Using Excel to Solve Linear Programming Problems

1. Alejandro is an auto mechanic. He spends 3 hours when he replaces the shocks on a car and 2 hours when he replaces the brakes. He works no more than 48 hours a week. He routinely completes at least two shocks replacements and six brake replacements a week. If he charges $500 for labor replacing shocks and $300 for labor replacing brakes, how many jobs of each type should he complete a week to maximize his income?

    a. Define the variables. Write the constraints and the objective function.

    b. Use Excel to solve

    c. Write the final answer as a sentence.

2. A bakery makes both cakes and cookies. Each batch of cakes requires two hours in the oven and three hours in the decorating room. Each batch of cookies needs one and a half hours in the oven and two-thirds of an hour in the decorating room. The oven is available no more than 15 hours a day and the decorating room can be used no more than 13 hours a day. How many batches of cakes and cookies should the bakery make in order to maximize profits if cookies produce a profit of $20 per batch and cakes produce a profit of $30 per batch?

    a. Define the variables. Write the constraints and the objective function.

    b. Use Excel to solve

    c. Write the final answer as a sentence.

3. Procter and Gamble Co. stock sells for $143 a share and has a 3-year average annual return of $28 a share. The beta value is .43. Apple Inc. sells for $150 a share and has a 3-year average annual return of $60 a share. The beta value is 1.21 Tori wants to spend no more than $12,000 investing in these two stocks, but she wants to earn at least $4000 in annual revenue. Tori also wants to minimize the risk. Determine the number of shares of each stock that Tori should buy.

    a. Define the variables. Write the constraints and the objective function.

    b. Use Excel to solve

    c. Write the final answer as a sentence.

4. Trees in urban area help keep air fresh by absorbing carbon dioxide. A city has $2,100 to spend on planting spruce and maple trees. The land available for planting is 45,000 square feet. How many of each tree should the city plan to maximize carbon dioxide absorption?

    Facts for a Single Tree:

	Spruce	**Maple**
Planting Cost	$30	$40
Area Required	600 square feet	900 square feet
Carbon Dioxide Absorption	650 lb/yr	300 lb/yr

    a. Define the variables. Write the constraints and the objective function.

    b. Use Excel to solve

    c. Write the final answer as a sentence.

5. A personal garden can help reduce carbon dioxide as well. You have 600 square feet for your garden. You want to use two types of plants: blue lagoon sedum and raspberry red sedum. Each blue lagoon sedum will cover 1.2 square feet, and each raspberry red sedum will cover 2 square feet. Each plant costs $2.50 and you only have $1000 to spend on your garden. You want to maximize the amount of carbon dioxide the plants in your garden absorb. Blue lagoon sedum absorbs 1.4 lb of carbon dioxide a year and raspberry red sedum absorbs 2.1 lb of carbon dioxide a year. How many of each type of plant should you plant? How much carbon dioxide will your garden absorb?

    a. Define the variables. Write the constraints and the objective function.

    b. Use Excel to solve

    c. Write the final answer as a sentence.

6. A chemical company must use a new process to reduce pollution. The old process emits 7 g sulfur and 12 g of lead per liter of chemical made. The new process emits 6 g of sulfur and 6.7 g of lead per liter of chemical made. The company makes a profit per liter of $19 under the old process and $25 under the new process. No more than 14,466 g of sulfur and no more than 11,181 g of lead can be emitted daily. How many liters of chemical could be made under the old process and under the new process to maximize profits? What is the maximum profit?

    a. Define the variables. Write the constraints and the objective function.

    b. Use Excel to solve

    c. Write the final answer as a sentence.