1. (a) Define the slack and surplus variables. What do they represent? What is (are) the difference(s) between a slack and a surplus variable?

(b) Briefly describe the important parts of each step needed to make a decision using decision sciences models.

(c) What are the different types of special situations that may occur while solving a linear programming problem? Briefly describe each of these special situations.

(d) What are the important properties of a straight line? Briefly describe each property. What are the different types of slopes possible for a straight line? Briefly describe each type of slope and give one example for each type.

2. Given the following linear programming problem

Maximize 20x + 15y

Subject to

2x + 2y < 100

2x + 3y < 120

x > 10

x, y > 0

(a) Graph the constraints.

(b) Find the coordinates of each corner point of the feasible region

(c) Determine the optimal solution.

3. Given that the optimal solution of the following linear programming problem is x = 10 and y = 10, state the problem in standard form and do a constraint analysis for the optimal solution.

Maximize 100x + 80y

Subject to

5x + 2y ≤ 80

3x + 5y ≥ 60

x + y ≤ 20

x ≤ 10

x, y > 0