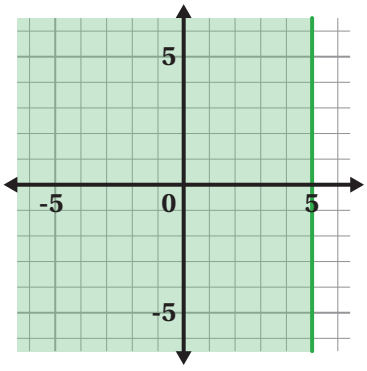
How can Ada use this information to graph the solutions to this inequality?

Explanations vary. **Since the inequality symbol in this problem is ≤, the line should be solid. Ada knows that (0, 0) is not a solution, so Ada should shade the side of the line that does not include that point.**

4. Brianna is creating a graph for the inequality $2x - 5y > 10$. She says that since the inequality has a greater-than symbol, she should shade the region above the line $2x - 5y = 10$. Is Brianna correct? Explain your thinking.

No. *Explanations vary.* If I plug in a point that's above the line $2x - 5y = 10$, such as $(2, 0)$, it makes the inequality false.

5. Which inequality is shown on the graph?



A. $y \leq 5$

B. $y \geq 5$

C. $x \geq 5$

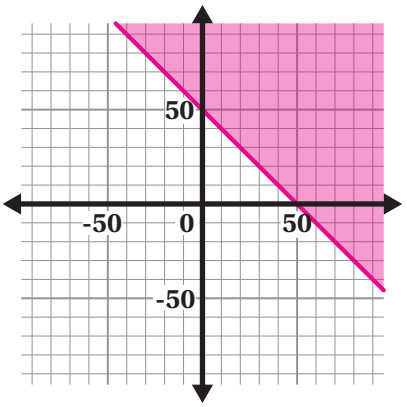
D. $x \leq 5$

Lesson Practice
A1.2.14

Name: ..... Date: ..... Period: .....

Problems 6–7: A food truck only sells hot dogs and hamburgers. They want to sell 50 items or more each day.

- x represents the number of hot dogs sold.
- y represents the number of hamburgers sold.



6. Which inequality represents this situation?

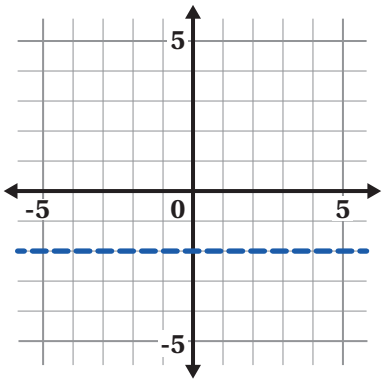
A. $x + y > 50$ **B.** $x + y < 50$

C. $x + y \geq 50$ **D.** $x + y \leq 50$

7. Complete the graph so that it represents all the solutions to the inequality for this situation.

8. Leah-James started to graph the inequality $y > -2$ by graphing a dashed line at $y = -2$. How might Leah-James decide where to shade?

Responses vary. **Pick a point above or below the line. Plug that point into the inequality and see if it makes the inequality true. If it does, shade the region that point is in. If it doesn't, shade the other region.**



Spiral Review

9. The equation of line a is $y = -2x - 1$. Select *all* the points that are on line a.

☑ **A.** $(-2, 3)$ ☐ **B.** $(0, 4)$ ☑ **C.** $(1, -3)$

☐ **D.** $(-1, -3)$ ☐ **E.** $(2, 5)$

10. Lola can spend up to \$15 on pens and notebooks. A pen costs \$2 and a notebook costs \$1.50. Using p for the number of pens and n for the number of notebooks, write an inequality that represents this situation.

$2p + 1.5n \leq 15$ (or equivalent)

11. A golf ball weighs 1.6 ounces and an empty metal bucket weighs 12 ounces. Neel adds golf balls one at a time to the empty metal bucket. How many golf balls will be in the bucket when the total weight is 20 ounces?

5 golf balls

Reflection

1. Put a smiley face next to the problem you learned from most.

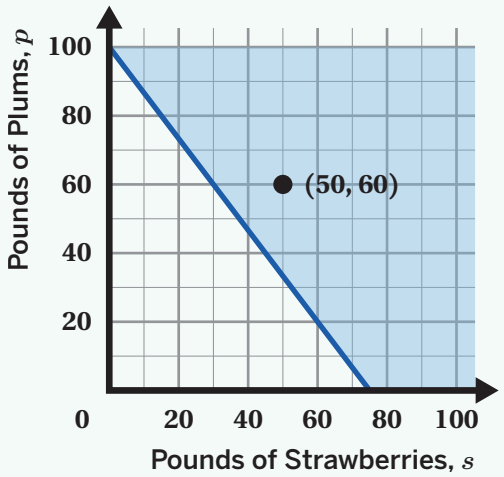
2. Use this space to ask a question or share something you're proud of.

Lesson Summary

Looking at solutions to two-variable inequalities on a graph can help us make sense of different situations.

Here is an example: Angel's family makes \$4 per pound of strawberries and \$3 per pound of plums that they sell. The inequality $4s + 3p \geq 300$ represents the pounds of strawberries, s, and pounds of plums, p, that Angel's family needs to sell to meet their goal of making at least \$300.

- To determine the solutions to the inequality, graph the corresponding equation $4s + 3p = 300$.
- Decide whether the points on the line will reach the goal by looking at the original inequality symbol.
- Then test a value, such as $(50, 60)$, to identify the solution region. $4(50) + 3(60) \geq 300$ ***True!***



Because the point $(50, 60)$ makes the inequality true, the *half-plane* that includes $(50, 60)$ is the solution region. So any combination of strawberries and plums in the shaded region, including those on the line, would meet their goal.

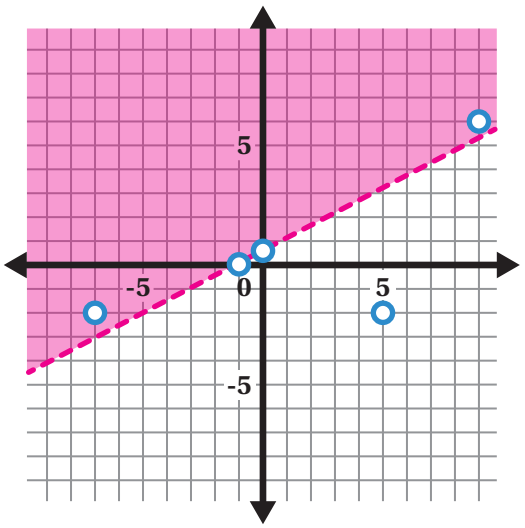
But not all solutions to the inequality will make sense for the situation. For example, the point $(90, -20)$ makes the inequality true, but it doesn't make sense for Angel's family to sell -20 pounds of plums.

Things to Remember:

Lesson Practice
A1.2.15

Name: ..... Date: ..... Period: .....

Problems 1–2: Here is an inequality: $2y - x > 1$.



1. Select *all* the points that are solutions to this inequality.

- ☑ **A.** (-7, -2)
- ☐ **B.** (-1, 0)
- ☐ **C.** (0, 0.5)
- ☐ **D.** (5, -2)
- ☑ **E.** (9, 6)

2. Graph all the solutions to $2y - x > 1$.

3. Jaylin says that $(3, 10)$ is a solution to $-2x + 4y < 15$. Is Jaylin's claim correct? Explain how you know.

No. *Explanations vary.* $-2(3) + 4(10)$ is equal to 34. 34 is greater than 15. The result would need to be less than 15 to make the inequality true.

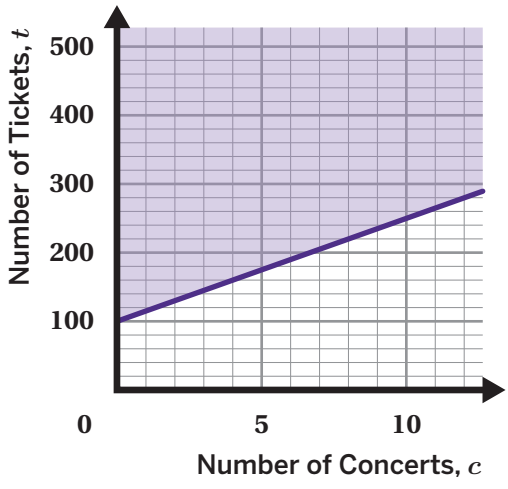
4. Mia is buying snacks for a movie night with her friends. Her budget is $60.

- A package of snack mix costs $5.00.
- A package of popcorn costs $2.50.

Write an inequality that represents all the snacks that Mia can buy for $60 or less. Use s for packages of snack mix and p for packages of popcorn.

$5s + 2.5p \leq 60$ (or equivalent)

Problems 5–6: The Funk-tions are looking into one more venue for their charity concerts. The Depot charges $300 per concert and tickets cost $20 each. The Funk-tions want to raise at least $2,000. The graph shows the solution set of $-300c + 20t \geq 2000$.



5. Write *one* solution to the inequality.

***Responses vary.* (6, 300)**

6. If the Funk-tions have 4 concerts and sell 200 tickets, will they reach their fundraising goal? Explain how you know.

Yes. *Explanations vary.* The point (4, 200) is in the shaded region of the graph which means it's a solution to the inequality.

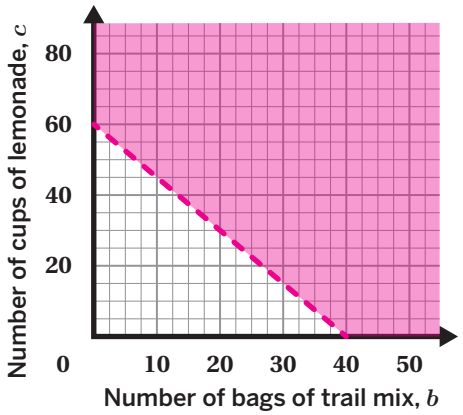
Name: ..... Date: ..... Period: .....

Problems 7–9: Aditi's soccer team is selling bags of trail mix for \$3 each and cups of lemonade for \$2 each. To make a profit, they need to earn more than \$120.

7. b represents the number of bags of trail mix and c represents the number of cups of lemonade. Which inequality describes all the ways Aditi's soccer team can make a profit?

(A.) $3b + 2c > 120$ B. $3b + 2c < 120$ C. $3b + 2c \geq 120$ D. $3b + 2c \leq 120$

8. Graph all of the solutions to the inequality you chose.

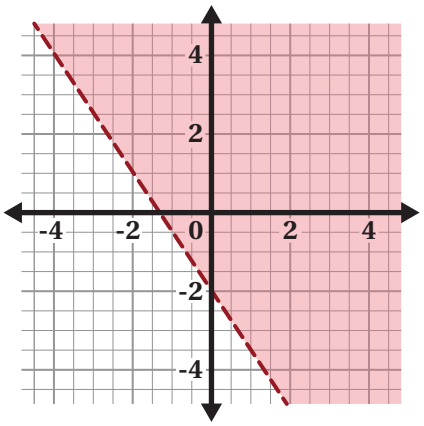


9. Explain how you could check if the boundary is included or not included in the solution region.

Explanations vary. **I could determine if the coordinates of the points on the line satisfy the inequality. For example, (20, 30) means 20 bags of trail mix and 30 cups of lemonade. The soccer team would earn \$120 if they sold that many bags of trail mix and cups of lemonade, which is not enough to make a profit.**

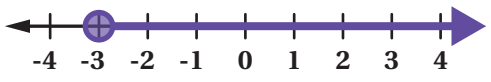
Spiral Review

10. The graph shows the solution set of an inequality. Select *all* the inequalities that produce this solution set.

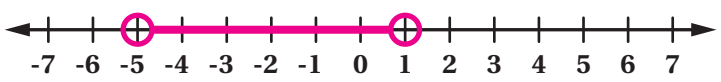


- ☐ A. $y < -1.5x - 2$
- ☑ B. $y > -1.5x - 2$
- ☑ C. $1.5x + y > -2$
- ☐ D. $y > 1.5x + 2$
- ☐ E. $y \leq 1.5x - 2$

11. Create an inequality using x that has the solution set shown on the graph. $x \geq -3$ **(or equivalent)**



12. Graph all the solutions to the inequality $|x + 2| < 3$.



Reflection

1. Circle the problem you think will help you most on the End-of-Unit Assessment.

2. Use this space to ask a question or share something you're proud of.

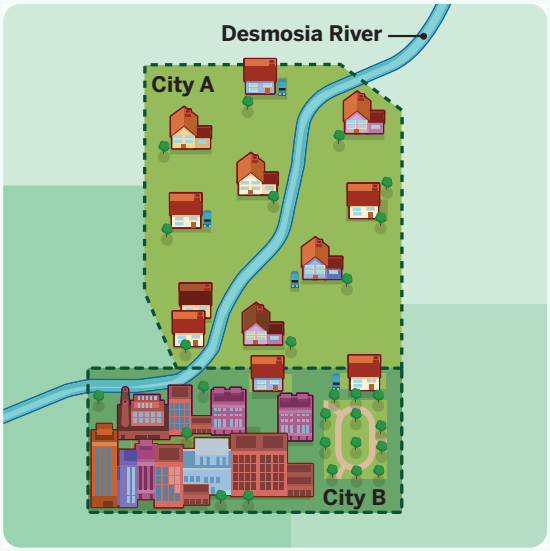
Lesson Summary

We can use two-variable linear inequalities to model real-world constraints and make sense of issues in society, such as fair water distribution.

When modeling, we often make an initial decision based on the information and variables we're given. But we might find additional variables to consider when we look deeper.

In the example of fair water distribution, some additional variables to consider are:

- The population of each city.
- The amount of land in each city.
- The amount of water each city uses.
- Any future predictions for change in the river's flow.



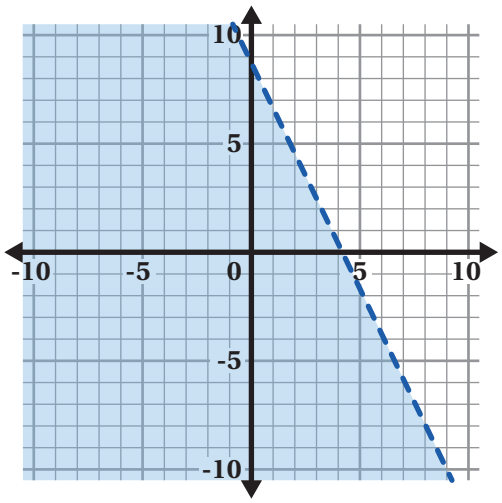
When we consider additional variables, we have the opportunity to revise our initial model to make it better and more precise. Additional variables, along with empathy, personal experiences, and listening to the experiences of others can help us make better models that meet the needs of the diverse groups of individuals who make up a community.

Things to Remember:

Lesson Practice
A1.2.16

Name: ..... Date: ..... Period: .....

1. Here is the graph of $y < 8 - 2x$. Select *all* the points that are solutions to the inequality.



- ☑ **A.** $(-5, 0)$
- ☐ **B.** $(10, 2)$
- ☐ **C.** $(4, 0)$
- ☑ **D.** $(-2, -6)$
- ☐ **E.** $(5, 5)$

Problems 2–3: Gabriel is selling tickets to a fundraising concert for the school band. His goal is to raise more than $\$145$. Student tickets, s, cost $\$3$ each. Adult tickets, a, cost $\$5$ each.

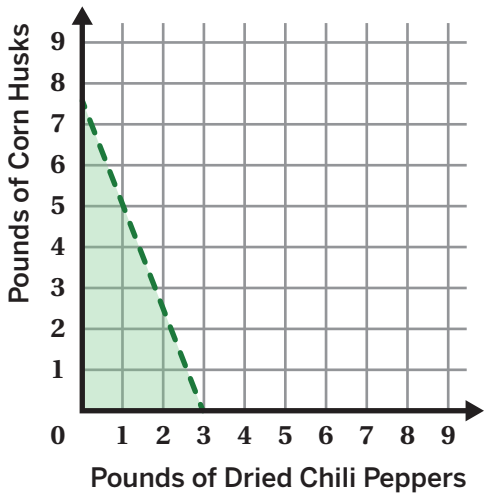
2. Which inequality represents the number of tickets Gabriel could sell to achieve his goal?

A. $3s - 145 > 5a$ **B.** $3s + 5a \geq 145$ **C.** $3s + 5a \leq 145$ **D.** $3s + 5a > 145$

3. Is $s = 10000$ and $a = 30000$ a reasonable solution in this situation? Explain your thinking.

No. *Explanations vary.* While this combination of tickets brings in a profit well over the goal, it isn't reasonable to expect Gabriel to sell 40,000 tickets to his school band concert.

Problems 4–6: Ramon is buying ingredients to make tamales. This graph represents the pounds of dried chili peppers and pounds of corn husks he can buy for less than $\$50$.



4. Can Ramon buy 2 pounds of dried chili peppers and 4 pounds of corn husks for less than $\$50$?

No

5. Can Ramon buy 1.5 pounds of dried chili peppers and 3 pounds of corn husks for less than $\$50$?

Yes

6. Explain how you determined your choices.

Responses vary. I used the shaded region of the graph to determine what Ramon can buy for less than $\$50$. Since the point $(2, 4)$ is not in the shaded region, I know that Ramon cannot buy 2 pounds of chili peppers and 4 pounds of corn husks. Since $(1.5, 3)$ is in the shaded region, I know he can buy 1.5 pounds of chili peppers and 3 pounds of corn husks.

Name: _____ Date: _____ Period: _____

Problems 7–8: Naoki and Tariq rented an electric scooter for a total of 60 minutes to explore the city they are visiting. Let n represent the number of minutes Naoki rides the scooter and t represent the number of minutes Tariq rides the scooter.

7. Write an inequality that represents all the ways Naoki and Tariq could share the total time they have to ride the scooter.

$n + t \leq 60$

8. Determine a solution to your inequality that you think is fair to Naoki and Tariq. Explain your thinking.

Responses vary. $(30, 30)$. This represents Naoki and Tariq splitting the time in half. This seems fair to me, but it might not be fair if something Naoki wanted to explore was farther away and he needed more time to travel. It might be more fair to split the time based on distance from where each person wanted to go.

9. Write up to four different inequalities to create a design on the coordinate plane.

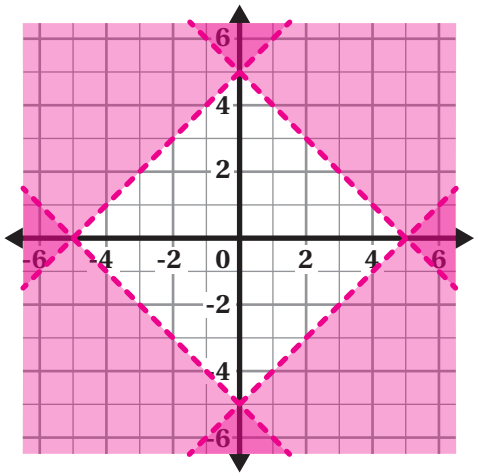
Responses vary.

Inequality 1: $y > x + 5$

Inequality 2: $y > -x + 5$

Inequality 3: $y < x - 5$

Inequality 4: $y < -x - 5$



Spiral Review

10. Select *all* the equations that are equivalent to $3x + 5 = 20 - x$.

- ☑ **A.** $4x = 15$
- ☐ **B.** $2x = 25$
- ☐ **C.** $-4x + 20 = -5$
- ☑ **D.** $4x - 15 = 0$
- ☐ **E.** $x - 20 = 5 + 3x$

Problems 11–12: Solve for y.

11. $-6x + 3y = 24$

$y = 8 + 2x$ (or equivalent)

12. $2 - 6x = 4 + 4y$

$y = -\frac{3}{2}x - \frac{1}{2}$ (or equivalent)

Reflection

1. Put a star next to a problem you want to understand better.
2. Use this space to ask a question or share something you're proud of.