Q. 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.

1. Clearly define the decision variables

Ans –

The Number of Collegiate (**x**) and Mini (**y**) Backpacks

1. What is the objective function?

Ans.-

**z** is the profit to be made by selling both types of backpacks

1. What are the constraints?

Ans.-

Nylon fabrics -> Nylon fabric (raw material) =5000 square foot

Selling Forecast -> At most 1000 Collegiates and 1200 Minis can be sold per week

Collegiates i.e., x<=1000 and Minis i.e., y<=1200

x,y >=0

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

Ans.-

Profit (**z**)=$(32x+24y) (in dollars)

Labor – 45x+40y=35(laborers)\*40(hrs)\*60(mins)=84000 mins

Amount of Nylon fabric used – 3x+2y<=5000 sq.foot