# Day 6 – Systems of Inequalities Applications – Notes

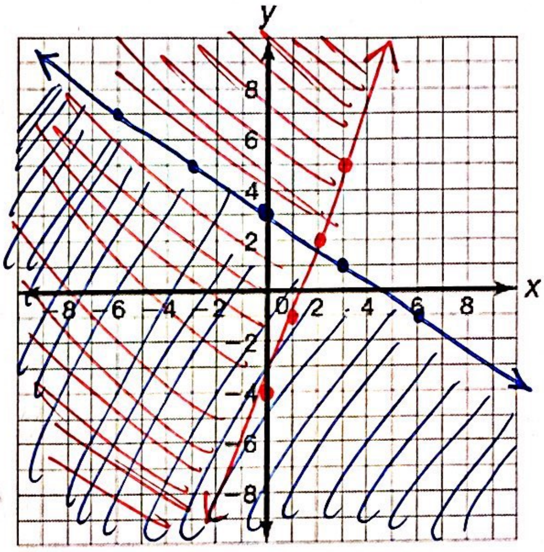
**Learning Target:** *I can apply inequalities and systems of inequalities to a real world context.*

**Review:** Graph the systems of inequalities:

a.

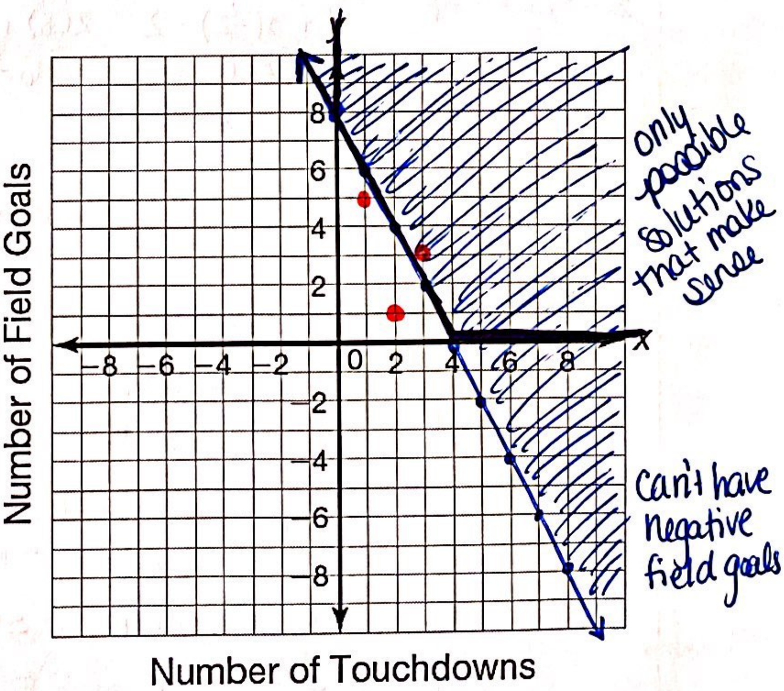
$$\begin{cases} y \leq -\frac{2}{3}x + 3 \\ y \geq 3x - 4 \end{cases}$$

Solution area



## Problem Solving with Linear Inequalities

**Example 1:** Noah plays football. His team's goal is to score at least 24 points per game. A touchdown is worth 6 points and a field goal is worth 3 points. Noah's league does not allow the teams to try for the extra point after a touchdown. The inequality 6x + 3y ≥ 24 represents the possible ways Noah's team could score points to reach their goal.




a. Graph the inequality on the graph.

$6x + 3y \geq 24$

$3y \geq -6x + 24$

$y \geq -2x + 8$

b. Are the following combinations solutions to the problem situation? Use your graph AND algebra to answer the following:

1. 2 touchdowns and 1 field goal

$6(2) + 3(1) \geq 24$

$12 + 3 \geq 24$

$15 \geq 24$ False, not a solution

2. 1 touchdown and 5 field goals

$6(1) + 3(5) \geq 24$

$6 + 15 \geq 24$

$21 \geq 24$ False, not a solution

3. 3 touchdowns and 3 field goals

$6(3) + 3(3) \geq 24$

$18 + 9 \geq 24$

$27 \geq 24$ True, Solution

# Determining Solutions from Equations

| Linear Functions/Systems | Linear/System Inequalities |
|---|---|
| Substitute your coordinate point in for all equations.<br><br>If the resulting equation is **TRUE** for **ALL** equations, the coordinate point is a **SOLUTION.**<br><br>If the resulting equation is **FALSE** for **ANY** of the equations, the coordinate point is **NOT A SOLUTION.** | Substitute your coordinate point in for all inequalities.<br><br>If the resulting inequality is **TRUE** for **ALL** inequaities, the coordinate point is a **SOLUTION.**<br><br>If the resulting inequallity is **FALSE** for **ANY** of the inequalities, the coordinate point is **NOT A SOLUTION.** |

**Practice:** Determine if the following points are solutions to the functions/systems.

| | | |
|---|---|---|
| a. $y = 3x - 1$ | x y<br>(-2, -7)<br>$-7 = 3(-2) - 1$<br>$-7 = -7$<br>Solution | x y<br>(1, 4)<br>$4 = 3(1) - 1$<br>$4 \neq 2$<br>Not a Solution |
| b. $x + 3y = 2$<br>$2x + 3y = 7$ | (8, -2)<br>$8 + 3(-2) = 2$   $2(8) + 3(-2) = 7$<br>$8 - 6 = 2$   $16 - 6 = 7$<br>$2 = 2$   $10 \neq 7$<br>Not a Solution | (5, -1)<br>$5 + 3(-1) = 2$   $2(5) + 3(-1) = 7$<br>$5 - 3 = 2$   $10 - 3 = 7$<br>$2 = 2$   $7 = 7$<br>Solution |
| c. $y > x + 1$ | (2, 3)<br>$3 > 2 + 1$<br>$3 \not> 3$<br>Not a Solution | (-3, 3)<br>$3 > -3 + 1$<br>$3 > -2$<br>Solution |
| d. $y > 2x + 4$<br>$y \leq -x - 2$ | (-2, 3)<br>$3 > 2(-2) + 4$   $3 \leq -(-2) - 2$<br>$3 > -4 + 4$   $3 \leq 2 - 2$<br>$3 > 0$   $3 \neq 0$<br>Not a Solution | (-4, 0)<br>$0 > 2(-4) + 4$   $0 \leq -(-4) - 2$<br>$0 > -8 + 4$   $0 \leq 4 - 2$<br>$0 > -4$   $0 \leq 2$<br>Solution |

# Creating Systems of Inequalities

Write a system of inequalities to describe each scenario.

a. Jamal runs the bouncy house a festival. The bouncy house can hold a maximum of 1200 pounds at one time. He estimates that adults weight approximately 200 pounds and children under 16 weight approximately 100 pounds. For 1 four minute session of bounce time, Jamal charges adults $3 each and children $2 each. Jamal hopes to make at least $18 for each session.

- Define your variables: x: # of adults
  y: # of children
- Write a system of inequalities
  Inequality 1: $3x + 2y \geq 18$ describes amount of $ he needs to make
  Inequality 2: $200x + 100y \leq 1200$ describes weight allowed in bounce house
- If 4 adults and 5 children are in 1 session, will that be a solution to the inequalities?
  $3(4) + 2(5) \geq 18$
  $12 + 7 \geq 18$
  $19 \geq 18$ True
  $200(4) + 100(5) \leq 1200$
  $800 + 500 \leq 1200$
  $1300 \leq 1200$ False
  This combo goes over the weight limit
- If 2 adults and 7 children are in 1 session, will that be a solution to the inequalities?
  $3(2) + 2(7) \geq 18$
  $6 + 14 \geq 18$
  $20 \geq 18$ True
  $200(2) + 100(7) \leq 1200$
  $400 + 700 \leq 1200$
  $1100 \leq 1200$ True
  This combo makes at least $18 and stays under 1200.

b. Charles works at a movie theater selling tickets. The theater has 300 seats and charges $7.50 for adults and $5.50 for children. The theater expects to make at least $1500 for each showing.

- Define your variables: x: # of adults
  y: # of children
- Write a system of inequalities
  Inequality 1: $x + y \leq 300$ describes seat allowance
  Inequality 2: $7.50x + 5.50y \geq 1500$ describes amount of $ they wish to make
- If 150 adults and 180 children attend, will that be a solution to the inequalities?
  $150 + 180 \leq 300$
  $330 \leq 300$
  False
  $7.50(150) + 5.50(180) \geq 1500$
  $1125 + 990 \geq 1500$
  $2115 \geq 1500$ True
  This combo makes at least $1500, but goes over seat capacity.
- If 175 adults and 105 children attend, will that be a solution to the inequalities?
  $175 + 105 \leq 300$
  $280 \leq 300$
  True
  $7.50(175) + 5.50(105) \geq 1500$
  $1312.50 + 577.50 \geq 1500$
  $1890 \geq 1500$
  This combo makes at least $1500 and stays under the 300 seat limit.