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QUANTITATIVE MANAGEMENT MODELING
Assignment -1

Question 1:

A. Clearly define the decision variables.

Collegiate(x)
Mini bag pack(y)

x =no of collegiate back packs.
y =no of mini back packs.

B. What is the objective function?

The objective function is maximizing profit (MP).
Profit of x $32
Profit of y $24

Maximizing profit (MP) = 32 x + 24 y

C. What are the constraints?

	X (collegiate)	Y(Mini)
Material required for production (sq. ft)	3 sq. ft	2 sq. ft
Profit for each product ($)	$32	$25
Time required for each product to produce (Minutes)	45min	40min
Target quantity to sell (Demand)	1000	1200

Material constraint:
Material receives from bank 5000sq.ft of nylon fabric.
$3x + 2y <= 5000$ sq.ft.

Time constraint:
45 minutes for product X, 40 minutes for product y
40 hours per week, total labor 35

45x + 40y =35 labor * 40 hours *60 minutes =84000 minutes

Demand constrains:
x <= 1000
y <= 1200

Non-Negativity:
x≥0
y≥0

D. Write down the full mathematical formulation for this LP problem.

Collegiate back packs per week =x
Mini back packs per week =y

Maximizing profit (MP) = 32 x + 24 y
x <= 1000 collegiates target to sell per week
y <= 1200 minis target to sell per week

45x + 40y <= 84000

3x + 2y <= 5000sq.ft of material required per week.
x,y≥ 0

Question 2:

A. Define the decision variables.

Total new products to be produced in weigelt corporation as per the size of product to maximize the profit in each plant.

P_1 = number of units produced on plant1with size L

Q_1= number of units produced on plant1with size M

R_1 = number of units produced on plant1with size S

P_2= number of units produced on plant2 with size L

Q_2= number of units produced on plant2 with size M

R_2 = number of units produced on plant2 with size S

P_3 = number of units produced on plant3 with size L

Q_3= number of units produced on plant3 with size M

R_3 = number of units produced on plant3 with size S

B. Formulate a Linear Programming for this Problem:

Maximize Profit

$Z = 420 (P_1+P_2+P_3) + 360 (Q_1+Q_2+Q_3) +300 (R_1+R_2+R_3)$

Constraints:
Total number of units produced regardless of which plant they come from.

Production Capacity per unit by plant each day

Plant 1 = $P_1 + Q_1 + R_1 \leq 750$
Plant 2 = $P_2 + Q_2 + R_2 \leq 900z$
Plant 3 = $P_3 + Q_3 + R_3 \leq 450$

Storage capacity per unit by plant each day

Plant 1 = $20P_1 + 15Q_1 + 12R_1 \leq 13000$
Plant 2 = $20P_2 + 15Q_2 + 12R_2 \leq 12000$
Plant 3 = $20P_3 + 15Q_3 + 12R_3 \leq 5000$

Sales forecast per day:

$P_1 + P_2 + P_3 \leq 900$
$Q_1 + Q_2 + Q_3 \leq 1200$
$R_1 + R_2 + R_3 \leq 750$

The Plants steadily uses a fixed % of their extra production capacity to make new product.

$$\frac{P_1+Q_1+R_1}{750} = \frac{P_2 + Q_2 + R_2}{900} = \frac{P_3 + Q_3 + R_3}{450}$$

P1, P2, P3, Q1, Q2, Q3, R1, R2, R3 ≥ 0.