Name ____________________________ Period __________ Date ____________

8-9
STUDENT PACKET

MATHLINKS GRADE 8
STUDENT PACKET 9
SYSTEMS OF LINEAR EQUATIONS

WORD BANK

Word or Phrase	Definition or Explanation	Example or Picture
linear function		
ordered pair		
slope of a line		
slope-intercept form of a linear equation		
solution to a system of equations		
system of equations		
y-intercept		

SOLVING LINEAR SYSTEMS BY GRAPHING

Summary (Ready)

We will solve systems of linear equations by graphing. We will write linear equations in equivalent forms. We will create a mathematical model (equation) to help us solve "the rope problem."

Goals (Set)

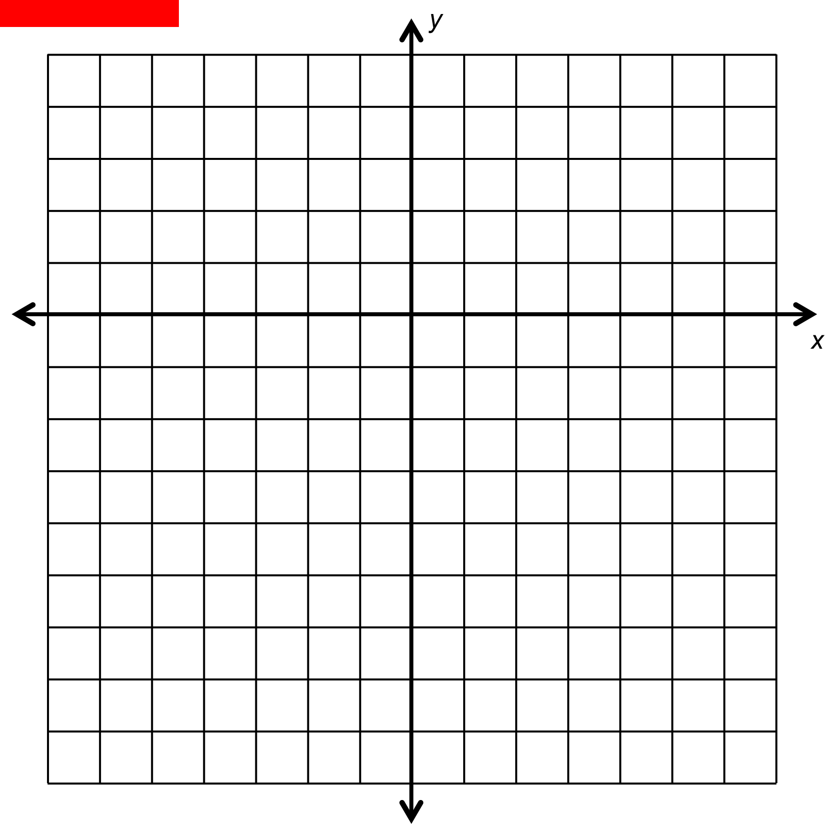
- Define a system of linear equations in two variables.
- Understand what it means to solve a system of linear equations.
- Understand why systems of linear equations have no solution, one solution, or infinitely many solutions.
- Solve systems of equations using a graphing method.
- Use mathematical representations to explore "the rope problem."

Warmup (Go)

In previous lessons you learned that the slope-intercept form of a line is $y = mx + b$. In this equation, "y is written in terms of x." Solve each equation below for y in terms of x. Then graph each line.

1. $4x + 2y + 12 = 0$

2. $\frac{1}{2}y = 3x - 1$



SAVING FOR A PRINTER REVISITED

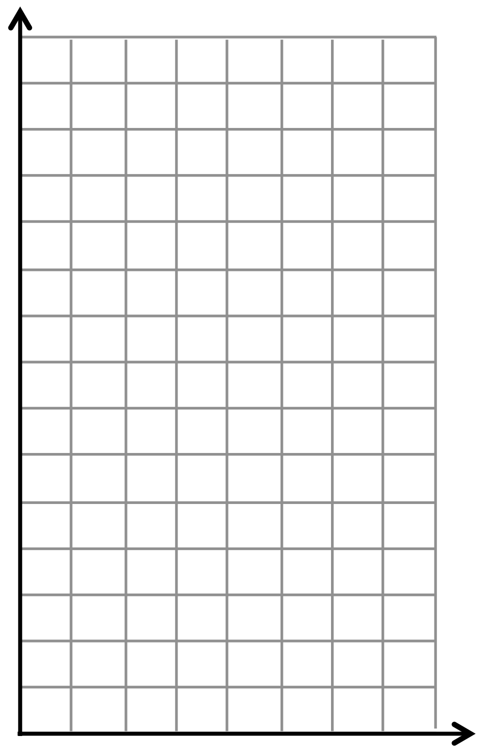
Theresa and Cary are saving for a printer. Theresa has $10 in the bank and will save $20 each month. Cary has $25 in the bank and will save $15 each month.

1. How much does Theresa have at month #0? ________

2. How much does Cary have at month #0? ________

3. Fill in the table for several months. Then graph the data. Use a different color for each girl's table values and graph. Label and scale the axes appropriately.

Theresa		Cary	
Month # (x)	Total savings in $ (y)	Month # (x)	Total savings in $ (y)
0		0	
1		1	
2		2	
3		3	
4		4	
5		5	
6		6	
7		7	



4. Write an equation that represents Theresa's savings. y = ____________________

5. Write an equation that represents Cary's savings. y = ____________________

6. Which girl is saving at a faster rate? ____________ Justify your answer by referring to the table, the graphs, and the equations.

7. At which months does Theresa have more money? ________

8. At which months does Cary have more money? ________

9. At which month do they have the same amount of money? ________ What do you notice about the graphs at this month?

WHAT ARE SYSTEMS OF EQUATIONS?

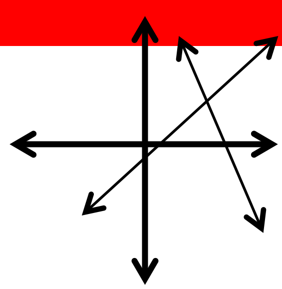
1. When a linear equation in two variables is graphed, what does the line represent?

A system of equations is a set of two or more equations in the same variables. In this packet, we will learn about systems of two linear equations with two variables.

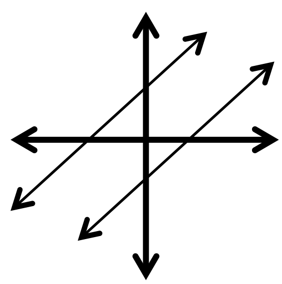
The solution set of an equation in *x* and *y* consists of all pairs (*x*, *y*) that satisfy the equation. The solution set of a system of equations consists of all pairs (*x*, *y*) that satisfy simultaneously the equations in the system. A system of two linear equations in two variables has one solution, no solution, or infinitely many solutions.

The solution sets for the linear equations belonging to two (different) systems of linear equations are graphed below. Refer to the graphs and write whether each system of equations appears to have *exactly one solution* or *no solution*. Explain your reasoning for each answer.

2. Two lines intersecting in exactly one point.



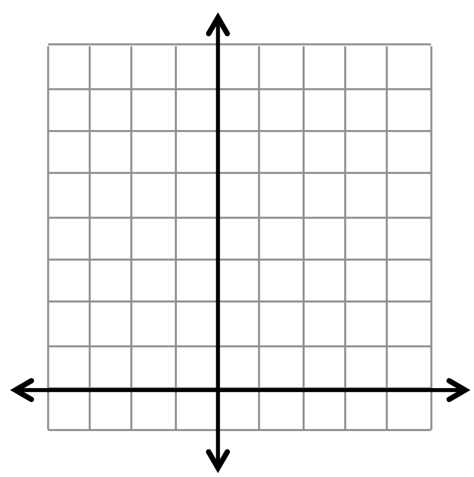
3. Two parallel lines.



4. Draw the graphs of the solution sets of the two equations in the following system of linear equations.
   Hint: Change the second equation to slope-intercept form before graphing.

$$\begin{cases} y = 2x + 3 \\ 2y = 4x + 6 \end{cases}$$

   Why do you think we say that this system has *infinitely many solutions* ?



5. Based on the definitions and examples on this page, classify the system of equations that illustrates the savings of Theresa and Cary on the previous page.

SOLVING SYSTEMS OF EQUATIONS BY GRAPHING

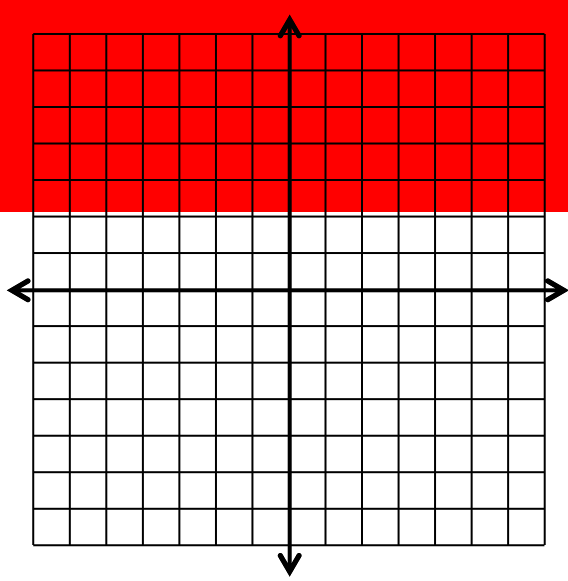
1. A system of equations whose solution sets are two parallel lines must have ____________________ solution(s).

2. A system of equations whose solution sets intersect in one point must have ____________________ solution(s).

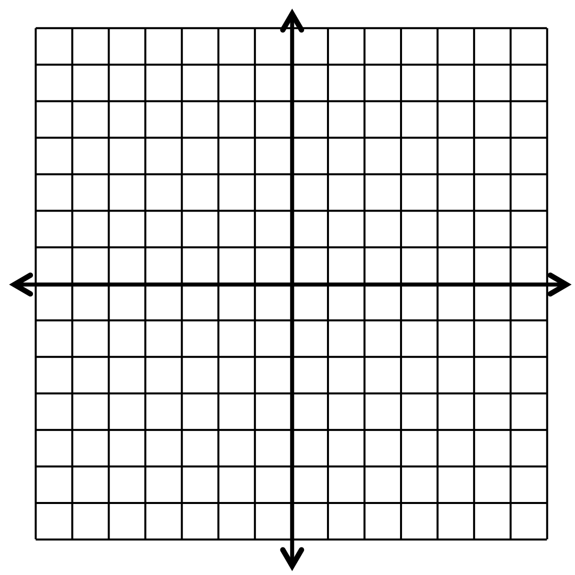
3. A system of equations whose solution sets are two lines that coincide (equivalent equations) must have ____________________ solution(s).

For each system, change equations to slope-intercept form when needed, graph the lines, and then describe the solutions.

4. $\begin{cases} 3y = 9x + 3 \\ y = 3x - 5 \end{cases}$



5. $\begin{cases} y - 6 = \frac{2}{5}x \\ 2x + y = -4 \end{cases}$



6. Consider the systems below. Without graphing or manipulating either system, explain how you know that there can be no solution to either.

a. $\begin{cases} y = -x + 4 \\ y = -x + 1 \end{cases}$

b. $\begin{cases} 3x + 2y = 5 \\ 3x + 2y = 6 \end{cases}$

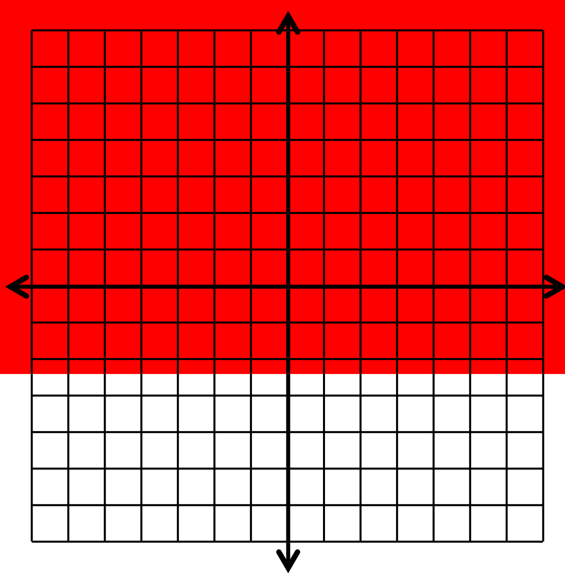
7. Without graphing, how do you know that the following system must have infinitely many solutions?

$$\begin{cases} y = 2x - 9 \\ 3y = 6x - 27 \end{cases}$$

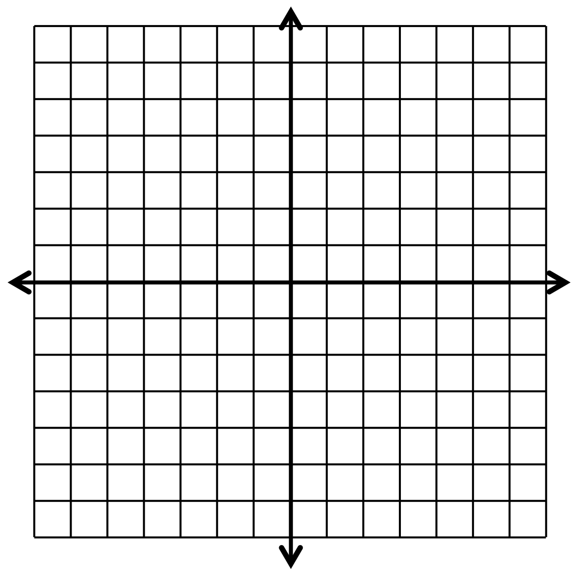
SOLVING SYSTEMS OF EQUATIONS BY GRAPHING (Continued)

For each system, change equations to slope-intercept form when needed, graph the lines, and then describe the solutions.

8. $\begin{cases} y = -3x + 5 \\ y = -\frac{1}{2}x \end{cases}$



9. $\begin{cases} y - 4x = 2 \\ 2x - \frac{1}{2}y = 1 \end{cases}$



10. How many solutions will each of the following systems have? Make conjectures and justify through discussion with your peers. Diagrams may be helpful.

a. Two lines with the same slope and different *y*-intercepts.

b. Two lines with the same slope and the same *y*-intercepts.

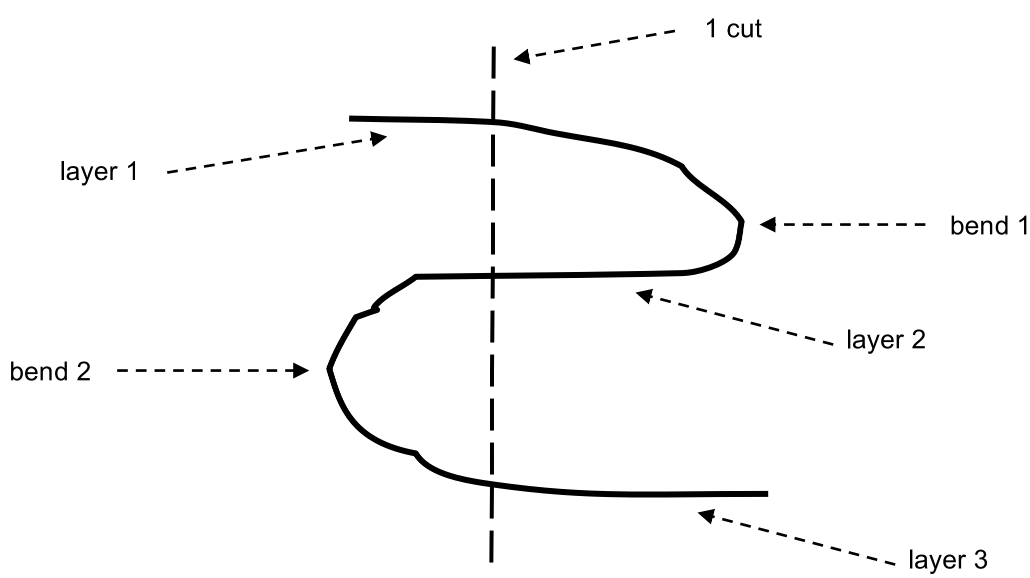
c. Two lines with different slopes and the same *y*-intercepts.

THE ROPE PROBLEM: GETTING STARTED

Many situations can be modeled using mathematics. In this problem, you will use the fourfold way and explore patterns that arise from cutting a rope.

- Start with **one** long piece of rope with three "layers" and two "bends."
- One vertical cut is made through all three layers as shown.

1. After one cut, how many pieces of rope are there? _____



2. Draw a 2^{nd} vertical line that cuts through each layer again.

   How many pieces of rope are there now? _____

3. Draw a 3^{rd} vertical line that cuts through each layer again.

   How many pieces of rope are there now? _____

CUTTING THE ROPE

Explore cutting the rope for different numbers of layers and cuts.

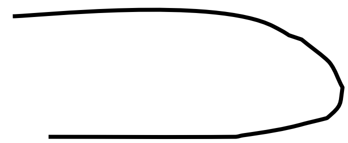
1. # of layers (q) = 1

# of cuts (c)	# of pieces (p)

Rule for any number of cuts:

p =

2. # of layers (q) = 2



# of cuts (c)	# of pieces (p)

Rule for any number of cuts:

p =

3. # of layers (q) = 3

# of cuts (c)	# of pieces (p)

Rule for any number of cuts:

p =

4. # of layers (q) = 4

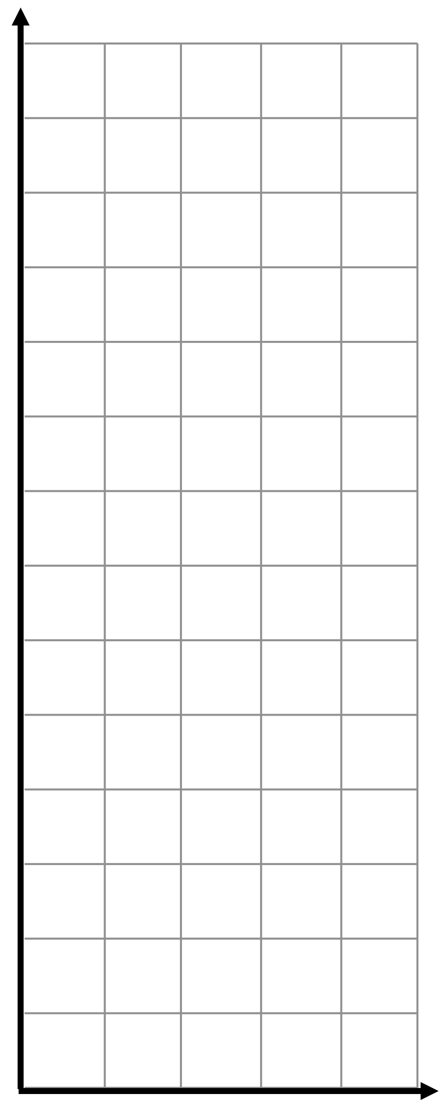
# of cuts (c)	# of pieces (p)

Rule for any number of cuts:

p =

CUTTING THE ROPE (Continued)

5. For each table, plot the points on the grid.
   Graph each set of points with a different color.
   Label and scale the axes appropriately.



6. What is the same about each graph?

7. What is different?

8. What does the y-intercept represent for each graph in terms of the cutting rope experiment?

9. What does the slope represent for each graph?

10. Looking at all four tables, write a rule that can be used to find the total number of pieces (p) for any number of layers (q) and any number of cuts (c):

    p = ________________

SOLVING LINEAR SYSTEMS BY SUBSTITUTION

Summary (Ready)

We will solve systems of linear equations by the substitution method.

Goals (Set)

- Solve systems of linear equations using tables, graphs, and algebraic notation.
- Compare the effectiveness of different strategies for solving systems of linear equations.
- Solve systems of equations using the substitution property.

Warmup (Go)

The <u>transitive property of equality</u> states that if $a = b$ and $b = c$, then $a = c$.

1. Given: Andre is the same height as Betty. Betty is the same height as Cleo.
   What can we conclude about the relative heights of Andre and Cleo?

The <u>substitution property of equality</u> states that if $a = b$, then a can replace b in any equation or inequality.

2. Given: ♡ = 2☁ (the value of one heart is equal to the value of two clouds)

   For the equation below, substitute so that the right side of the equation has only clouds and numbers, no hearts.

   3♡ + 5☁ = 3(________) + 5☁

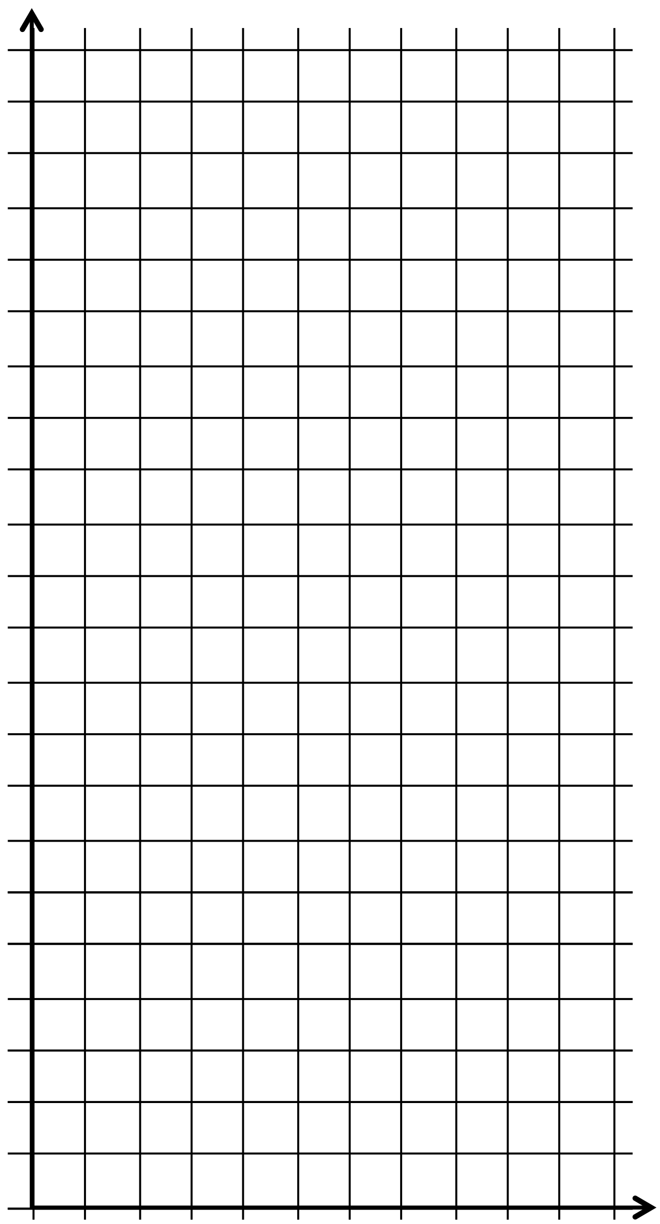
   Simplify the right side of the equation:

GOING TO THE PARK REVISITED

Two friends, Malcolm and Zeke, are going to the park that is near their school. They leave at the same time from different locations. Malcolm is 30 meters from the school on his way to the park, and he is walking at the rate of 1 meter per second. Zeke is at school and will jog to the park at a rate of 4 meters per second.

1. Fill in the table and graph the data. Use one color for Malcolm's graph and another for Zeke's. Label and scale the axes appropriately.

Malcolm		Zeke	
Time in seconds (x)	Distance from school in meters (y)	Time in seconds (x)	Distance from school in meters (y)
0	30	0	
1		1	
2		2	
3		3	



2. Based on the **table**, at what number of seconds are the two boys the same distance from school? _____
   How do you know?

3. Based on the **graphs**, at what number of seconds are the two boys the same distance from school? _____
   How do you know?

GOING TO THE PARK REVISITED (Continued)

4. Write information about the graphs of both boys' travels.

	Equation in slope-intercept form (distance in terms of time)	Slope	Intercept
Malcolm	$y =$		
Zeke	$y =$		

5. We are focusing on the number of seconds x at which the two boys are the same distance from school. From the information in problem 4, why is it true that x is the solution of the equation $x + 30 = 4x$?

6. Solve for x.

7. What does the solution for x mean in the context of the problem?

8. From above, since $x =$ _____, use the substitution property to solve for y in the equations for Malcolm and Zeke, and simplify:

   Malcolm: $y =$ ________________ = ________________

   Zeke: $y =$ ________________ = ________________

9. What do the solutions for y mean in these equations?

10. After how many seconds are the boys the same distance from school? __________

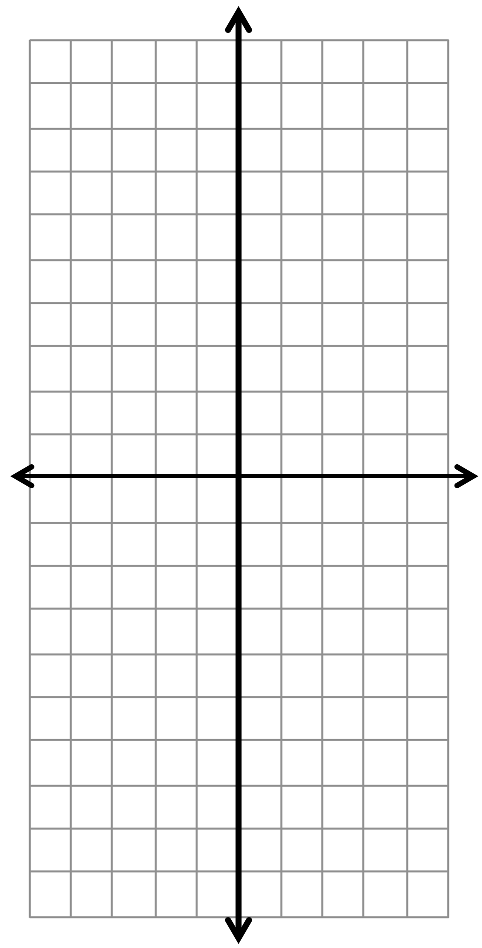
    What is this distance? __________

11. Looking at the algebraic substitution process above, does the number of seconds at which the boys are the same distance from school match what is in the table and the graphs on the previous page?

SOLVING SYSTEMS BY SUBSTITUTION

1. Solve the following system of equations by following the instructions and answering the questions below.

$$\begin{cases} y = -4x + 2 \\ y = 8x - 1 \end{cases}$$



a. Graph the system.

b. Ike looked at the graphs and said, "I can't tell for sure what the solution is." Explain why you think Ike said this.

c. Estimate the solution.

d. Since the expressions $-4x + 2$ and $8x - 1$ are both equal to y, use the transitive property to write a new equation in x. Then solve for x.

____________ = ____________

e. From above, since x = _____, use the substitution property to solve for y in both of the original equations.

$y = -4x + 2$ $y = 8x - 1$

$y = -4($ ____ $) + 2$ $y = 8($ ____ $) - 1$

f. Does y have the same value for both equations above? ______

g. What is the solution to the system? (____, ____)

SOLVING SYSTEMS BY SUBSTITUTION (Continued)

2. Solve the system below by following the instructions and answering the questions below.

$$\begin{cases} y = 2x - 1 \\ 2y - 3x = -5 \end{cases}$$

a. Circle the expression involving x from the first equation that is equal to y. Then use the substitution property in the second equation and solve for x.

$2y - 3x = -5$

$2(\_\_\_\_\_\_\_\_\_\_) - 3x = -5$

b. From above, x = _____. Use the substitution property to solve for y in both of the original equations.

$y = 2x - 1$ $2y - 3x = -5$

c. What is the solution to the system? (____, ____)

3. Solve the following system using the substitution method. Note that there is not a variable isolated ("by itself") in either equation given.

$$\begin{cases} 2x = -2 + 2y \\ 3x - 4y = -2 \end{cases}$$

SOLVING SYSTEMS BY SUBSTITUTION CHALLENGE

Solve each system using the substitution method.

1. $\begin{cases} y = 3x + 1 \\ y = x + 5 \end{cases}$	2. $\begin{cases} y - 2x = 6 \\ y = 2x + 2 \end{cases}$
3. $\begin{cases} 2x - 3y = 15 \\ x + y = 6 \end{cases}$	4. $\begin{cases} 4x = 6 + y \\ 2x - \frac{1}{2}y = 3 \end{cases}$

SOLVING LINEAR SYSTEMS BY ELIMINATION

Summary (Ready)	Goals (Set)
We will solve systems of linear equations by the elimination method.	• Deepen understanding of what it means to solve a system of linear equations in two variables. • Compare the effectiveness of different strategies for solving systems of equations. • Apply properties of equality to solve systems of linear equations. • Use systems of equations to solve problems.

Warmup (Go)

For all numbers a, b, and c, if $a = b$, then

$a + c = b + c$		$ac = bc$
addition property of equality (equals added to equals are equal)	AND	multiplication property of equality (equals multiplied by equals are equal)

Given $m = n$. Write true (T) or false (F) next to each statement.

___1. $m + 3 = n + 3$ ___2. $m + (2 + 5) = n + 7$ ___3. $6m = 6n$

___4. $m - 4 = n - 4$ ___5. $m - (2 - 6) = n - 4$ ___6. $\frac{m}{-6} = \frac{n}{-6}$

___7. $\frac{m}{3} = \frac{3}{n}$ ___8. $2(m + 5) = 2n + 10$ ___9. $m - 8 = 8 - n$

For each problem, given two equations, write a new equation. (Note that equations are written in vertical alignment to make adding and subtracting expressions easier.)

10.
$$\begin{array}{rcrcr} (3 & + & 6) & = & (9) \\ +(2 & + & 5) & = & +(7) \\ \hline \square & + & \square & = & \square \end{array}$$

Why can you add 2 + 5 to the left side of the first equation and 7 to the right side?

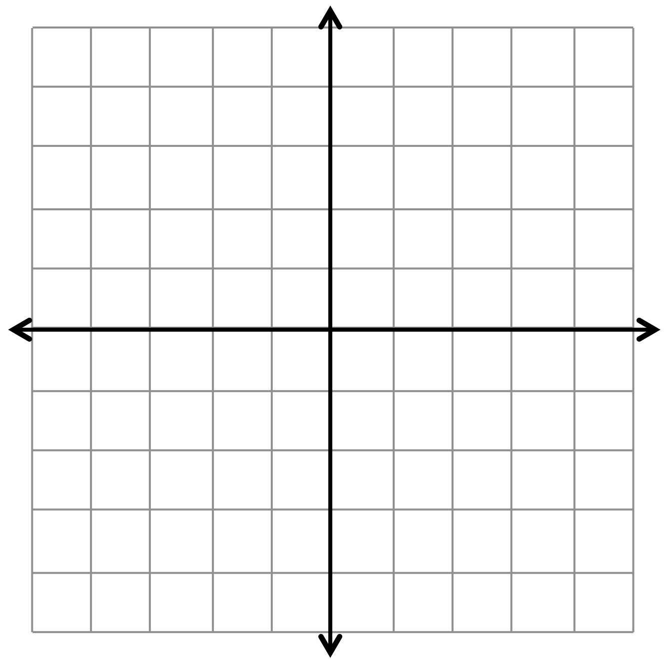
11.
$$\begin{array}{rcrcr} (3 & + & 6) & = & (9) \\ -(2 & + & 5) & = & -(7) \\ \hline \square & + & \square & = & \square \end{array}$$

Why can you subtract 2 + 5 from the left side of the first equation and 7 from the right side?

SOLVING SYSTEMS REVIEW

1. Graph this system of equations:

$$\begin{cases} 2x + y = 5 \\ x + 2y = 4 \end{cases}$$



2. What ordered pair represents the solution to this system?

   (____, ____)

3. Solve the system above using the substitution method.

   a. As an ordered pair, the solution to the system is: (______, ______)

   b. As equations, the solution to the system is: x = ____ y = ____

4. Consider the solution in the box above as equations of lines. Graph these two equations on the same grid above. Where do these two lines intersect? What does that mean?

CREATING EQUATIONS USING PROPERTIES OF EQUALITY

On the previous page, you solved the system $\begin{cases} 2x+y=5 \\ x+2y=4 \end{cases}$ in two different ways.

Use different colored pencils for each graph.

1a.	Apply the addition property of equality to this system to arrive at another equation. Graph this equation on the previous page. Slope-intercept form may be helpful. 1b. What do you notice about the graph of the new equation?	$(2x + y) = (5)$ $+(x + 2y) = +(4)$ ――――――― $=$
2a.	Multiply both sides of the second equation by -2 to arrive at another equation. Graph this equation on the previous page. Slope-intercept form may be helpful. 2b. What do you notice about the graph of the new equation?	$-2(x + 2y) = -2(4)$ $=$
3a.	Add the expressions for the equation created in problem 1a to the expressions for the equation created in problem 2a to arrive at another equation. Graph this equation on the previous page. Slope-intercept form may be helpful. 3b. What do you notice about the graph of the new equation?	from 1a: from 2a: ―――――――
4a.	Use properties of equality to create another equation from the original ones. Then graph this new equation. Slope-intercept form may be helpful. 4b. What do you notice about the graph of this new equation?	

Circle all the equations on this page that pass through the point (2, 1). Each of these equations is a <u>linear combination</u> of the original equations, so the solution (2, 1) of the original system must also be a solution of each of these equations.

SOLVING SYSTEMS BY ELIMINATION

Given a system of two linear equations, properties of equality can be used to create new systems that have the same solution as the given ones. Using this idea strategically allows for manipulating the equations to eliminate one of the variables. This process is called solving a system by elimination.

Consider the following system: $\begin{cases} 2x+y=10 & (1) \\ -y=-x+2 & (2) \end{cases}$

1. Here is one strategy for using elimination to solve this system.

Directions	Work
Rewrite both equations in the form $ax + by = c$, changing equations (1) and (2) to (3) and (4).	(1) → (3) (2) → (4)
Apply the addition property of equality to equations (3) and (4) to eliminate y. This is now equation (5)	(5)
Solve for x.	
Use substitution in equation (1) to solve for y.	
Write the solution	as an ordered pair. (_____, _____) as equations: x = _____, y = _____
Check the solution in equation (2).	

SOLVING SYSTEMS BY ELIMINATION (Continued)

Consider the same system: $\begin{cases} 2x+y=10 & (1) \\ -y=-x+2 & (2) \end{cases}$

2. Here is another strategy for using elimination to solve this system.

Rewrite both equations in the form *ax* + *by* = *c*.	(1) → (3) (2) → (4)
Apply the multiplication property of equality by multiplying both sides of equation (4) by -2.	(5)
Apply the addition property of equality to equations (3) and (5) to eliminate *x.*	
Solve for *y.*	
Use substitution into equation (1) to find *x.*	
Write the solution	as an ordered pair. ________________ as equations: __________; __________
Check the solution in equation (2).	

SOLVING SYSTEMS BY ELIMINATION (Continued)

Solve the following system of equations.

3. Given system: $\begin{cases} y + x = 5 \\ y = 6 - 2x \end{cases}$

   a. Rewrite both equations in the form $ax + by = c$

   b. Solve by eliminating the y's

   c. Solve by eliminating the x's

   d. Write the solution as equations and as an ordered pair.

4. Given system: $\begin{cases} 4x - 3y = 1 \\ 3y = 2 - 2x \end{cases}$

   a. Rewrite both equations in the form $ax + by = c$

   b. Solve by eliminating the y's

   c. Solve by eliminating the x's

   d. Write the solution as equations and as an ordered pair.

SOLVING SYSTEMS BY ELIMINATION PRACTICE

Solve each system using the elimination method. Check by substitution or by solving again for the other variable.

1. $\begin{cases} 3x + y = 12 \\ y - 2 = -5x \end{cases}$	2. $\begin{cases} 3x = y + 3 \\ 2y = 5x - 1 \end{cases}$
3. $\begin{cases} 4x - 3y = 12 \\ 3y = 4x - 6 \end{cases}$	4. $\begin{cases} 2y = 5x - 1 \\ 2 - 10x = -4y \end{cases}$

SOLVING WORD PROBLEMS

For each problem, see if you can find the answer using guess and check, a table, or other problem solving techniques.

Then solve the problem using a system of equations. Identify the variables. Translate each word problem into a system of equations. Solve the system by using the substitution or elimination method. Clearly state the solutions. Check solutions in the original problem.

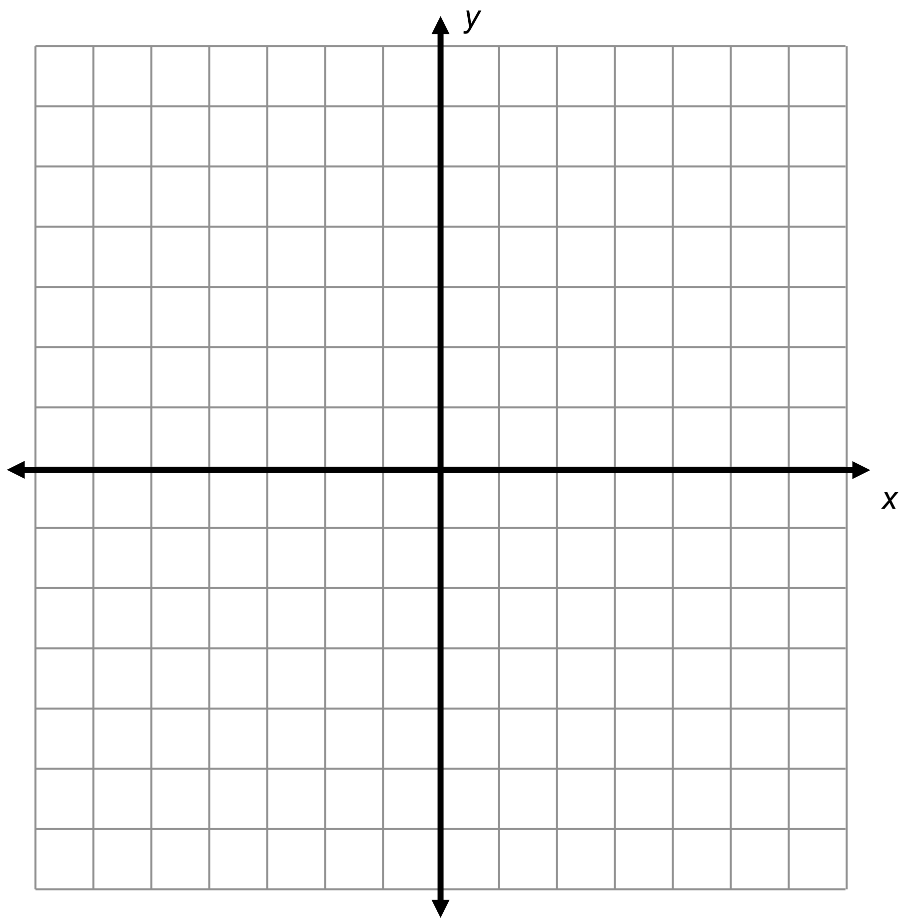
1. Sid and Nancy went to the same store. Sid bought 4 shirts and 3 pairs of jeans for $181. Nancy bought 1 shirt and 2 pairs of jeans for $94. All shirts were the same price and all jeans were the same price. How much did shirts and jeans each cost?	2. The sum of two numbers is 79. Three times the first number added to 5 times the second number is 283. What are the two numbers?

SKILL BUILDERS, VOCABULARY, AND REVIEW

SKILL BUILDER 1

Complete the table. Then graph each line below.

	Draw a line through point:	With a slope of:	*y*-intercept of the line:	Name another point on the line:
1.	*A* (4, 2)	1		
2.	*B* (-1, -4)	0		
3.	*C* (-2, 0)	$\frac{1}{2}$		
4.	*D* (0, 4)	$-\frac{2}{5}$		



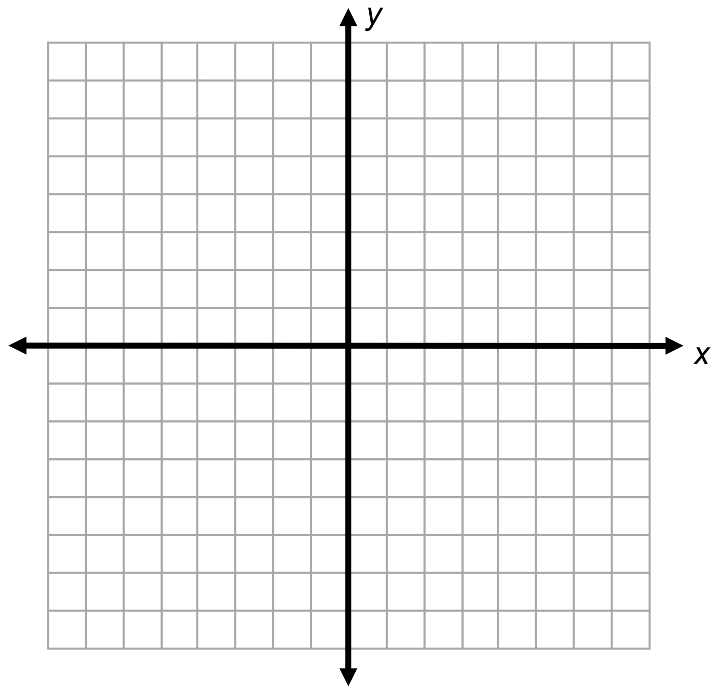
SKILL BUILDER 2

1. Graph each set of ordered pairs. Label the two points and draw the line through them.

Set 1: *A*(5, 6) and *B*(0, 4)

Set 2: *G*(-4, -2) and *H*(2, -5)

Set 3: *K*(6, 3) and *L*(6, -3)



		Find the slope by counting:	Use the slope formula to calculate the slope in two different ways:	
2.	Line *AB*		$\frac{(6)-(4)}{(5)-(0)} =$	$\frac{(4)-(6)}{(0)-(5)} =$
3.	Line *GH*			
4.	Line *KL*			

Solve each equation for *y* in terms of *x*. In other words, put each in slope-intercept form, $y = mx + b$.

5. $6x - y = -7$	6. $-y = 2x + 5$	7. $x + \frac{2}{3}y = -6$

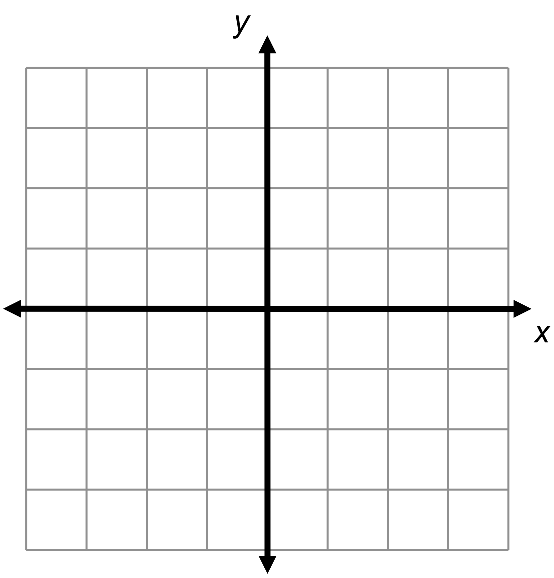
SKILL BUILDER 3

Complete each input-output table for the given equations and graph all three below.

Line 1 1. $y = \frac{1}{2}x + 3$	
input (x)	output (y)
0	
2	
-2	

Line 2 2. $y = \frac{1}{2}x - 3$	
input (x)	output (y)
0	
2	
-2	

Line 3 3. $y = \frac{1}{2}x$	
input (x)	output (y)
0	
2	
-2	



4. What do you notice about the three lines?

5. What is the slope of each of the lines?

   Line 1 ________________ Line 2 ________________ Line 3 ________________

   Circle the number that represents the slope in each equation.

6. What is the *y*-intercept of each of the lines?

   Line 1 ________________ Line 2 ________________ Line 3 ________________

   Underline the number that represents the *y*-intercept in each equation.

SKILL BUILDER 4

Complete each input-output table for the given equations and graph all three below.

Line 1

1. $y = -2x + 1$

input (x)	output (y)
0	
2	
-1	

Line 2

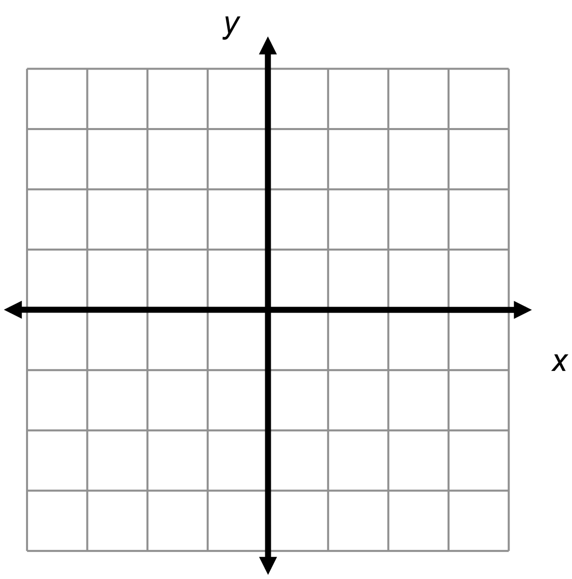
2. $y = 2x + 1$

input (x)	output (y)
0	
1	
-2	

Line 3

3. $y = \frac{1}{2}x + 1$

input (x)	output (y)
0	
2	
-2	



4. What do you notice about the three lines?

5. What is the slope of each of the lines?

Line 1 ________________ Line 2 ________________ Line 3 ________________

Circle the number that represents the slope in each equation.

6. What is the *y*-intercept of each of the lines?

Line 1 ________________ Line 2 ________________ Line 3 ________________

Underline the number that represents the *y*-intercept in each equation.

SKILL BUILDER 5

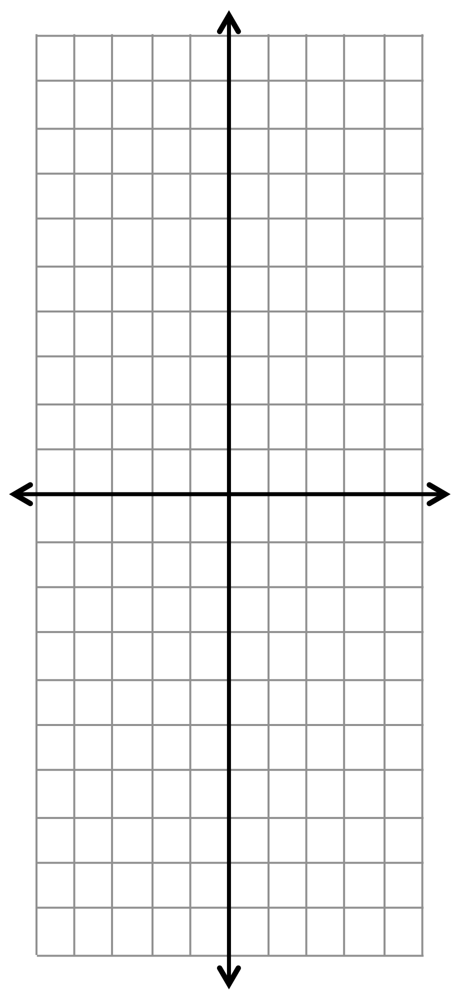
Here is information about some linear functions. Use tables, graphs, and/or equations to answer the questions.

<table>
<tr><th>Line A</th><th>Line B</th><th>Line C</th><th>Line D</th></tr>
<tr>
<td>Goes through
(3, 3) and (2, 0)</td>
<td>Goes through
(5, -1) and (3, -2)</td>
<td>Table of Values
<table>
<tr><th>x</th><th>y</th></tr>
<tr><td>0</td><td>3</td></tr>
<tr><td>1</td><td>6</td></tr>
<tr><td>2</td><td>9</td></tr>
<tr><td>3</td><td>12</td></tr>
<tr><td>4</td><td>15</td></tr>
<tr><td>5</td><td>18</td></tr>
<tr><td>6</td><td>21</td></tr>
</table>
</td>
<td>$y = 3x$</td>
</tr>
</table>

1. Do lines *A* and *B* intersect? _____ If yes, where? _____
   If no, explain why.

2. Do lines *C* and *D* intersect? _____ If yes, where? _____
   If no, explain why.

3. If you have not already done so, write equations for lines *A*, *B*, and *C* above. Make a table of values for line *D* above. Graph all lines to the right.



> Recall that a direct proportion is a relationship where one variable is a constant multiple of the other (also called a direct variation).

4. Which line appears to represent a direct variation?_____

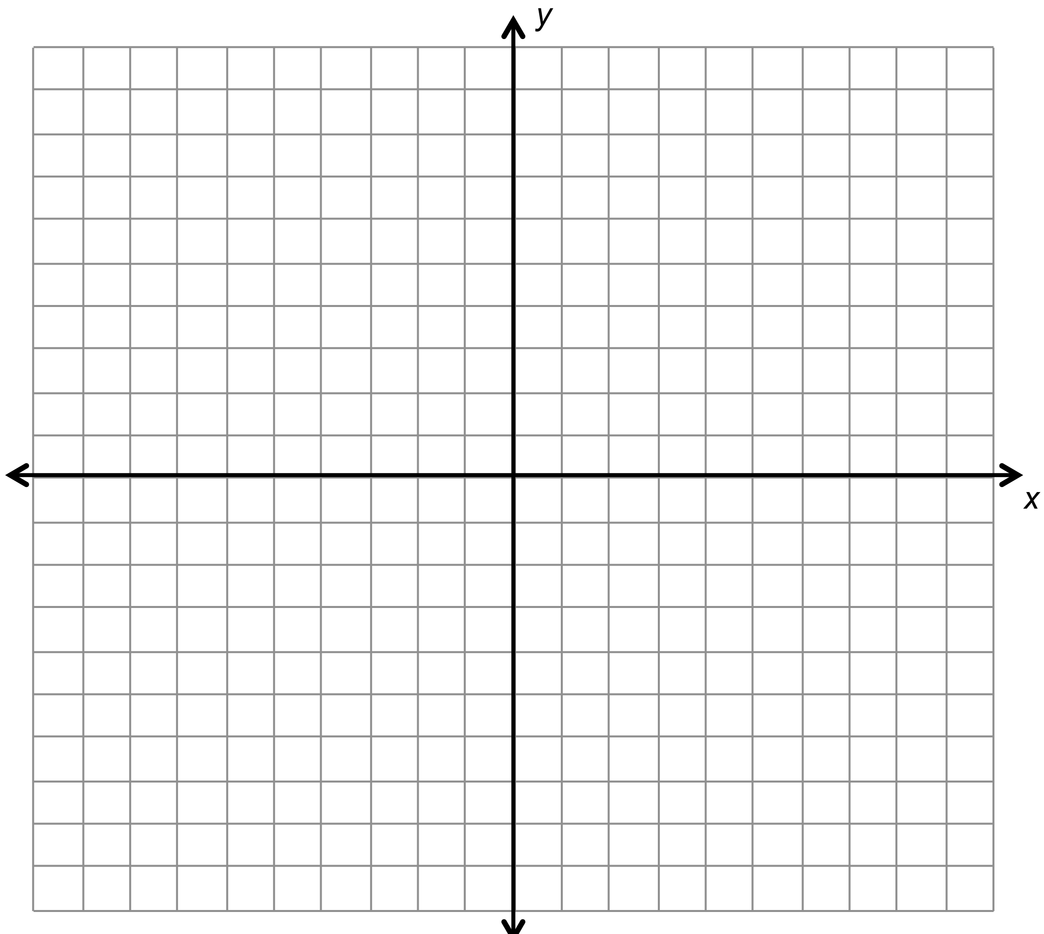
   What is the multiplier?______

5. Which line goes through the origin? ______

SKILL BUILDER 6

Write each equation in slope-intercept form. If the equation is already in slope-intercept form, then circle the equation. Graph each equation and label the graphs.

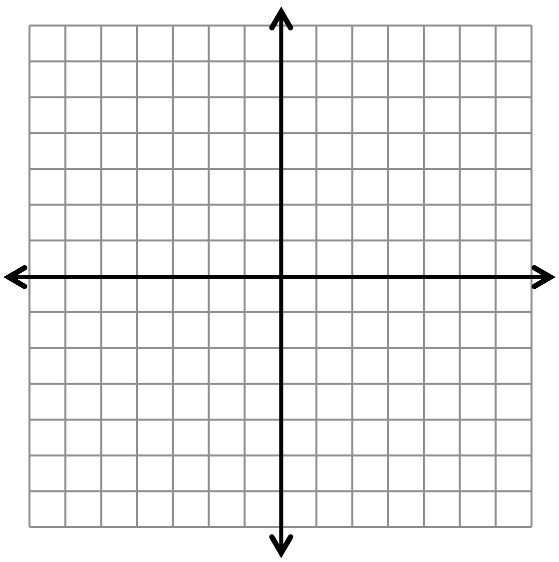
1. $4x - 7 = y$	2. $-y = \frac{1}{2}x + 5$
3. $\frac{1}{2}y = 3x - 1$	4. $-x + \frac{1}{4}y = 2$



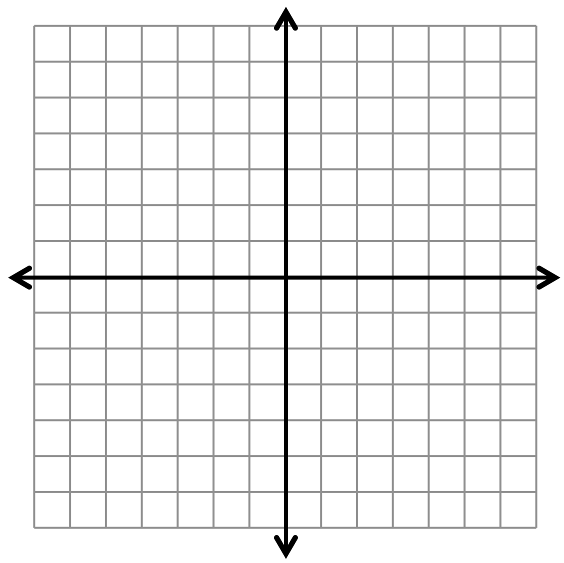
SKILL BUILDER 7

Solve the following systems of equations by graphing. Clearly list and describe the solutions, if any.

1. $\begin{cases} y = -2x + 2 \\ -3y - 9 = x \end{cases}$



2. $\begin{cases} \frac{1}{2}x + y = 3 \\ 2y = 6 - x \end{cases}$



Solve each equation for x.

3. $-5x + \frac{1}{3} = 7x - \frac{1}{6}$

4. $\frac{5}{7} = \frac{9}{x}$

5. $\frac{a}{b} = \frac{c}{x}$

SKILL BUILDER 8

Solve each system using the substitution method or the elimination method.

1. $\begin{cases} y + 3x = 1 \\ 2x - 4 = y \end{cases}$	2. $\begin{cases} \frac{1}{3}x - 2y = -3 \\ y = 3 \end{cases}$
3. $\begin{cases} -x - y = 7 \\ 2x + 2y = -14 \end{cases}$	4. $\begin{cases} -3x + 2y = 4 \\ 2y = 3x \end{cases}$

5. Explain what it means to solve a system of linear equations.

FOCUS ON VOCABULARY

Here are four linear functions:

(a) $y = 2x + 3$ (b) $y = 2x + 6$

(c) $y = -2x + 6$ (d) $2y = 12 – 4x$

Complete each statement using mathematical vocabulary from the word bank and this packet.

1. To find the ______________ _____ _____ ________, find the change in the y-value and divide by the change in the x-value.

2. (3, -5) is an ______________ _________, which labels the point on a coordinate plane with x-coordinate 3 and y-coordinate -5.

3. The _____ – _________________ of the linear function $y = 3x + 6$ is 6 and is located on the graph at the point (0, 6).

4. Equations (a) and (b) have the same _______________________________.

5. Equations (b) and (c) have the same _______________________________.

6. For the system of equations (b) and (c), (0, 6) is a _______________________.

7. Systems of equations whose graphs are parallel lines have _______________________ solution(s). An example of this type of system is equations (____) and (____).

8. Systems of equations that are equivalent have _______________________ solution(s). An example of this type of system is equations (____) and (____).

9. Systems of equations whose graphs intersect in one point have _____________________ solution(s). An example of this type of system is equations (____) and (____).

SELECTED RESPONSE

Show your work on a separate sheet of paper and choose the best answer(s).

1. What is the solution to this system of equations?

$$\begin{cases} 2x - y = \frac{1}{4} \\ x + 4y = 3\frac{1}{2} \end{cases}$$

A. $\left(\frac{3}{4}, \frac{1}{2}\right)$ B. $\left(\frac{1}{2}, \frac{3}{4}\right)$ C. $\left(\frac{3}{4}, \frac{1}{2}\right)$ D. $\left(-\frac{3}{4}, -\frac{1}{2}\right)$

2. A system of two linear equations that has exactly one solution is represented by

A. Parallel lines
B. Lines intersecting in exactly one point.
C. Lines that are graphs of equivalent equations.
D. Both A and C

3. An example of a graph of a system of linear equations that has infinitely many solutions is

A. A pair of lines intersecting in exactly one point.
B. A pair of parallel lines.
C. Lines that are graphs of equivalent equations.
D. Three lines intersecting in exactly one point.

4. Consider this system. Just by looking at it, how do you know that it has no solutions?

$$\begin{cases} y = -2x - 1 \\ y = -2x + 6 \end{cases}$$

A. Both equations are linear.
B. Both equations are in slope-intercept form.
C. Both equations have the same slope and different *y*-intercepts.
D. The graphs of the equations are parallel lines.

KNOWLEDGE CHECK

Show your work on a separate sheet of paper and write your answers on this page.

9.1 Solving Systems of Linear Equations by Graphing

1. Solve this system by graphing.

$$\begin{cases} y + x = -2 \\ y = -x - 2 \end{cases}$$

2. Without manipulating either equation in the following system, explain why it has no solutions.

$$\begin{cases} x + y = -4 \\ x + y = 3 \end{cases}$$

3. Use the rule you found for the cutting the rope activity to find the number of pieces created when there are 6 layers and 4 cuts.

9.2 Solving Systems of Linear Equations by Substitution

4. Solve this system by using the substitution method.

$$\begin{cases} -4 = 2x - y \\ -9 = -3x + y \end{cases}$$

9.3 Solving Systems of Linear Equations by Elimination

5. Solve this system by using the elimination method.

$$\begin{cases} -9 = 4x + y \\ -2y = 3x + 10 \end{cases}$$

HOME-SCHOOL CONNECTION

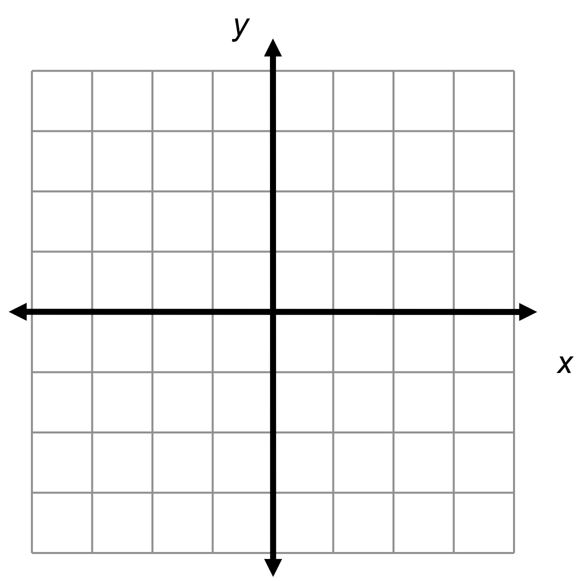
Here are some questions to review with your young mathematician.

1. Solve this system of equations using substitution or elimination. Describe why you chose your method.

$$\begin{cases} 2y = -x + 4 \\ 3y + x = -2 \end{cases}$$

2. Solve this system of equations by graphing.

$$\begin{cases} y = -x + 1 \\ y = 2x + 1 \end{cases}$$



Parent (or Guardian) Signature ____________________________

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COMMON CORE STATE STANDARDS – MATHEMATICS

STANDARDS FOR MATHEMATICAL CONTENT	
8.EE.8a	Analyze and solve pairs of simultaneous linear equations: Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
8.EE.8b	Analyze and solve pairs of simultaneous linear equations: Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.
8.EE.8c	Analyze and solve pairs of simultaneous linear equations: Solve real-world and mathematical problems leading to two linear equations in two variables.
8.F.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*
8.F.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; ~~give examples of functions that are not linear.~~ ~~*For example, the function A = s*~~^{2} ~~*giving the area of a square as a function of its side length is not linear because its graph contains the points (1, 1), (2, 4) and (3, 9), which are not on a straight line.*~~
8.F.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

STANDARDS FOR MATHEMATICAL PRACTICE	
MP1	Make sense of problems and persevere in solving them.
MP2	Reason abstractly and quantitatively.
MP6	Attend to precision.
MP7	Look for and make use of structure.