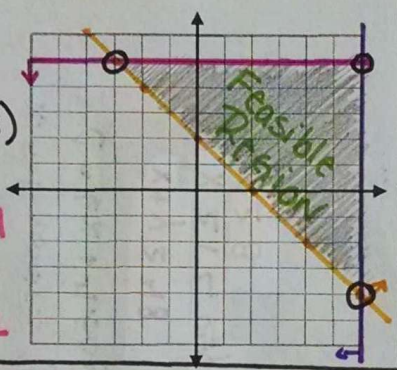
Algebra I Pre-AP -- Linear Programming I

First, graph each system of linear inequalities, using the grids provided. Then on notebook paper, write the coordinates of all vertices and find the minimum and maximum value of the given objective function.

Example: $y \le 5$, $x \le 6$, $x + y \ge 2$; $F = 2x + 4y$

Constraints (restrictions)

Objective Function



Vertices:

(6, -4) (-3, 5) (6, 5)

$F = 2x + 4y$

$F = 2(6) + 4(-4) = -4$

$F = 2(-3) + 4(5) = 14$

$F = 2(6) + 4(5) = 32$

Max value of 32 @ (6, 5) + Min value of -4 @ (6, -4)

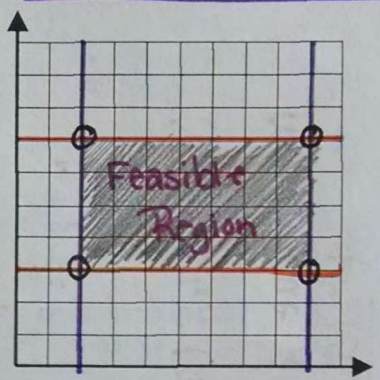
1) $x \ge 2$, $x \le 9$, $y \ge 3$, $y \le 7$; $A = 5x + 2y$

Max value of 59 @ (9, 7)
Min value of 16 @ (2, 3)

Vertices

(2, 7) (9, 7)
(2, 3) (9, 3)

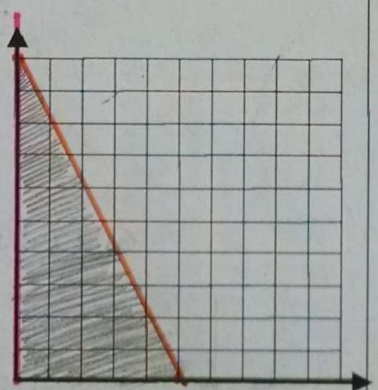
$A = 5(2) + 2(7) = 24$
$A = 5(9) + 2(7) = 59$
$A = 5(2) + 2(3) = 16$
$A = 5(9) + 2(3) = 51$



2) $x \ge 0$, $y \ge 0$, $2x + y \le 10$; $B = x + 3y$

Max value of 30 @ (0, 10)

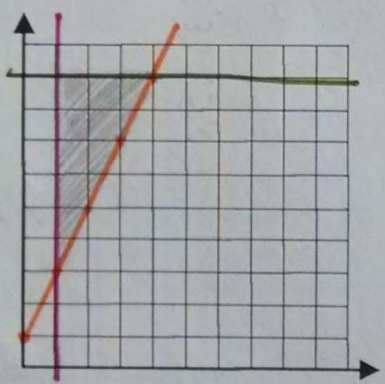
Min value of 0 @ (0, 0)



3) $x \ge 1$, $y \le 9$, $2x - y \le -1$; $C = 4x + y$

Max value of 25 @ (4, 9)

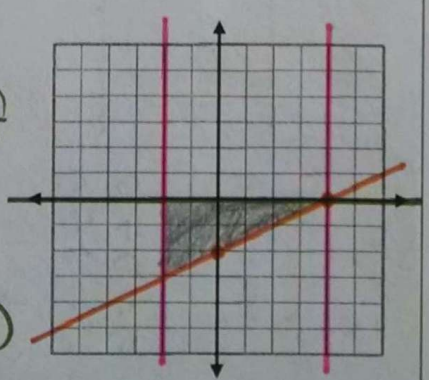
Min value of 7 @ (1, 3)



4) $x \ge -2$, $x \le 4$, $y \le 0$, $x - 2y \le 4$; $A = 6x + 18y$

Max value of 24 @ (4, 0)

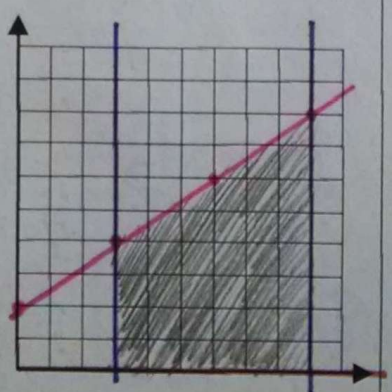
Min value of -30 @ (-2, -3)



5) $x \ge 3$, $y \ge 0$, $x \le 9$, $2x - 3y \ge -6$; $F = 4x + y$

Max value of 44 @ (9, 8)

Min value of 12 @ (3, 0)

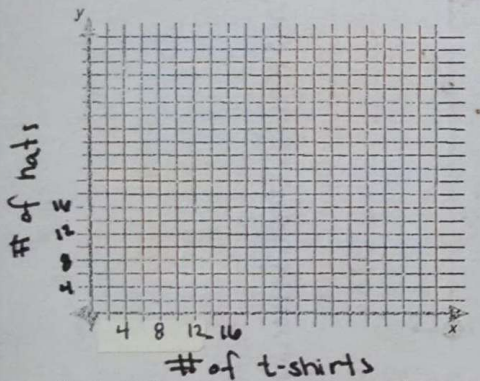


Name: _____

4.3 Linear Programming Word Problems

Show the restriction equations and the objective function for each. Graph on the provided grid.

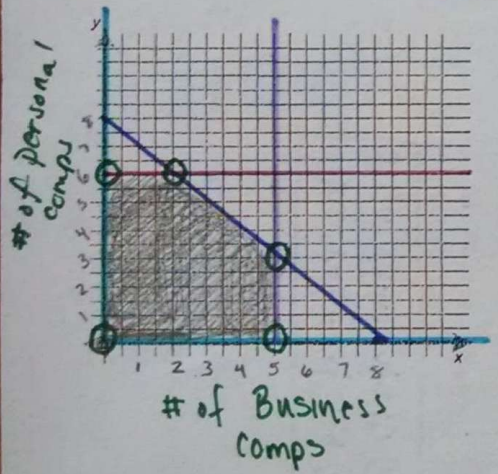
1. Suppose you are buying t-shirts and hats to sell at lunch. The minimum order is 48 total items. You already have pre-orders for 12 t-shirts and 8 hats. If t-shirts cost $6 to make and hats cost $7.50, how many of each should you order to minimize cost?



x: # of t-shirts y: # of hats

$C = 6x + 7.50y$

2. A small computer company manufactures two models of computers. One model is for business use and the other model is for personal use. The company can make no more than eight computers per day. They want to build no more than five business computers and no more than six personal computers per day. The company makes a profit of $75 on each personal computer and $100 on each business computer. How many of each type of computer should they make to maximize their profit? What is the profit?



$P = 100b + 75p$

$b \leq 5$ $p \leq 6$

$b + p \leq 8$

$b \geq 0$ $p \geq 0$

(0,0) (0,6) (2,6) (5,3) (5,0)

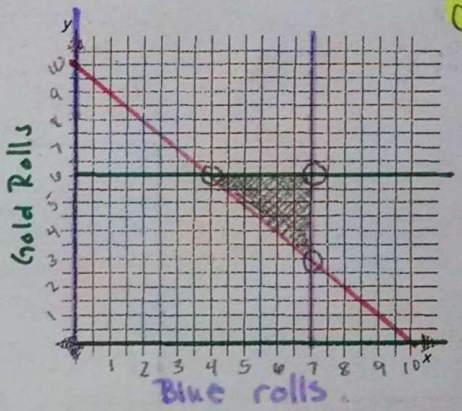
Max Profit of $725

at (5,3)

5 business computers +

3 personal computers

3. You are in charge of decorating the school gym for graduation. You need to buy gold and blue rolls of crepe paper. Gold crepe paper costs $5 per roll and blue crepe paper costs $3 per roll. You will need at least ten rolls of crepe paper. You want no more than seven rolls of blue and no more than six rolls of gold. How many rolls of each color crepe paper should you buy to minimize your cost? What is the minimum cost?



$C = 5G + 3B$

$G + B \geq 10$

$0 \leq B \leq 7$

$0 \leq G \leq 6$

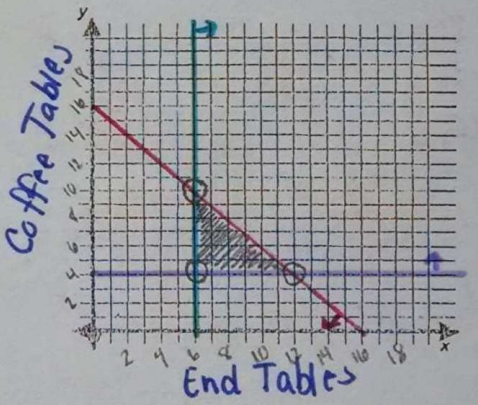
(7,3) (7,6) (4,6)

Minimum Cost of $36

for 7 Blue rolls +

3 Gold rds

4. You own a company that makes furniture. Your company makes end tables and coffee tables. Each week you must make at least 6 end tables and at least 4 coffee tables. Your company can make at most 16 tables per week. The profit on a coffee table is $40 and on an end table it is $30. How many tables of each should you make per week to maximize your profit? What is your maximum profit?



x: End Tables y: coffee tables

$x \geq 6$

$y \geq 4$

$x + y \leq 16$

(12,4) (6,4) (6,10)

Maximum Profit

of $580

for 6 end tables +

10 coffee

Tables