

6.9 Systems of Inequalities Activity

Section 1: Solve the systems of Linear Inequalities

$$1. \begin{cases} y \leq 2x + 4 \\ y > x - 2 \end{cases}$$

$$4. \begin{cases} 7 \geq 2x + 1 \\ y \leq x \end{cases}$$

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

$$5. \begin{cases} y > 2x - 1 \\ y + x < 16 \end{cases}$$

$$3. \begin{cases} 2x + 3y > 6 \\ x - 2y \leq 5 \end{cases}$$

$$6. \begin{cases} y \leq 1 \\ x \leq -1 \end{cases}$$

Section 2: Graph the feasible region described by the system of inequalities. Then find the coordinates of all corner points.

$$7. \begin{cases} 3x + 4y \leq 24 \\ 9x - 2y \leq 30 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

$$(0, 0), (0, 6), \left(\frac{10}{3}, 0\right), (4, 3)$$

$$8. \begin{cases} x + 2y \leq 8 \\ 3x - y \leq 6 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

$$(0, 0), (0, 4), \left(\frac{20}{7}, \frac{18}{7}\right), (2, 0)$$

Section 3: Solve the following Linear Programming problems.

9. Maximize: $F(x, y) = 2x + 5y$

$$\text{Given: } \begin{cases} x + y \leq 6 \\ x - y \leq 4 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

Maximum at $(0, 6)$ $F(x, y) = 30$

10. Minimize: $F(x, y) = \frac{1}{2}x + \frac{3}{4}y$

$$\text{Given: } \begin{cases} 3x + 4y \leq 32 \\ 4x + 2y \leq 36 \\ x \geq 0 \\ y \geq 0 \end{cases}$$

Minimum at (0, 0). $F(x, y) = 0$

Section 4: Linear Programming Word Problems

11. A cafe sells two types of sandwiches, The Vegan and the Monster Sammich of Meat. The profit on the sandwiches is \$2 for The Vegan and \$3 for the Monster Sammich of Meat. The amount of bread available is enough for 30 sandwiches. There are 4 hours available to prepare the sandwiches. If The Vegan takes 7 minutes to prepare and the Monster Sammich of Meat takes 10 minutes, How many of each sandwiches should be prepared to maximize the profit?

24 Monster Sammiches of Meat for a profit of \$72

12. A 30-acre orchard is to contain two types of trees, peach and almond. The profit per year is \$16.80 per peach tree and \$21.60 per almond tree. An acre can sustain 1080 peach trees or 900 almond trees. If the grower has available labor to plant a maximum of 30,000 trees, how many of each type of tree should be planted?

3000 peach trees and 27,000 almond trees for a profit of \$633,600