Solution 1:

Given,

Fabric sheet = 5000sqft

Total time consumed = 40 hours*60 minutes = 2400 minutes

Number of laborers = 35

So, Total number of laborers and consumed time = 2400 minutes*35 laborers = 84000 minutes that equals to 1400 hours

Decision Variable:

Here, the decision variables are Collegiate (C) and Mini (M)

Objective Function:

Maximation Dmax = 32C + 24M

Constraints: C <= 1000, M <= 1200

Mathematical Formulation:

3C + 2M <= 5000 (Fabric sheet)

(3/4) C + (2/3) M <= 1400 (Time) where C, M >= 0

Each Collegiate requires 45 minutes of labor that is 3/4 hours.

Each Mini requires 40 minutes of labor that is 2/3 hours.

Solution 2:

a) Decision variables:

Let P1, Q1 & R1 are the variables assigned to Plant 1.

Let P2, Q2 & R2 are the variables assigned to Plant 1.

Let P3, Q3 & R3 are the variables assigned to Plant 1.

b) Linear programming model:

Objective function Lmax = 420P1 + 420P2 + 420P3 + 360Q1 + 360Q2 + 360Q3 + 300R1 + 300R2 + 300R3

c) Time Constraints:

Plants Capacity:

P1+Q1+R1 <= 750 (plant 1 spare capacity)

P2+Q2+R2 <= 900 (plant 2 spare capacity)

P3+Q3+R3 <= 450 (plant 3 spare capacity)

Sales Forecast:

P1+Q1+R1 <= 900 (sales forecast of Large)

P2+Q2+R2 <= 1200 (sales forecast of Medium)

P3+Q3+R3 <= 750 (sales forecast of Small)

Maximum space availability:

20P1+15Q1+12R1 <= 13000 (storage space in plant 1)

20P2+15Q2+12R2 <= 12000 (storage space in plant 2)

20P3+15Q3+12R3 <= 5000 (storage space in plant 3)

Pmax, Qmax, Rmax >= 0

As per the given analysis each plant must have same percentage of its production units

P1+Q1+R1/750 = P2+Q2+R2/900 = P3+Q3+R3/450

450(P1+Q1+R1) - 750(P3+Q3+R3) = 0

900(P1+Q1+R1) - 750(P2+Q2+R2) = 0

450(P2+Q2+R2) - 900(P3+Q3+R3) = 0

Non-Negativity

Where P1,P2,P3,Q1, Q2,Q3,R1,R2,R3 >=0