

## 3.2 - Linear Programming (LP) Problems

A **linear programming problem** consists of a linear objective function to be maximized or minimized subject to certain constraints in the form of linear equations or inequalities.

**Examples of SETTING UP LP problems:**

- (a) (From Tan) Madison Finance has a total of \$20 million earmarked for homeowner and auto loans. On the average, homeowner loans have a 10% annual rate of return, whereas auto loans yield a 12% annual rate of return. Management has also stipulated that the total amount of homeowner loans should be greater than or equal to four times the total amount of automobile loans. Determine the total amount of loans of each type Madison should extend to each category in order to maximize its returns.
- (b) (From Tan) A farmer has 150 acres of land suitable for cultivating crops A and B. The cost of cultivating crop A is \$40/acre, whereas that of crop B is \$60/acre. The farmer has a maximum of \$7400 available for land cultivation. Each acre of crop A requires 20 labor-hours, and each acre of crop B requires 25 labor-hours. The farmer has a maximum of 3300 labor-hours available. If she expects to make a profit of \$150/acre on crop A and \$200/acre on crop B, how many acres of each crop should she plant in order to maximize her profit?

- (c) (From Tan) A financier plans to invest up to \$2 million in three projects. She estimates that project A will yield a return of 10% on her investment, project B will yield a return of 15% on her investment, and project C will yield a return of 20% on her investment. Because of the risks associated with the investments, she decided to put not more than 20% of her total investment in project C. She also decided that her investments in projects B and C should not exceed 60% of her total investment. Finally, she decided that her investment in project A should be at least 60% of her investments in projects B and C. How much should the financier invest in each project if she wishes to maximize the total returns on her investments?