Problem 1: Dwight and Hattie have run the family farm for over thirty years. They are currently planning the mix of crops to plant on their 120-acre farm for the upcoming season. The table below gives the labor hours and fertilizer required per acre, as well as the total expected profit per acre for each of the potential crops under consideration. Dwight, Hattie, and their children can work at most 6,500 total hours during the upcoming season. They have 200 tons of fertilizer available. What mix of crops should be planted to maximize the family's total profit?

Crop	Labor Required (hours per acre)	Fertilizer Required (tons per acre)	Expected Profit (per acre)
Oats	50	1.5	$500
Wheat	60	2	$600
Corn	105	4	$950

(a) Formulate a linear programming model algebraically

Problem 2: The kitchen manager for Seattle Academy high school is trying to decide what to feed its students. He would like to offer some combination of milk, beans, and oranges, YUM! The goal is to minimize cost, subject to meeting the minimum nutritional requirements imposed by law. The cost and nutritional content of each food, along with the minimum nutritional requirements, are shown below. What diet should be fed to each student? Think carefully how a cost minimum is different than a profit maximum and how the constraints are set up.

	Milk (gallons)	Navy Beans (cups)	Oranges (large Calif. Valencia)	Minimum Daily Requirement
Niacin (mg)	3.2	4.9	0.8	13.0
Thiamin (mg)	1.12	1.3	0.19	1.5
Vitamin C (mg)	32.0	0.0	93.0	45.0
Cost ($)	2.00	0.20	0.25	

(a) Formulate a linear programming model algebraically

Problem 3: 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. How many of each backpack should be produced per week?

(a) Formulate a linear programming model algebraically

(b) Use the graphical method by hand to solve this model.