LP MODEL

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LP MODEL COMPUTATION OF LINEAR PROGRAMMING WITH AN EXAMPLE

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 longterm 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. a. Clearly define the decision variables b. What is the objective function? c. What are the constraints? d. Write down the full mathematical formulation for this LP problem

```
table=matrix(c(3,45,32,2,40,24),ncol=3,byrow=T)
colnames(table)<-c('Material','Time Requirement','Unit cost')
rownames(table)<-c('collegaiate','Mini')
table
```

```
            Material Time Requirement Unit cost
collegaiate        3               45        32
Mini               2               40        24
```

```
        Material Time Requirement Unit cost
```

collegiate 3 45 32 Mini 2 40 24

suppose

a.DEFINING THE DECISION VARIABLE

the number of backpacks of collegiate

$$= K_m$$

the number of backpacks of Mini

$$= K_t$$

so,the decision variables are

$$k_m, K_t$$

b. DERIVING THE OBJECTIVE FUNCTION

$$MAX \quad Z = 32K_m + 24K_t$$

c. DERVIVING THE CONSTRAINTS

Material constraint: The back savers company can use the maximum 5000 sq.foot of nylon material per week is

$$3K_m + 2K_t \leq 5000$$

Labor constraint: The laborers for back savers is 35, and provided 40 hours per week for each labor, given that back savers laborers makes collegiate backpack in 45 minutes and Mini backpack in 40 minutes. so, convert the labor hours into minutes and so that the total labor should not exceed the available labor so 35X40X60 = 84000

$$3K_m + 2K_t \leq 84000$$

Sales constraint: The max no of collegiate backpacks for selling is 1000 a

$$K_m \leq 1000$$

The max no of Mini backpacks for selling is 1200

$$K_t \leq 1200$$

d. The full mathematical formulation for the given R code to solve the LP program by using the "lpsolve" with the pacakage of the R studio

the profit company per unit is

$$32K_m + 24K_t$$

Note: ##The above equation in the non negativity of constraints is

$$0 \leq K_m \leq 1000$$

$$0 \leq K_t \leq 1200$$