**ASSIGNMENT 1: QUANT MANAGEMENT MODELLING**

Back Savers is a company that produces backpacks primarily for students. They are considering offering some combination of two different models—the Collegiate and the Mini. Both are made out of the same rip-resistant nylon fabric. Back Savers has a long-term contract with a supplier of the nylon and receives a 5000 square-foot shipment of the material each week. Each Collegiate requires 3 square feet while each Mini requires 2 square feet. The sales forecasts indicate that at most 1000 Collegiates and 1200 Minis can be sold per week. Each Collegiate requires 45 minutes of labor to produce and generates a unit profit of $32. Each Mini requires 40 minutes of labor and generates a unit profit of $24. Back Savers has 35 laborers that each provides 40 hours of labor per week. Management wishes to know what quantity of each type of backpack to produce per week.

* **Clearly define the decision variables**

The Management wishes to know what quantity of each type of backpack to produce per week

Two types of backpacks: Collegiate and Mini

Let C = No. of Collegiate

M = No. of Mini

* **What is the objective function?**

Collegiate generates a unit profit of $32

Mini generates a unit profit of $24

Objective function is to Maximize total profit

Maximize Total Profit = $32C + $24M

* **What are the constraints?**

**Nylon:**

Back Savers receives a 5000 square foot of nylon each week

Collegiate requires 3 square feet

Mini requires 2 square feet

Therefore, for Nylon: 3C+2M ≤ 5000 Square feet

**Labor:**

Collegiate requires 45 minutes of Labor = 3/4 hour

Mini requires 40 minutes of labor = 2/3 hour

Back savers have 35 laborers, and each provides 40 hours of labor per week

Total No. of hours = 35\*40 = 1400 hours

For Labor: (3/4)C + (2/3)M ≤ 1400 hours

**Sales Forecast:**

Sales forecasts indicate that at most 1000 Collegiate and 1200 Minis can be sold per week

For Sales Forecast:

C ≤ 1000

M ≤1200

* **Write down the full mathematical formulation for this LP problem**

Let C = No. of Collegiate

M = No. of Mini

Maximize Total Profit = $32C + $24M

Nylon: 3C+2M ≤ 5000 Square feet

Labor: (3/4)C + (2/3)M ≤ 1400 hours

Sales Forecast: C ≤ 1000

M ≤ 1200

C ≥ 0, M ≥ 0