1. Feedco produces two types of cattle feed. Feed 1 must contain at least 80% wheat, and feed two must contain at least 60% alfalfa. Feed 1 sells for $1.50 per pound and feed two sells for $1.30 per pound. Feedco can purchase up to 1000 lbs of wheat at $0.50 per pound and up to 800 lbs of alfalfa at $0.40 per pound. Demand for each type of feed is unlimited.

a. Formulate and solve an LP to maximize Feedco’s profits.

b. If a seller is found that could be used to buy an additional 100 lbs of alfalfa at $0.60 per pound, should Feedco purchase this and change the above found strategy? Why or why not?

c. If a seller is found that could be used to buy an additional 100 lbs of alfalfa at $1.40 per pound, should Feedco purchase this and change the above found strategy? Why or why not?

2. I now have $1000. The following investments are available during the next three years:

   Investment A: Every dollar invested now yields $0.10 a year from now and $1.30 three years from now.

   Investment B: Every dollar invested now yields $0.20 a year from now and $1.10 two years from now.

   Investment C: Every dollar invested a year from now yields $1.50 three years from now.

   During each year, uninvested cash can be placed in money market funds, which yield 6% interest per year. At most $500 may be placed in any one of the investments A, B, and C.

a. Formulate and solve an LP to maximize my cash on hand three years from now.

b. If the problem were changed to allow up to $600 in any one of the investments A, B, or C, which investment would you increase?
3. A company makes two products called X and Y from a mix of chemicals. The company makes the mix using three raw materials as ingredients. The raw materials are identified by the letters A, B, and C. At least 45% of the mix must be raw material A and no more than 30% of the mix may be raw material C. After processing the mix, the products are withdrawn in the proportions: 40% is X, 20% is Y, and 40% is a waste product that must be discarded.

Up to 1000 pounds of X can be sold for $12 per pound. Product Y is sold for $18 per pound for any amount up to 2000 pounds. No more than 1000 pounds of X or 2000 pounds of Y may be produced.

The processing cost of the mix is $1.50 per pound. Material A costs $6 per pound for any amount. Material B costs $3 per pound up to 2500 pounds. Raw material C is free for up to 1500 pounds. No more than 2500 and 1500 pounds of raw materials B and C are available respectively.

a. Solve the problem with a linear programming model. Describe the optimum mix of raw materials and production levels for the products. How much profit does the business make?

b. What restrictions in the problem are limiting the profit?