

Professor Wu

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Quantitative Management Modeling

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Assignment # 1

The Linear Programming Model

2.

a.

1. Number of Collegiate.

2. Number of Minis.

b.

The goal of the problem is to produce the number of each type of backpack to achieve the highest possible total profit. Each Collegiate yields a unit profit of \$32 while each Mini yields a unit profit of \$24. The objective function is therefore,

$$\text{Maximize Total Profit} = \$32C + \$24M.$$

c.

The first set of constraints in this problem involve the limited resources (nylon and labor hours.) Given the number of backpacks produced, C and M, and the required nylon and labor hours for each, the total resources used can be calculated. These total resources used need to be less than or equal to the amount available. Since the labor available is in units of hours, the labor required for each backpack needs to be in units of hours (3/4 hour and 2/3 hour) rather than minutes (45 minutes and 40 minutes.) These constraints are as follows:

Nylon: $3C + 2M \leq 5400$ square feet,

Labor Hours: $(3/4)C + (2/3)M \leq 1400$ hours.

The final constraint is that they should not produce more of each backpack than the sales forecast. Therefore,

Sales Forecast: $C \leq 1000$

$$M \leq 1200.$$

d.

After adding nonnegativity constraints, the complete algebraic formulation is given below:

Let C = Number of Collegiates to produce,

M = Number of Minis to produce.

Maximize Total Profit = $\$32C + \$24M$,

subject to

Nylon: $3C + 2M \leq 5400$ square feet,

Labor Hours: $(3/4)C + (2/3)M \leq 1400$ hours,

Sales Forecast: $C \leq 1000$

$M \leq 1200$.

And $C \geq 0$, $M \geq 0$.