'Additional Applied Optimization'

What this means, is word problems where you're supposed to maximize or minimize some quantity...

The book gives a list of steps for doing this:

1. Give quantities names (letters, variables).

2. Express the relationships between the variables as equations, or as inequalities. [Drawing a picture can help here. Not so much with of a 'business' nature – profit is hard to draw.]

3. If you're optimizing a variable y, then write an equation

$$y = f(x)$$

where x is some other variable. [Here, you may have to eliminate other variables.]

4. Find f'(x), and find critical numbers. Test the values of the critical numbers, and also the values at the endpoints of the domain of f.

5. Interpret your result. [Which means, write a sentence at the end of your answer...]

Example

An open rectangular box with square base is to be made from 48ft² of material. What dimensions will result in the box with the largest volume?

Example

You want to run an underground power cable from a power station on one side of a river to a house on the other side. The house is 5 miles downstream from the station and the river has a constant width of 1 mile. It costs \$1000 per mile to lay cable underground and \$3000 per mile to lay cable under water. How should you lay the cable to minimize the total cost, and what is this minimal cost?

Example

There are 50 apple trees in an orchard. Each tree produces 800 apples. For each additional tree planted in the orchard, the output of per tree drops by 10 apples. How many trees should be added to maximize the total out put of trees?

Example A wire 50 inches long is cut into two pieces. One piece is bent into a circle and the other into a square. Where should the wire be cut to minimize the total area?