

Collaborative Project — Systems of Equations and Inequalities

1. During a college football game, a concession stand used 5200 beverage cups for hot chocolate and coffee sales. They charged \$2.50 per cup for hot chocolate and \$2 per cup for coffee. The hot chocolate and coffee sales generated revenue of \$11,500 during the game. How many cups of each beverage were sold?

2. The stand's supply and demand equations for cheeseburger sales during the game are

$$\text{Supply: } p = 0.0003x + 2.15$$

$$\text{Demand: } p = (3.11 - 0.00018x)^2$$

where p is the price of a cheeseburger and x is the number sold. Use a graphing utility to graph the supply and demand equations. Find and interpret the market equilibrium.

3. The athletic department sold a total of 18,900 tickets for the game. The tickets were of three types: reserved, general admission, and student. The combined number of student and reserved tickets sold was 6300. There were 8400 more general admission tickets sold than student tickets. How many tickets were sold of each type?
4. The football training staff recommends that players consume at least 280 calories, 450 mg of sodium, and 59 grams of carbohydrates during practice. The staff supplies 8-ounce sports drinks and 1.2-ounce energy bars. The table shows the calorie, sodium, and carbohydrate contents of each supplement.

	Calories	Sodium (milligrams)	Carbohydrates (grams)
Sports drink	20	110	5
Energy bar	110	60	22

- a. Write and graph a system of linear inequalities that describes the numbers of sports drinks and energy bars that satisfy the training staff recommendations.
- b. What combination of sports drinks and energy bars gives the exact minimum amounts recommended for all three nutrients?
- c. Without using any energy bars, the least number of sports drinks that satisfies all recommendations results in much more than is needed of which nutrient?
5. A local company decides to print and sell T-shirts and sweatshirts to commemorate a bowl game bid for the football team. The company has 24 production hours available to print the shirts. Their production time is 1.5 minutes per T-shirt and 2 minutes per sweatshirt. It costs the company \$5 to make each T-shirt and \$12 to make each sweatshirt. The company wants to limit total costs to \$6240 while making and selling at least 800 shirts. The company will sell T-shirts for \$10 and sweatshirts for \$20. What should the company produce to yield an optimal revenue? What is the optimal revenue?