Grade 8: Satisfying Two Linear Equations

8(9) **Expressions, equations, and relationships.** The student is expected to identify and verify the values of x and y that simultaneously satisfy two linear equations in the form $y = mx + b$ from the intersections of the graphed equations.

8(5)(B) **Proportionality.** The student is expected to represent linear non-proportional situations with tables, graphs, and equations in the form of $y = mx + b$.

1. Complete the table for each of the following linear functions.

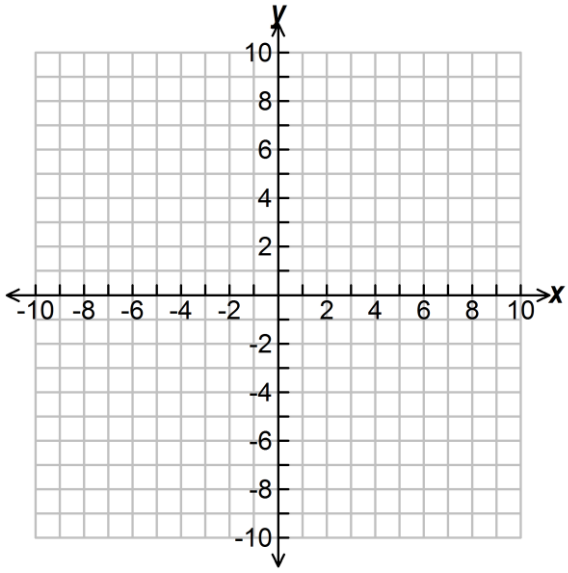
$y = -3x + 4$

x	y
	10
−1	
0	
	−2
	−5

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

x	y
	−4
0	
2	
	0
8	

2. Plot the points, and graph both linear functions on the coordinate plane below.



3. Use the graph to identify two additional points that satisfy each linear equation.

$y = -3x + 4$	$y = \frac{1}{2}x - 3$
(_____ , _____)	(_____ , _____)
(_____ , _____)	(_____ , _____)

4. What is the one point that satisfies both linear equations?

Answer Key

1. Complete the table for each of the following linear functions.

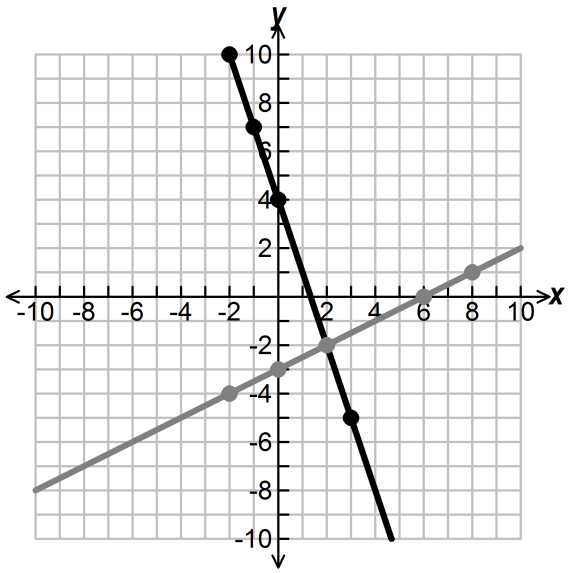
$y = -3x + 4$

x	y
−2	10
−1	**7**
0	**4**
2	−2
3	−5

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

x	y
−2	−4
0	**−3**
2	**−2**
6	0
8	**1**

2. Plot the points, and graph both linear functions on the coordinate plane below.



3. Use the graph to identify two additional points that satisfy each linear equation.

Answers may vary. An example is provided.

$y = -3x + 4$

(4, -8)

(1, 1)

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

(4, −1)

(−4, −5)

4. What is the one point that satisfies both linear equations?

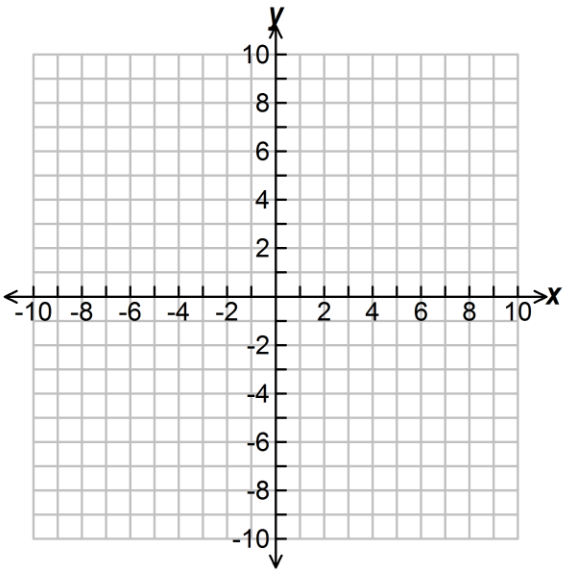
(2, −2)

Algebra I: Solution of a System of Linear Inequalities

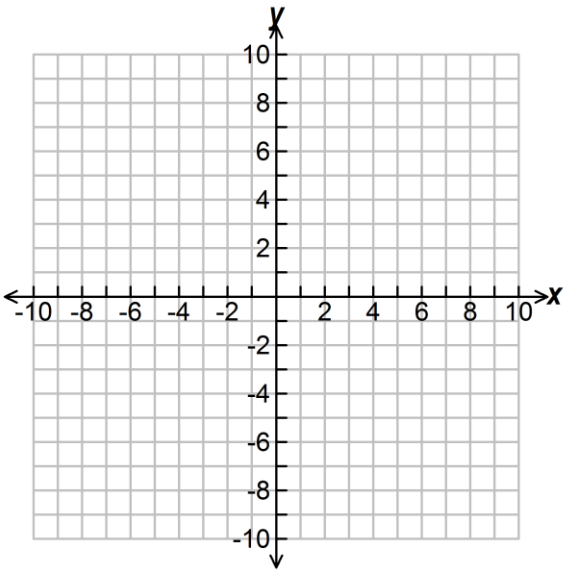
A(3)(H) **Linear functions, equations, and inequalities.** The student is expected to graph the solution set of systems of two linear inequalities in two variables on the coordinate plane.

Graph each linear inequality on the coordinate plane provided below.

$3y \leq 2x + 6$



$8x - 2y < 16$



1. Use the graph to determine three points that are in the solution set of each inequality.

$3y \leq 2x + 6$	$8x - 2y < 16$
(_____ , _____)	(_____ , _____)
(_____ , _____)	(_____ , _____)
(_____ , _____)	(_____ , _____)

2. Trace one of the inequalities on patty paper. Overlay this graph onto the graph of the other inequality. Identify three points that are in the solution sets of both inequalities.

$3y \leq 2x + 6$ and $8x - 2y < 16$

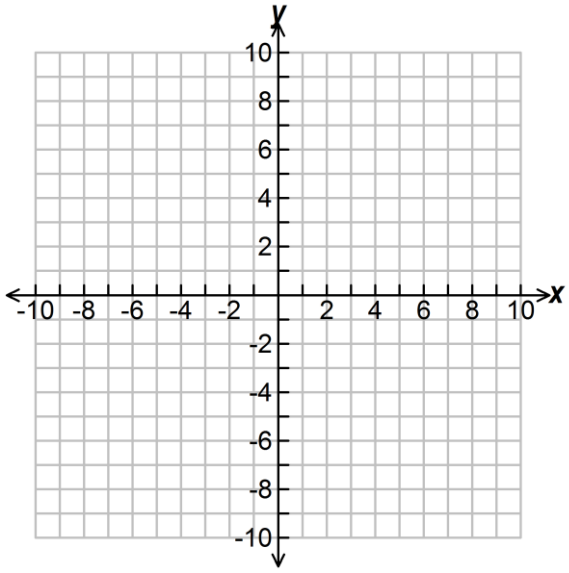
(_____ , _____)

(_____ , _____)

(_____ , _____)

Graph the solution set to the system of inequalities:

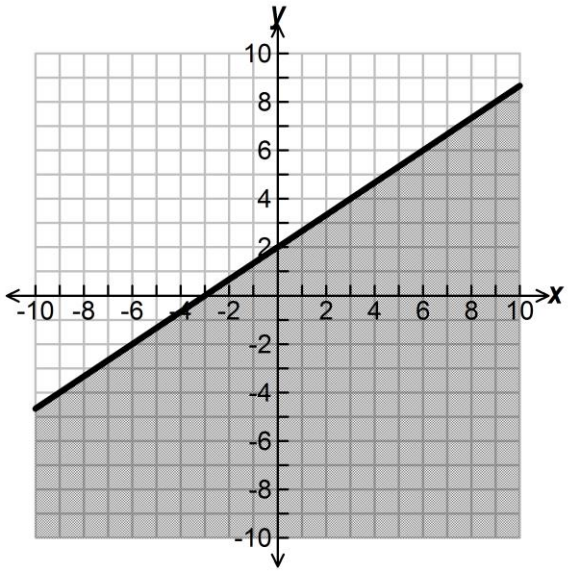
$$3y \leq 2x + 6$$
$$8x - 2y < 16$$



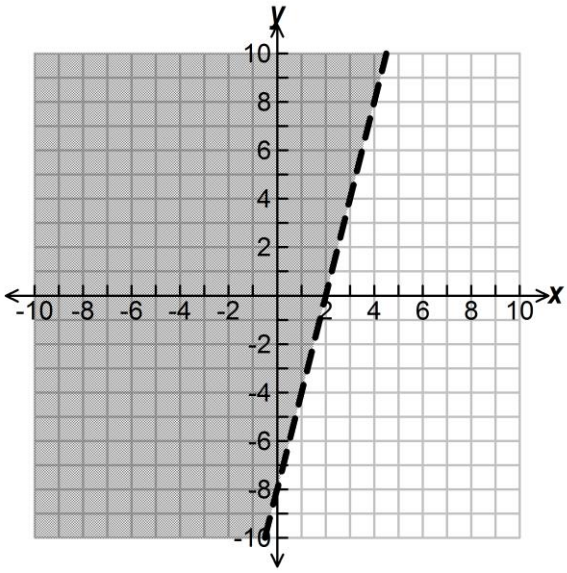
Answer Key

1. Graph each linear inequality on the coordinate plane provided below.

$3y \leq 2x + 6$



$8x - 2y < 16$



2. Use the graph to determine three points that are in the solution set of each inequality. **Answers may vary. An example is provided.**

$3y \leq 2x + 6$	$8x - 2y < 16$
(0, 0)	**(0, 0)**
(0, –2)	**(0, –2)**
(2, 0)	**(0, 6)**

3. Trace one of the inequalities on patty paper. Overlay this graph onto the graph of the other inequality. Identify three points that are in the solution sets of both inequalities **Answers may vary. An example is provided.**

$3y \leq 2x + 6$ and $8x - 2y < 16$

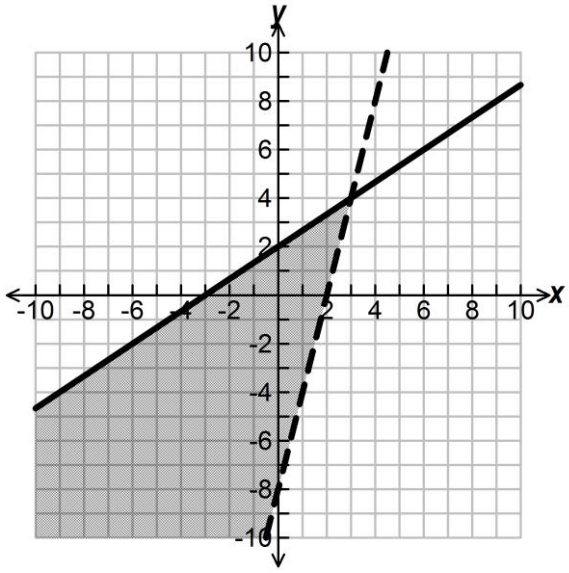
(0, 0)

(0, –2)

(–2, 0)

4. Graph the solution set to the system of inequalities:

$$3y \leq 2x + 6$$
$$8x - 2y < 16$$



Geometry: Quadrilateral on the Coordinate Plane

G(2)(B) **Coordinate and transformational geometry.** The student is expected to derive and use the distance, slope, and midpoint formulas to verify geometric relationships, including congruence of segments and parallelism or perpendicularity of pairs of lines.

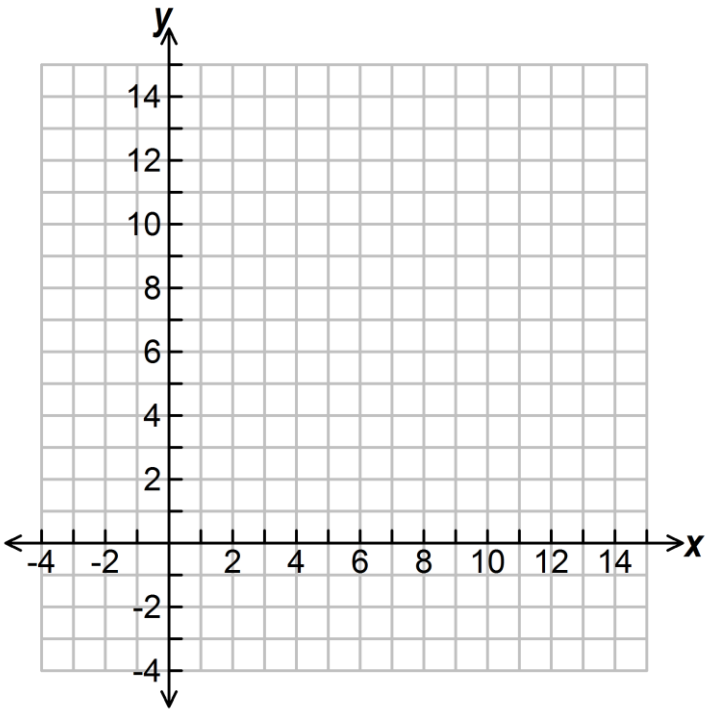
G(6)(E) **Proof and congruence**. The student is expected to prove a quadrilateral is a parallelogram, rectangle, square, or rhombus using opposite sides, opposite angles, or diagonals, and apply these relationships to solve problems.

The four linear equations listed below form the boundaries for a quadrilateral.

$$y = 3x - 20 \qquad x + y = 4$$
$$3x - y = -8 \qquad y = -(x - 2) + 10$$

1. Determine the coordinates of the intersection of the diagonals of the quadrilateral.

2. Graph the quadrilateral to verify your results.



3. Describe two ways to verify that the quadrilateral formed is a parallelogram.

Answer Key

The four linear equations listed below form the boundaries for a quadrilateral.

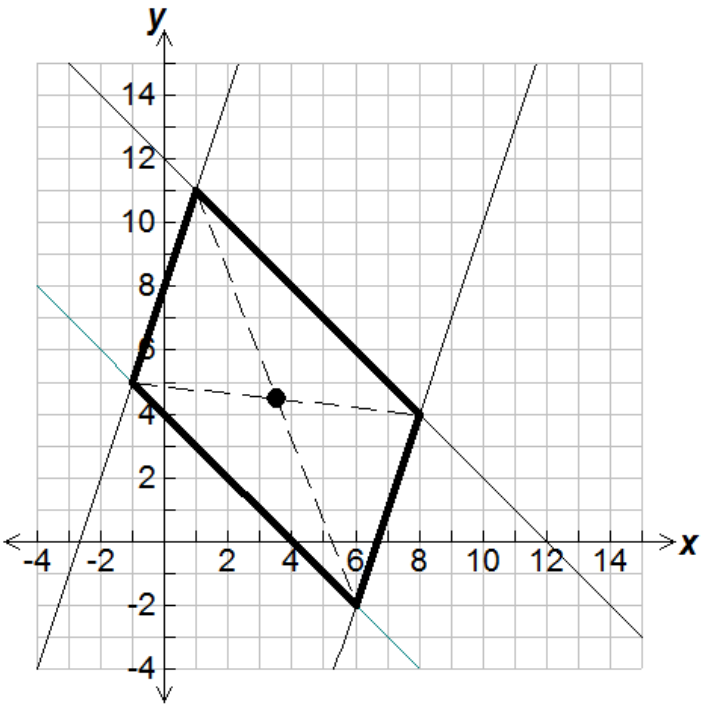
$y = 3x - 20$ $\qquad$ $x + y = 4$

$3x - y = -8$ $\qquad$ $y = -(x - 2) + 10$

1. Determine the coordinates of the intersection of the diagonals of the quadrilateral.

   (3.5, 4.5)

2. Graph the quadrilateral to verify your results.



3. Describe two ways to verify that the quadrilateral formed is a parallelogram.
   Answers may vary. An example is provided.
   One way to verify that the resulting quadrilateral is a parallelogram is to compare the slopes of the line representing the sides. If both pairs of the opposite sides have the same slopes, then the opposite sides are parallel. The quadrilateral is a parallelogram.
   Another way is to determine the midpoint of both diagonals. If the diagonals share the same midpoint, then they bisect each other. The quadrilateral is a parallelogram.

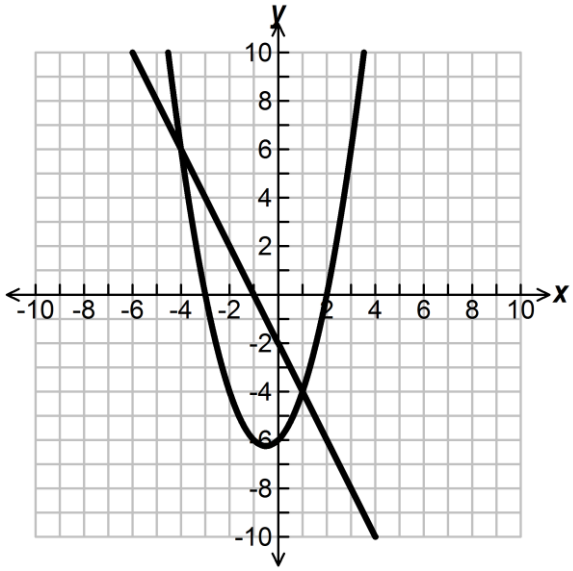
Algebra II: Systems of Equations

2A(3)(C) **Systems of equations and inequalities.** The student is expected to solve, algebraically, systems of two equations in two variables consisting of a linear equation and a quadratic equation.

2A(3)(D) **Systems of equations and inequalities.** The student is expected to determine the reasonableness of solutions to systems of a linear equation and a quadratic equation in two variables.

The graph below represents the system of equations

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



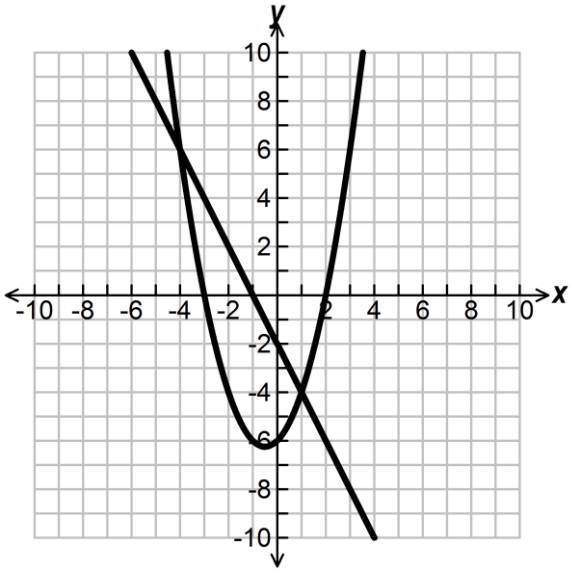
1. Based on an inspection of the graph of this system, what are reasonable solutions for this system?

2. Verify algebraically that your solutions are correct.

Answer Key

1. The graph below represents the system of equations

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



1. Based on an inspection of the graph of this system, what are reasonable solutions for this system?

   (–4, 6) and (1, –4)

2. Verify algebraically that your solutions are correct.

$$\mathbf{-2x - 2 = (x - 2)(x + 3)}$$
$$\mathbf{-2x - 2 = x^2 + x - 6}$$
$$\mathbf{- 2 = x^2 + 3x - 6}$$
$$\mathbf{0 = x^2 + 3x - 4}$$
$$\mathbf{0 = (x + 4)(x - 1)}$$

$$\mathbf{0 = x + 4}$$
$$\mathbf{0 - 4 = x + 4 - 4}$$
$$\mathbf{-4 = x}$$

$$\mathbf{y = -2(-4) - 2}$$
$$\mathbf{y = 8 - 2}$$
$$\mathbf{y = 6}$$

$$\mathbf{y = (-4 - 2)(-4 + 3)}$$
$$\mathbf{y = (-6)(-1)}$$
$$\mathbf{y = 6}$$

$$\mathbf{(-4, 6)}$$

$$\mathbf{0 = x - 1}$$
$$\mathbf{0 + 1 = x - 1 + 1}$$
$$\mathbf{1 = x}$$

$$\mathbf{y = -2(1) - 2}$$
$$\mathbf{y = -2 - 2}$$
$$\mathbf{y = -4}$$

$$\mathbf{y = (1 - 2)(1 + 3)}$$
$$\mathbf{y = (-1)(4)}$$
$$\mathbf{y = -4}$$

$$\mathbf{(1, -4)}$$