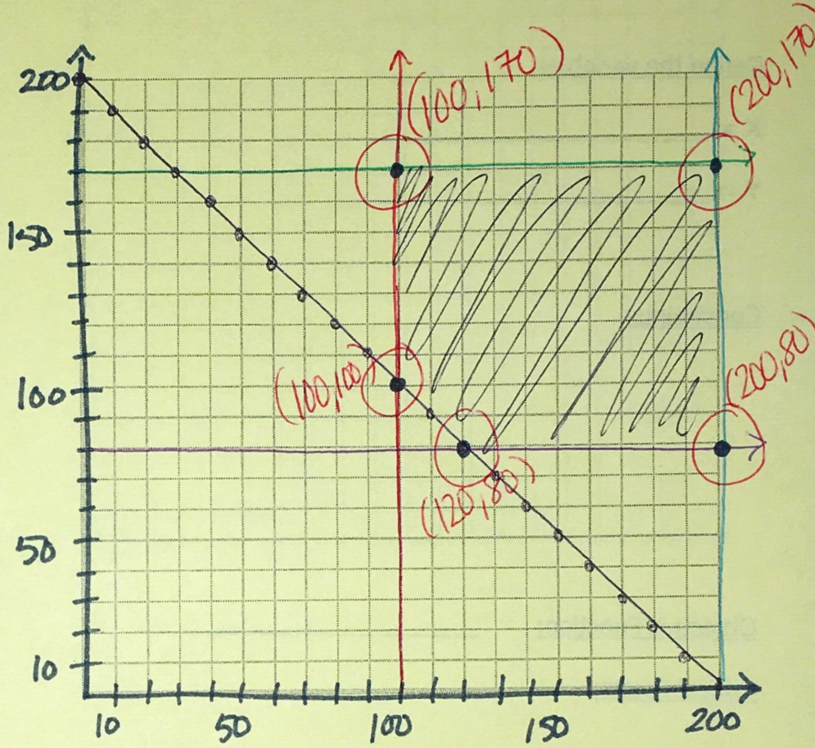
Algebra 2
1.4 – Linear Programming Practice 2

Name: Key

Date: ____________ Per: ________

1. A calculator company produces a scientific calculator and a graphing calculator. Long-term projections indicate an expected demand of at least 100 scientific and 80 graphing calculators each day. Because of limitations on production capacity, no more than 200 scientific and 170 graphing calculators can be made daily. To satisfy a shipping contract, a total of at least 200 calculators much be shipped each day. If each scientific calculator sold results in a \$2 loss, but each graphing calculator produces a \$5 profit, how many of each type should be made daily to maximize net profits?



Define the variables:

X = #of scientific calc.

Y = #of graphing calc

Constraints:

$x \geq 100$ $\quad$ $y \geq 80$ $\quad$ $x + y \geq 200$

$x \leq 200$ $\quad$ $y \leq 170$ $\quad$ $\downarrow$

$x \geq 0$ $\quad$ $y \geq 0$ $\quad$ $y \geq -x + 200$

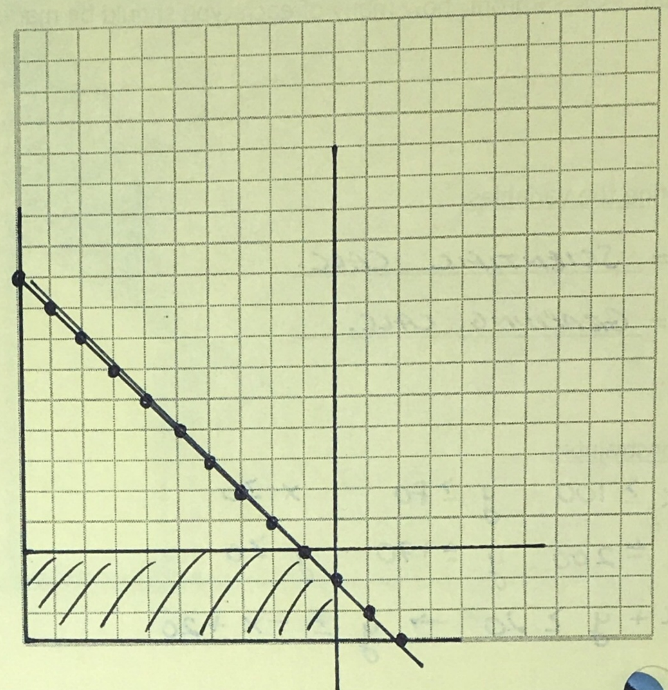
Objective Function: $f(x,y) = -2x + 5y$

Critical Points:

(100,100)	(100,170)	(200,170)	(200,80)	(120,80)
$-2(100)+5(100)$	$-2(100)+5(170)$	$-2(200)+5(170)$	$-2(200)+5(80)$	$-2(120)+5(80)$
$=300$	$=650$	$=450$	$=0$	$=160$

Conclusion: The company should produce 100 scientific calculators and 170 graphing calculators.

2. Mr. Davidoff owns a car and motorcycle. He has at most 12 gallons of gasoline to be used between the car and the motorcycle. The car's tank holds 10 gallons and the motorcycle's tank holds 3 gallons. If the mileage for the car is 27 mpg and the motorcycle mileage is 98 mpg, how many gallons of gas should each vehicle use if Mr. Davidoff wants to travel as far as possible? What is the maximum number of miles?



Define the variables:

X = CAR

Y = MOTORCYCLE

Constraints:

$x + y \leq 12 \rightarrow y \leq -x + 12$

$x \geq 0 \quad x \leq 10$

$y \geq 0 \quad y \leq 3$

Objective Function: $M(x,y) = 27x + 98y$

Critical Points:

$(0,0) = 27(0) + 98(0) = 0$

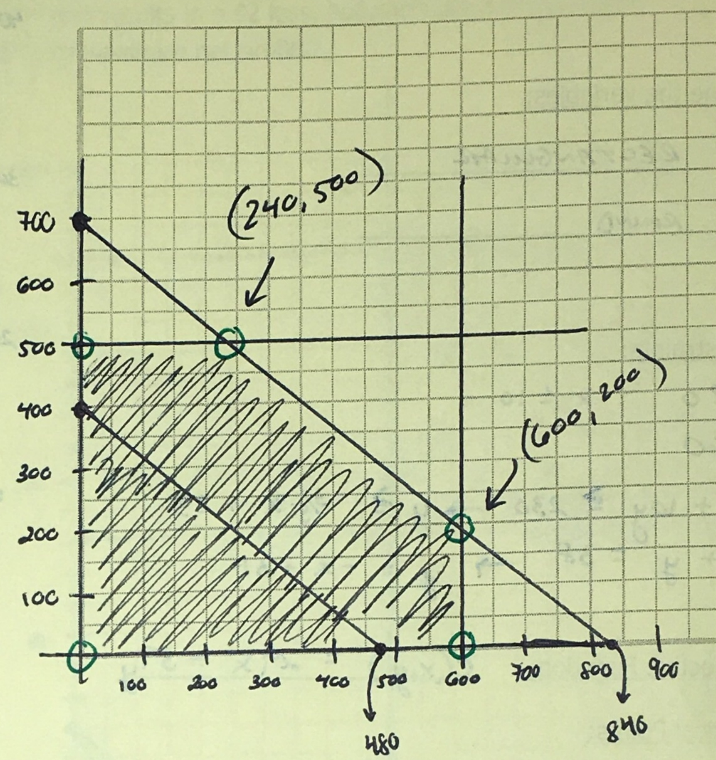
$(0,3) = 27(0) + 98(3) = 294$

$(10,2) = 27(10) + 98(2) = 466$

$(9,3) = 27(9) + 98(3) = 537$

Conclusion: MR. DAVIDOFF SHOULD USE 9 GALLONS OF GAS IN THE CAR AND 3 GALLONS OF GAS IN THE MOTORCYCLE TO TRAVEL A MAXIMUM DISTANCE OF 537 MILES.

Reynaldo Electronica manufactures radios and DVD players. The manufacturing plant has the capacity to manufacture at most 600 radios and 500 DVD players. It costs the company $10 to make a radio and $12 to make a DVD player. The company can spend $8400 to make these products. Reynaldo Electronica makes a profit of $19 on each radio and $12 on each DVD player. To maximize profits, how many of each product should they manufacture?



Define the variables:

X = RADIOS

Y = DVD PLAYERS

Constraints:

$x \geq 0$ $x \leq 600$

$y \geq 0$ $y \leq 500$

$10x + 12y \leq 8400 \rightarrow y \leq -\frac{5}{6}x + 700$

Objective Function: $P(x,y) = 19x + 12y$

al Points:

$(0,0) = 19(0) + 12(0) = 0$

$(0,500) = 19(0) + 12(500) = 6000$

$(600,0) = 19(600) + 12(0) = 11400$

$(240,500) = 19(240) + 12(500) = 10560$

$(600,200) = 19(600) + 12(200) = 13800$

$y = 500$

$10x + 12y = 8400$

$10x + 12(500) = 8400$

$10x + 6000 = 8400$

$10x = 2400$

$x = 240$

$x = 600$

$10x + 12y = 8400$

$10(600) + 12y = 8400$

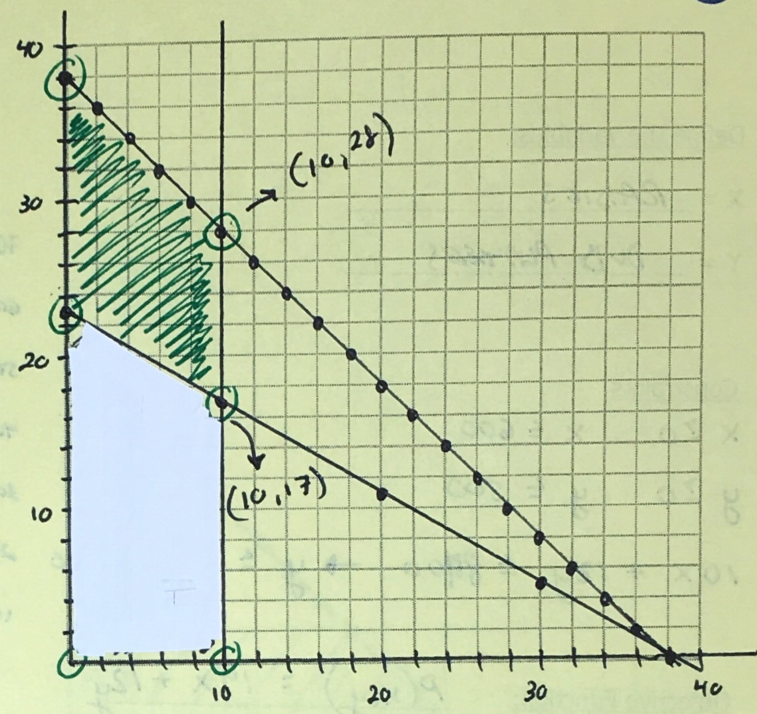
$6000 + 12y = 8400$

$12y = 2400$

$y = 200$

Conclusion: TO MAXIMIZE A PROFIT OF $13,800 THEY SHOULD MAKE 600 RADIOS AND 200 DVD PLAYERS

4. A banquet hall offers two types of tables for rent: 6-person rectangular at a cost of $29 each and 10-person round at a cost of $59 each. Kelly is renting the hall and needs tables for 230 people. The banquet hall can hold a maximum of 38 tables and has 10 rectangular tables available. How many of each type of table should be rented to minimize cost? What is the minimum cost?



Define the variables:

X = RECTANGULAR

Y = ROUND

Constraints:

$x \geq 0$ $\quad x \leq 10$

$y \geq 0$

$6x + 10y \geq 230 \rightarrow y \geq -\frac{3}{5}x + 23$

$x + y \leq 38 \rightarrow y \leq -x + 38$

Objective Function: $C(x,y) = 29x + 59y$

Critical Points:

$(0, 38) = 29(0) + 59(38) = 2242$

$(10, 28) = 29(10) + 59(28) = 1942$

$(10, 17) = 29(10) + 59(17) = 1293$

$(0, 23) = 29(0) + 59(23) = 1357$

$x = 10$

$6x + 10y = 230$

$6(10) + 10y = 230$

$60 + 10y = 230$

$10y = 170$

$y = 17$

$x = 10$

$x + y = 38$

$10 + y = 38$

$y = 28$

Conclusion: IN ORDER TO MINIMIZE COST AT $1293, KELLY SHOULD RENT 10 RECTANGULAR TABLES AND 17 ROUND TABLES