

Exam 2

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?

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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be raw material A and no more than 30% of the mix may be raw material C. After processing the mix, the products are withdrawn in the proportions: 40% is X, 20% is Y, and 40% is a waste product that must be discarded.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?