



### BACKSAVER'S LP MODEL FORMULATION

#### A) DECISION VARIABLES

Let  $X_i$  = Backpack

Where  $i$  = Model of Backpack (1,2)

Therefore,

$X_1$  = Collegiate Backpack

$X_2$  = Mini Backpack

#### B) OBJECTIVE FUNCTION

The objective of Back Savers is to maximize the profits, therefore, the equation to maximize profits is:

$$Z_{\max} = 32X_1 + 24X_2$$

#### C) CONSTRAINTS

Back Savers receive 5000 square-foot shipment of material each week thus total resources used should be less than or equal to this shipment:

$$3X_1 + 2X_2 \leq 5000 \text{ square feet}$$

We also have a constraint on number of labor hours ( $35 \times 40 = 1400$ ), therefore:

$$(3/4)X_1 + (2/3)X_2 \leq 1400 \text{ hours}$$

$$(45 \text{ min} = 3/4 \text{ h} \ \& \ 40 \text{ min} = 2/3 \text{ h})$$

They should also not produce more of each backpack than the sales forecast thus:

$$X_1 \leq 1000, \ X_2 \leq 1200$$



## D) MATHEMATICAL FORMULATION

Therefore, the mathematical formulation for this linear programming problem is:



$$Z_{\max} = 32X_1 + 24X_2$$

Subject to the constraints:

$$3X_1 + 2X_2 \leq 5000 \text{ square feet ----- (1)}$$

$$(3/4)X_1 + (2/3)X_2 \leq 1400 \text{ hours ----- (2)}$$

$$\text{Where } X_1 \leq 1000, X_2 \leq 1200 \text{ \& } X_1 \geq 0, X_2 \geq 0$$

