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 long-term 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**

Decision variables: Number of collegiate backpacks to produce and number of mini backpacks to produce

1. **What is the objective function?**

$32 collegiate + $24 mini = maximize total profit

1. **What are the constraints?**

Available square feet of Nylon: 3 collegiate + 2 mini ≤ 5000

Labor hours: 45 collegiate + 40 minis ≤ 84,000

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

X1 = collegiate backpacks

X2= mini backpacks

32X1 + 24 X2 = max Z

32X1 + 24 X2 ≤ 5000

X1, X2 ≥ 0