

Assignment: Module 2 - The LP Model

1. a. The decision variables are **number of units of bags** produced per week– the Collegiate(X_1) and the Mini(X_2).
b. Objective function is to maximize the profit by the sale of the two types of bag.
 $Z = 32 * X_1 + 24 * X_2$
c. Constraints are
limit of bag production based on the total sq-ft. nylon received from the supplier
 $3 * X_1 + 2 * X_2 \leq 5000$
Bag manufacturing count should be less than maximum bags can be sold per week.
 $X_1 \leq 1000, X_2 \leq 1200$
Another constraint is based on the number of hours labors can work per week.
 $45 * X_1 + 40 * X_2 \leq 40 * 60 * 35$
d. Mathematical formula for the linear problem.
Maximize profit $Z = 32 * X_1 + 24 * X_2$
 $3 * X_1 + 2 * X_2 \leq 5000$
 $X_1 \leq 1000, X_2 \leq 1200$
 $45 * X_1 + 40 * X_2 \leq 40 * 60 * 35$

2. a. Decision variables:
Let's assume that below are the **per day** production rate/volume

X_{11} = number of Large Products made at Plant 1
 X_{12} = number of Medium Products made at Plant 1
 X_{13} = number of Small Products made at Plant 1

X_{21} = number of Large Products made at Plant 2
 X_{22} = number of Medium Products made at Plant 2
 X_{23} = number of Small Products made at Plant 2

X_{31} = number of Large Products made at Plant 3
 X_{32} = number of Medium Products made at Plant 3
 X_{33} = number of Small Products made at Plant 3

b. LP model:

Constraints:

Production unit limit per day

$$X_{11} + X_{12} + X_{13} \leq 750$$

$$X_{21} + X_{22} + X_{23} \leq 900$$

$$X_{31} + X_{32} + X_{33} \leq 450$$

In process storage space for day's production

$$20 \cdot X_{11} + 15 \cdot X_{12} + X_{13} \leq 13000$$

$$20 \cdot X_{21} + 15 \cdot X_{22} + X_{23} \leq 12000$$

$$20 \cdot X_{31} + 15 \cdot X_{32} + X_{33} \leq 5000$$

Sales forecast of quantities sale per day

$$X_{11} + X_{21} + X_{31} \leq 900$$

$$X_{12} + X_{22} + X_{32} \leq 1200$$

$$X_{13} + X_{23} + X_{33} \leq 750$$

Objective Function:

$$\text{Maximize the profit } C = (X_{11} + X_{21} + X_{31}) \cdot 420 + (X_{12} + X_{22} + X_{32}) \cdot 360 + (X_{13} + X_{23} + X_{33}) \cdot 300$$