Warm Up:

Use substitution to solve the system of equations.

$$\begin{cases} 5x + 6y = -9 \\ 2x - 2 = -y \end{cases}$$

$y=-2x+2$

$5x+6(-2x+2)$

$5x-12x+12=-9$

$-7x=-21$

$x=3$

$-2(3)+2$

$y=-4$

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16. Step 1 Solve one equation for one variable.

$12x + y = 21$

$y = -12x + 21$

Step 2 Substitute the expression into the other equation.

$18x - 3y = -36$

$18x - 3(-12x + 21) = -36$

$18x + 36x - 63 = -36$

$54x = 27$

$x = \frac{1}{2}$

Step 3 Substitute the x-value into one of the original equations to solve for y.

$y = -12x + 21$

$y = -12\left(\frac{1}{2}\right) + 21$

$y = -6 + 21$

$= 15$

The solution is the ordered pair $\left(\frac{1}{2}, 15\right)$.

18. Step 1 Solve one equation for one variable. The first equation is already solved for x:

$y + 1 = x$.

Step 2 Substitute the expression into the other equation.

$-2(y + 1) + 3y = 2$

$-2x + 3y = 2$

$-2y - 2 + 3y = 2$

$y = 4$

Step 3 Substitute the y-value into one of the original equations to solve for x.

$y + 1 = x$

$(4) + 1 = x$

$5 = x$

The solution is the ordered pair (5, 4).

20. **Step 1** To eliminate x, multiply both sides of t[h]e first equation by 5 and both sides of the secon[d] equation by 6.

$5(6x - 3y) = 5(-6)$
$6(-5x + 7y) = 6(41)$

Add to eliminate x.

$$\begin{aligned} 30x - 15y &= -30 \quad ① \\ -30x + 42y &= 246 \quad ② \\ \hline 27y &= 216 \\ y &= 8 \end{aligned}$$

Step 2 Substitute the y-value into one of the original equations to solve for x.

$$\begin{aligned} 6x - 3(8) &= -6 \\ 6x - 24 &= -6 \\ 6x &= 18 \\ x &= 3 \end{aligned}$$

The solution is the ordered pair (3, 8).

22. **Step 1** To eliminate y, multiply both sides of the first equation by -2.

$-2(3x + y) = -2(7)$ ①

Add to eliminate y.

$$\begin{aligned} -6x - 2y &= -14 \quad ① \\ -3x + 2y &= 11 \quad ② \\ \hline -9x &= 3 \\ x &= \frac{1}{3} \end{aligned}$$

Step 2 Substitute the x-value into one of the original equations to solve for y.

$$\begin{aligned} 3\left(\frac{1}{3}\right) + y &= 7 \\ 1 + y &= 7 \\ y &= 6 \end{aligned}$$

The solution is the ordered pair $\left(\frac{1}{3}, 6\right)$.

24.
$$\begin{aligned} 10x - 2y &= 22 \\ 2y &= 10x - 22 \\ y &= 5x - 11 \\ 5(5x - 11) - 25x &= 65 \\ 25x - 55 - 25x &= 65 \\ -55 &= 65 \ ✗ \end{aligned}$$

inconsistent; no solution

26.
$$\begin{aligned} -x + \frac{3}{4}y &= 4 \\ \frac{3}{4}y &= x + 4 \\ y &= \frac{4}{3}x + \frac{16}{3} \\ 8x - 6\left(\frac{4}{3}x + \frac{16}{3}\right) &= -8 \\ 8x - \frac{24}{3}x - \frac{96}{3} &= -8 \\ 8x - 8x - 32 &= -8 \\ -32 &= -8 \ ✗ \end{aligned}$$

inconsistent; no solution

28. **Step 1** Solve one equation for one variable. The first equation is already solved for x: $x = 3y + 3$.

Step 2 Substitute the expression into the other equation.

$$\begin{aligned} y + 3x &= -21 \\ y + 3(3y + 3) &= -21 \\ y + 9y + 9 &= -21 \\ 9y + 9 &= -21 \\ 10y &= -30 \\ y &= -3 \end{aligned}$$

Step 3 Substitute the y-value into one of the original equations to solve for x.

$$\begin{aligned} x &= 3y + 3 \\ x &= 3(-3) + 3 \\ x &= -9 + 3 \\ x &= -6 \end{aligned}$$

The solution is the ordered pair $(-6, -3)$.

29. **Step 1** Solve one equation for one variable. The first equation is already solved for y: $y = -2x + 14$.

Step 2 Substitute the expression into the other equation.

$$\begin{aligned} 1.5x - 3.5y &= 2 \\ 1.5x - 3.5(-2x + 14) &= 2 \\ 1.5x + 7x - 49 &= 2 \\ 8.5x &= 51 \\ x &= 6 \end{aligned}$$

Step 3 Substitute the x-value into one of the original equations to solve for y.

$$\begin{aligned} y &= -2x + 14 \\ y &= -2(6) + 14 \\ y &= -12 + 14 \\ y &= 2 \end{aligned}$$

The solution is the ordered pair (6, 2).

30. **Step 1** Solve one equation for one variable.

$y - x = 8$

$y = x + 8$

Step 2 Substitute the expression into the other equation.

$\frac{4}{5}y - 3x = \frac{1}{5}$

$y = x + 8$

$\frac{4}{5}(x + 8) - 3x = \frac{1}{5}$

$\frac{4}{5}x + \frac{32}{5} - 3x = \frac{1}{5}$

$4x + 32 - 15x = 1$

$-11x = -31$

$x = \frac{31}{11}$

$= 2\frac{9}{11}$

Step 3 Substitute the *x*-value into one of the original equations to solve for *y*.

$y = -2x + 14$

$y = \left(\frac{31}{11}\right) + 8$

$y = \frac{31}{11} + \frac{88}{11}$

$y = \frac{119}{11} = 10\frac{9}{11}$

The solution is the ordered pair $\left(2\frac{9}{11}, 10\frac{9}{11}\right)$.

31. **Step 1** Solve one equation for one variable.

$x + 5y = 5$

$x = -5y + 5$

Step 2 Substitute the expression into the other equation.

$\frac{1}{5}x + 2y = -2$

$\frac{1}{5}(-5y + 5) + 2y = -2$

$-y + 1 + 2y = -2$

$y = -3$

Step 3 Substitute the *y*-value into one of the original equations to solve for *x*.

$x = -5y + 5$

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

$x = 15 + 5$

$x = 20$

The solution is the ordered pair $(20, -3)$.

34. The error is in solution A. The equation $y = 2 + x$ must be substituted into the other equation, not the equation in which it was solved for *y*.

36a. Malcolm: $y = 45x + 300$

Owen: $y = 60x + 325$

$45x + 300 = 60x + 325$

$-15x + 300 = 325$

$-15x = 25$

$x = -\frac{5}{3} = -1\frac{2}{3}$

b. Possible answer: No; the solution is not reasonable since the number of customers cannot be a negative fraction.

40. D

41. G;

42. A: $\begin{cases} x + y = 7 \\ x - y = -3 \end{cases}$

$x + y = 7$
$y = -x + 7$
$x - (-x + 7) = -3$
$2x - 7 = -3$
$2x = 4$
$x = 2$
$x + y = 7$
$(2) + y = 7$
$y = 5$
solution (2, 5)

43. $\begin{cases} x - 4y = 6 \\ y = -4x + 7 \end{cases}$

$x - 4(-4x + 7) = 6$
$17x - 28 = 6$
$17x = 34$
$x = 2$
$y = -4(2) + 7$
$y = -1$
solution (2, −1)
The system is independent and consistent.

44. H

3-3 Solving Systems of Linear Inequalities

Objective

Solve systems of linear inequalities.

3-3 Solving Systems of Linear Inequalities

Vocabulary

system of linear inequalities

3-3 Solving Systems of Linear Inequalities

When a problem uses phrases like "greater than" or "no more than," you can model the situation using a system of linear inequalities.

A **system of linear inequalities** is a set of two or more linear inequalities with the same variables. The solution to a system of inequalities is often an infinite set of points that can be represented graphically by shading.

When you graph multiple inequalities on the same graph, the region where the shadings overlap is the solution region.

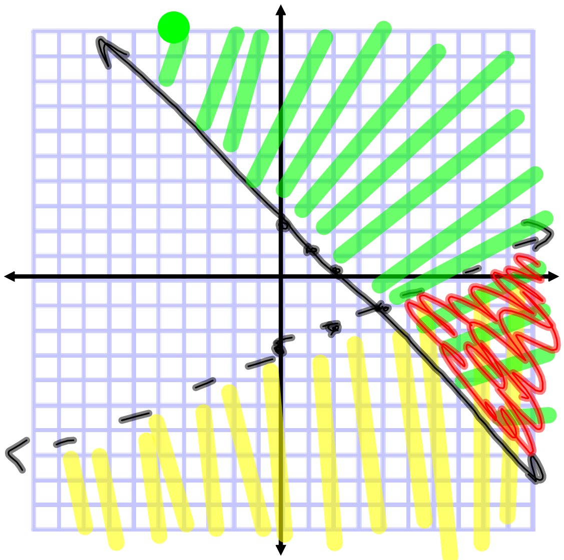
Holt Algebra 2

When given a system of inequalities:

1) Graph each individually (it helps to have 2 colors, or shade one up/down and the other left/right).
2) Your answer is the region where both has shading.

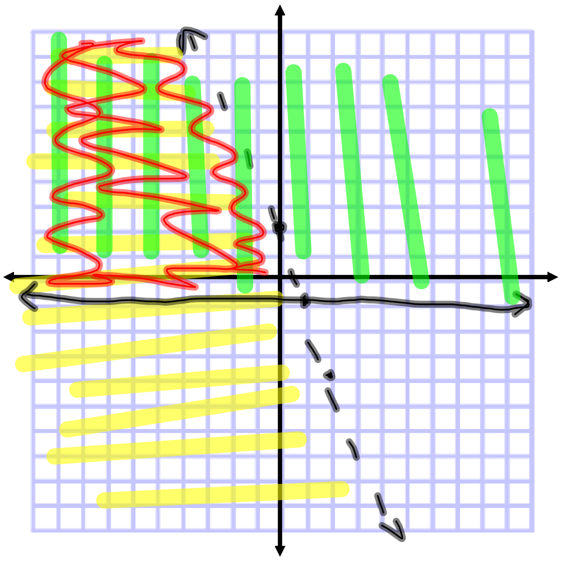
Graph the system of inequalities.

$$\begin{cases} y < \frac{1}{2}x - 3 \\ y \geq -x + 2 \end{cases}$$



Graph each system of inequalities.

$$\begin{cases} y < -3x + 2 \\ y \geq -1 \end{cases}$$



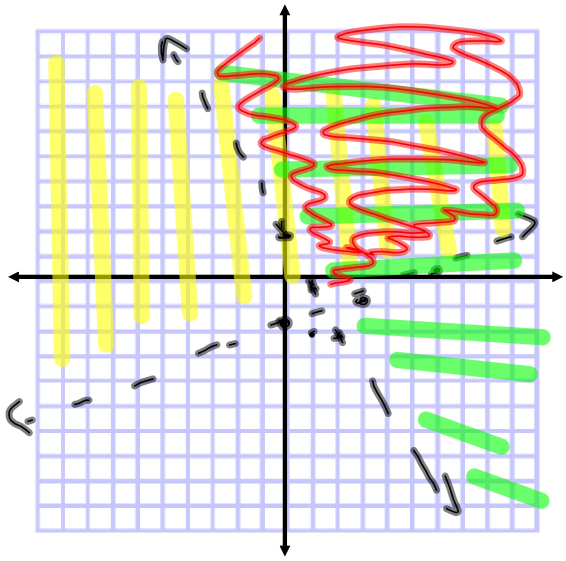
Graph the system of inequalities.

$$\begin{cases} x - 3y < 6 \\ 2x + y > 1.5 \end{cases}$$

$$\frac{-3y}{-3} < \frac{6-x}{-3}$$

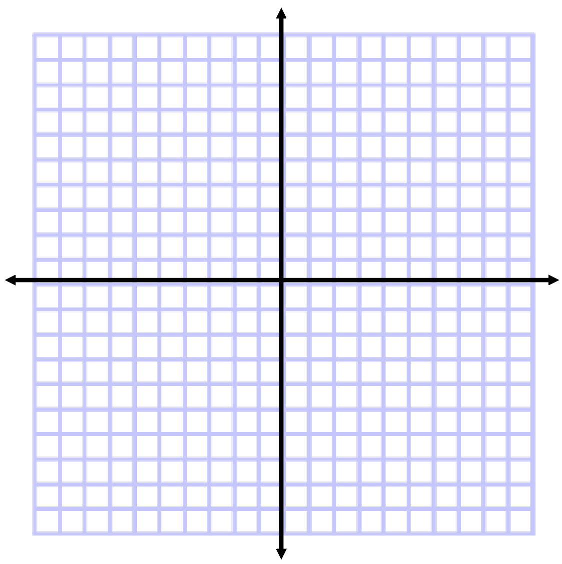
$$y > \frac{1}{3}x - 2$$

$$y > -2x + 1.5$$



Graph each system of inequalities.

$$\begin{cases} y \leq 4 \\ 2x + y < 1 \end{cases}$$



Lauren wants to paint no more than 70 plates for the art show. It costs her at least \$50 plus \$2 per item to produce red x **plates and \$3 per item to produce gold** y **plates. She wants to spend no more than \$215. Write and graph a system of inequalities that can be used to determine the number of each plate that Lauren can make.**

P: $x+y \leq 70$

\$: $50+2x+3y \leq 215$

Leyla is selling hot dogs and spicy sausages at the fair. She has only 40 buns, so she can sell no more than a total of 40 hot dogs and spicy sausages. Each hot dog sells for $2, and each sausage sells for $2.50. Leyla needs at least $90 in sales to meet her goal. Write and graph a system of inequalities that models this situation.

x
y

#: $x + y \leq 40$

\$: $2x + 2.5y \geq 90$

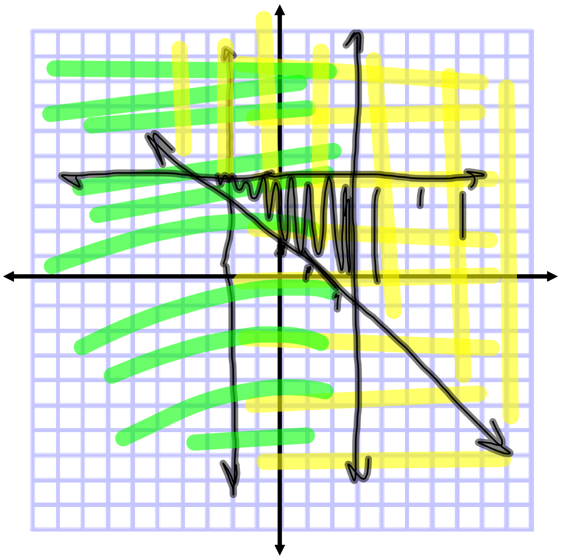
3-3 Solving Systems of Linear Inequalities

Systems of inequalities may contain more than two inequalities.

Approach these the same way, just know that more than 2 equations will need to be graphed.

Graph the system of inequalities, and classify the figure created by the solution region.

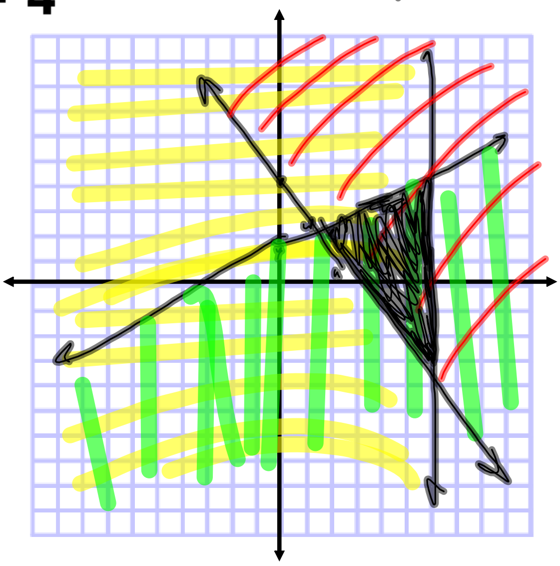
$$\begin{cases} x \geq -2 \\ x \leq 3 \\ y \geq -x + 1 \\ y \leq 4 \end{cases}$$



Graph the system of inequalities, and classify the figure created by the solution region.

$$\begin{cases} x \leq 6 \\ y \leq \frac{1}{2}x + 1 \\ y \geq -2x + 4 \end{cases}$$

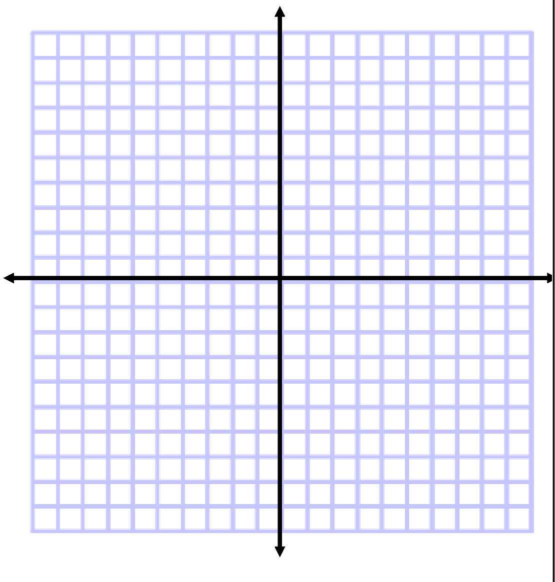
Right △



Write a system of at least 3 inequalities and graph them.

Graph the system of inequalities, and classify the figure created by the solution region.

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



Homework:

p. 202 #11-14, 16-22, 26, 34-36