FOM 11 **6.5 Optimization Problems II: Exploring Solutions**

From last day we learned how to create a model for an optimization problem. Here we will explore the patterns in a feasible region to predict where the maximum and minimum values of an objective functions will occur.

Example 1: A company does custom paint jobs on cars and trucks. Due to the size of the workshop, the company can paint a maximum of 8 cars and 5 trucks in one day. The total output for the shop cannot exceed 10 vehicles in one day. The company earns \$400 for a truck paint job and \$250 for a car paint job. How many of each should they book to earn the greatest profit in one day?

Let x = # of cars
y = # of trucks

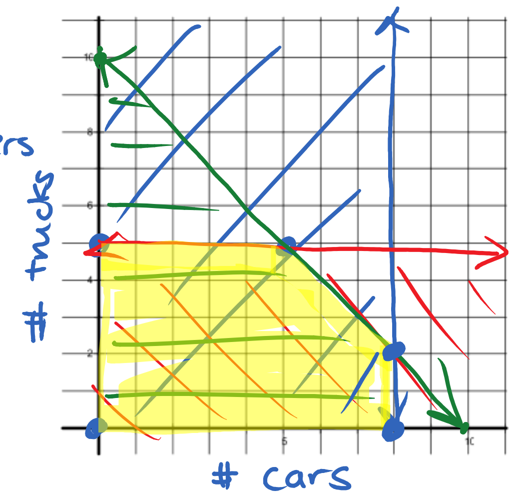
$x + y$ have to whole numbers

$x \leq 8$

$y \leq 5$

$x + y \leq 10$

Objective function
$P = 250x + 400y$



Find the value of the profit throughout the feasible region and state any pattern you notice.

$(0,0) \rightarrow P = 250(0) + 400(0) = \$0$

$(0,5) \rightarrow P = 250(0) + 400(5) = \$2000$

$(5,5) \rightarrow P = 250(5) + 400(5) = \$3250$

$(8,2) \rightarrow P = 250(8) + 400(2) = \$2800$

$(8,0) \rightarrow P = 250(8) + 400(0) = \$2000$

Maximum profit is \$3250.

Minimum profit is \$0

What happens to the value of the profit as you move from left to right?

What happens to the value of the profit as you move from the bottom to the top?

What points in the feasible region result in each **optimal solution?**

a. the maximum possible value of the profit?

b. the minimum possible value of the profit?

Summary:

- The optimal solutions to the objective function are represented by the **vertices** (or intersections of the boundaries) of the feasible region. If one or more of the intersecting boundaries is not part of the solution set, the optimal solution will be nearby.
- You can verify each optimal solution to make sure it satisfies each constraint by substituting the values of its coordinates into each linear inequality in the system.

Assignment: pg. 334 #1-3