Assignment 2

# Question 1

1. The decision variables are the quantity of Collegiate backpack produced and the quantity of mini backpacks produced.
2. Let Xj = type of backpack where: j=1 – Collegiate; j=2 – Mini and Z = profit.

Maximize (Z) – Z = 32x1 + 24x2

1. Functional constraints include demand Constraints, nylon resource constraint and labor constraint. The LP model assumes non-negativity constraints. See full equations below.
2. **Objective Function:**

Maximize (Z) - Z = 32x1 +24x2

**Functional Constraints:**

x1 ≤ 1000

Demand constraints

x2 ≤ 1,200

Nylon resource constraint

3x1 +2x2  ≤ 5,000

Labor constraint

45x1 + 40x2 ≤ 1,400

**Nonnegativity Constraints:**

x1, x2 ≥ 0

# Question 2

1. The decision variables would be number of each size produced at each plant.

Let Xj,k = size, plant # where:

j = 1 – large; j = 2 – medium; j = 3 – small

k = 1 – plant 1; k = plant 2 – medium; k = 3 – plant 3

1. Objective Function:

Let Z = Profit

Z = 420x11 + 420x12 + 420x13 + 360x21 + 360x22 + 360x23 + 300x31 + 300x32 + 300x33

x11 + x21 + x31 ≤ 750

production constraint

x12 + x22 + x32 ≤ 900

x13 + x23 + x33 ≤ 450

20x11 + 15x21 + 12x31 ≤ 13,000

space constraint

20x12 + 15x22 + 12x32 ≤ 12,000

20x13 + 15x23 + 12x33 ≤ 5,000

x11 + x12 + x13 ≤ 900

demand constraint

x21 + x22 + x23 ≤ 1,200

x31 + x32 + x33 ≤ 750

((x11 + x21 + x31 )/ 750) = ((x12 + x22 + x32 )/ 900)

((x12 + x22 + x32 )/ 900) = ((x13 + x23 + x33 )/ 450)

((x11 + x21 + x31 )/ 750) = ((x13 + x23 + x33 )/ 450)

labor constraint

((x11 + x21 + x31 )/ 750) - ((x12 + x22 + x32 )/ 900) = 0

((x12 + x22 + x32 )/ 900) - ((x13 + x23 + x33 )/ 450) = 0

((x11 + x21 + x31 )/ 750) - ((x13 + x23 + x33 )/ 450) = 0

x11, x12, x13, x21, x22, x23, x31, x32, x33 ≥ 0

Nonnegativity constraint